Deriving traditional reproductive regimes to explain subnational fertility differentials in Zambia

Kambidima Wotela
Centre for Actuarial Research (CARe)

Thesis presented for the degree of Doctor of Philosophy to the Faculty of Commerce, University of Cape Town

October 2008

ABSTRACT

Thesis title: Deriving traditional reproductive regimes to explain subnational fertility differentials in Zambia
Author: Kambidima Wotela; Cape Town, October 2008

This thesis applies multivariate statistical techniques to six data sets to account for past and present-day features underlying ethnic fertility differentials in Zambia. First, using data on Zambian societies in the Murdock Ethnographic Atlas, the author applies multivariate cluster analysis to derive groups of societies with similar traditional reproduction behaviour (Zambian traditional reproductive regimes). This multivariate approach avoids pitfalls associated with defining ethnicity based on single characteristics or by means of proxies, such as language.

The results reveal four Zambian traditional reproductive regimes. They also show that, in Zambia, traditional social and community features are important avenues for controlling sexual and marital unions—and hence reproduction. Specifically, the results associate low fertility with societies whose control of reproduction at community level is weak. This suggests that societies that control fertility at family level have lower fertility. This result supports an important component (family nucleation) of the intergenerational wealth flows theory. However, the results show that the impact of social and community features depends on traditional economic and political arrangements.

Second, fertility estimates for the four Zambian traditional reproductive regimes derived from census and DHS data show that fertility differentials existed before 1980. However, over time, fertility levels between traditional reproductive regimes have been converging.

Lastly, multivariate analysis of variance and descriptive discriminant analysis results show that fertility levels of Zambian traditional reproductive regimes have been converging because of differences in exposure and response to urbanisation between different ethnic societies. This suggests that modernisation and ideational theories provide eminent explanations of fertility declines in some Zambian ethnic societies.

Overall, national estimates show that fertility in Zambia is high and its transition to low fertility has been modest. Fertility decline has been sluggish because it is declining rapidly among a small group of women belonging to ethnic societies that had the highest fertility in the land.

TABLE OF CONTENTS

Abstract .... **ii**
Table of contents .... **iii**
List of tables .... **vi**
List of figures .... **ix**
List of tables and figures in the appendices .... **xi**
Acknowledgements .... **xii**
1 Introduction **1**
2 100 years 10 enumerations 1 problem: explaining sub-national fertility variations in Zambia **7**
2.1 Introduction to Zambia 7
2.2 Fertility estimation in Zambia 9
2.2.1 A history of fertility data collection in Zambia from 1900 to 2000 10
2.2.2 National and provincial fertility estimates from 1950 to 2000 14
2.2.3 Fertility trends and provincial fertility differentials in Zambia 17
2.3 Explanations of sub-national fertility differentials in Zambia 22
2.3.1 Materials on regional fertility differentials in Zambia 22
2.3.2 Ethnic fertility differentials in Zambia 27
2.4 Integrating ethnicity and cultural features into fertility analysis: concepts, methods and issues 31
2.4.1 Ethnicity: definition and issues 31
2.4.2 Cultural customs and norms 32
2.4.3 Dealing with the concerns of integrating anthropology and demography 38
2.5 The determinants of fertility 41
2.5.1 Proximate determinants of fertility 42
2.5.2 Background determinants of fertility 43
2.5.3 Identifying and linking cultural customs and norms underlying reproduction in traditional societies to fertility outcomes 44
2.6 Explaining fertility variations between ethnic societies in Zambia 50
2.6.1 Theories of fertility transition 50
2.6.2 Strands of fertility theories that may explain fertility variations between ethnic societies in Zambia 58
2.7 Evaluating ethnic fertility differentials in Zambia 60
3 Current fertility estimates and past trends in Zambia **64**
3.1 Estimating fertility levels and trends 64
3.2 Describing the data sources 64
3.2.1 The Zambian census data 65
3.2.2 The Zambian DHSs 68
3.3 Comparing census and DHS data sources 68
3.3.1 Age distribution 69
3.3.2 Classification and province of residence 70
3.3.3 Female education in Zambia 71
3.3.4 Current marital status of Zambian woman 71
3.3.5 Comparability of the census and DHS data sources 72
3.4 Estimating Zambian lifetime and current fertility 72
3.4.1 Lifetime fertility 73
3.4.2 Current fertility 80

3.5 Fertility trends: 1981 to 2000 ... 90

3.5.1 Extracting past fertility estimates from Zambian birth histories ... 90
3.5.2 The tempo of national fertility decline between 1981-2001 ... 93

3.6 Summary, limitations and conclusions ... 94

4 Migration history, settlement and kinship lineage arrangements of ethnic societies in Zambia ... 96

4.1 Rationale for discussing the migration history and settlement of ethnic societies in Zambia ... 96

4.2 The origin of ethnic societies and their migrations to Zambia ... 97

4.2.1 Ethnic societies that migrated directly from the Great Lakes region ... 100
4.2.2 Ethnic societies that migrated from the Luba and Lunda Kingdoms ... 100
4.2.3 Ethnic societies that migrated from South Africa and Zambian ethnic societies influenced by South African ethnic societies ... 102

4.3 Ethno-geographical location of Zambian ethnic societies ... 103

4.4 Affiliations based on kinship lineage ... 107

4.4.1 Zambian ethnic societies tracing relations through cognatic kinship lineage ... 107
4.4.2 Zambian ethnic societies tracing relations through dual kinship lineage: matrilineal kinship with a strong emphasis of patrilineal inheritance ... 108
4.4.3 Zambian ethnic societies tracing relations through patrilineal kinship ... 109
4.4.4 Zambian ethnic societies tracing relations through matrilineal kinship ... 109

4.5 Comparability of the ethno-geographical regional clusters ... 113

4.5.1 Kinship lineage clusters of Zambian ethnic societies ... 113
4.5.2 Murdock's ethnic clusters of Zambian ethnic societies ... 115
4.5.3 Linguistic clusters of Zambian ethnic societies ... 117
4.5.4 Political clusters of Zambian ethnic societies ... 119

4.6 Conclusion ... 121

5 Explaining past fertility differentials: Deriving traditional reproductive regimes in Zambia ... 122

5.1 The use of cluster analysis to derive traditional reproductive regimes ... 122

5.2 Multivariate cluster analysis: procedure and techniques ... 123

5.2.1 Measures of proximity in cluster analysis ... 124
5.2.2 Clustering algorithms ... 126
5.2.3 Determining the number of clusters ... 130
5.2.4 Examining dimensions that define clusters ... 132

5.3 Deriving traditional reproductive regimes in Zambia using multivariate cluster analysis ... 135

5.3.1 Anthropological data on Zambian traditional societies in Murdock's Ethnographic Atlas ... 135
5.3.2 Application of clustering analysis procedures ... 139
5.3.3 Distinguishing characteristics of the four traditional reproductive clusters found in Zambia ... 150

5.4 Review of the adopting the approach of perceiving ethnicity as traditional reproductive regimes ... 165

5.4.1 Summary and results ... 165
5.4.2 Reliability of deriving traditional reproductive regimes using multivariate cluster analysis ... 167
5.4.3 Problems of using anthropological and ethnographic information ... 168

6 Converging fertility levels: Past trends and fertility estimates for Zambian traditional reproductive regimes ... 169

6.1 Comparing fertility between traditional reproductive regimes ... 169

6.2 Extending the traditional reproductive regimes to other Zambian societies ... 169

6.3 Assigning women in contemporary data sources to respective traditional reproductive regimes ... 171

6.4 Fertility differentials between traditional reproductive regimes ... 176

6.4.1 Lifetime fertility estimates for traditional reproductive regimes ... 176

6.4.2 Current fertility estimates for traditional reproductive regimes ... 179

6.4.3 Fertility trends for each traditional reproductive regime ... 183

6.5 Converging fertility levels ... 186

7 Contemporary features underlying the erosion of traditional governors of fertility: Converging fertility explained ... 188

7.1 Identifying features underlying differential fertility trends between Zambian traditional reproductive regimes ... 188

7.2 The traditional reproductive regimes and the present-day determinants of fertility 189

7.2.1 The grouping variable: Traditional reproductive regimes ... 190

7.2.2 The response variables: Present-day features underlying fertility ... 191

7.3 Describing the single-factor multiple-group multivariate analysis of variance and descriptive discriminant analysis ... 196

7.3.1 Univariate tests for single-factor multiple-groups ... 197

7.3.2 Assessments to ensure data is suitable for multivariate analysis ... 197

7.3.3 Single-factor multiple-groups multivariate tests for assessing the significance of group differences ... 198

7.3.4 Identifying important features in a single-factor multiple-groups multivariate environment ... 199

7.3.5 Linear combinations of response variables that describe group differences ... 199

7.3.6 Measuring differences between specific groups in multiple-groups multivariate designs ... 201

7.4 Explaining features underlying converging fertility trends ... 202

7.4.1 Descriptive and univariate differences between Zambian traditional reproductive regimes ... 202

7.4.2 Suitability of census and DHS data on Zambian traditional reproductive regimes for multivariate analysis ... 202

7.4.3 Significance of multivariate differences between Zambian traditional reproductive regimes ... 205

7.4.4 Important features accounting for differences between Zambian traditional reproductive regimes ... 206

7.4.5 Using linear discriminant functions to explain differences between Zambian traditional reproductive regimes ... 207

7.4.6 Present-day features that make high traditional fertility patrilineal regime women different from women belonging to other regimes ... 211

7.4.7 Describing present-day features underlying differences between Zambian traditional reproductive regimes ... 213

7.5 Summary and conclusions ... 214

8 Features underlying ethnic fertility differentials in Zambia: Thesis summary and conclusions ... 216

References ... 228

Appendices ... 246

LIST OF TABLES

Table 2.1 Official national and provincial total fertility estimates: Zambia, 1950-2002 14
Table 2.2 National fertility estimates according to author and method: Zambia, 1969 Census 16
Table 2.3 Observed fertility estimates by province and tribal ethnic group: Zambia, 1950-51 DSS 23
Table 2.4 Observed fertility estimates of urban women by province of ethnic origin: Zambia, 1951-54 USS........28
Table 2.5 Observed fertility estimates of women residing in Lusaka by mother tongue: Lusaka, Zambia, 1968-69 LUSDSS........29
Table 3.1 Demographic and socio-economic characteristics of Zambian women aged 15-49: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 69
Table 3.2 Summary statistics showing the age distribution of women before and after applying the El-Badry correction: Zambia 1990 Census........78
Table 3.3 Parity by age group before and after applying corrections: Zambia 1990 Census........78
Table 3.4 Mean parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 79
Table 3.5 Summary statistics showing the distribution of women with known current fertility before and after correcting for not stated BLTM/BLY data: Zambia 1990 Census 82
Table 3.6 Age specific and total fertility estimates by age group after application of each correction: Zambia 1990 Census........85
Table 3.7 Age specific and total fertility estimates by age group after application of each correction: Zambia 2000 Census........85
Table 3.8 Adjusting current fertility using the Brass P/F Ratio method, Brass P/F Ratio (Feeney factor) method and the Relational Gompertz Model: Zambia 1990 Census 88
Table 3.9 Adjusting current fertility using the Brass P/F Ratio method, Brass P/F Ratio (Feeney factor) method and the Relational Gompertz Model: Zambia 2000 Census 88
Table 3.10 Age-specific and total fertility estimates by age group: Zambia 1990 and 2000 Censuses; 1992, 1996, and 2001-02 Zambia DHS........89
Table 3.11 Age period specific fertility rates: 1992, 1996 and 2001-02 Zambia DHS 92
Table 3.12 Statistics describing the Zambian fertility trends of women under 40 years old........93
Table 4.1 Ethnic societies according to secondary origin and period of arrival in Zambia........99
Table 4.2 Ethnic societies grouped according to ethno-geographical location of settlement in Zambia........ 104
Table 4.3 Ethnic societies according to region of settlement and kinship lineage system..... 111
Table 4.4 Ethnic societies in Zambia grouped by Mitchell according to region and lineage type........ 114

Table 4.5 Ethnic societies grouped according to Murdock's classification of Zambian ethnic societies 115
Table 4.6 Ethnic societies in Zambia grouped according to language groups 118
Table 4.7 Proportion of the total population shared by each ethno-political group 120
Table 5.1 Zambian societies whose pre-industrial information is included in Murdock's Ethnographic Atlas 137
Table 5.2 Factors underlying reproduction in traditional societies obtained from Murdock's Ethnographic Atlas 138
Table 5.3 Variance accounted for by successive principal components according to attributes underlying reproduction in traditional societies 141
Table 5.4 Selected principal components for each of the three sets of attributes underlying reproduction in traditional societies 143
Table 5.5 Selected principal components of attributes underlying reproduction in traditional societies—reduced model 144
Table 5.6 Results from a minimum description length analysis set at minimum = 2 and maximum = 20, Zambian traditional societies using data from Murdock's (1967) Ethnographic Atlas 145
Table 5.7 Defining characteristics of traditional reproductive regimes in Zambia derived from Murdock's Ethnographic Atlas 151
Table 6.1 Traditional reproductive regimes in Zambia according to region 170
Table 6.2 Zambian ethnic/tribal distribution according to traditional reproductive cluster: 1953 population estimates; 1990 and 2000 Censuses 173
Table 6.3 Population distributions of Zambian traditional reproductive regimes: 1953 population estimates; 1990 and 2000 Censuses 174
Table 6.4 Distribution of Zambian women aged 15-49 by self-reported ethnicity according to each traditional reproductive regime: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS 175
Table 6.5 Distributions of women aged 15-49 according to Zambian traditional reproductive regimes: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS 176
Table 6.6 Mean parity by age group tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 177
Table 6.7 Current fertility estimates for each traditional reproductive regime derived from Brass P/F Ratio (traditional), Brass P/F (Feeney factor) and Relational Gompertz Model: Zambia 1990 Census 180
Table 6.8 Current fertility estimates for each traditional reproductive regime derived from Brass P/F Ratio (traditional), Brass P/F (Feeney factor) and Relational Gompertz Model: Zambia 2000 Census 181
Table 6.9 Age-specific and total fertility estimates by age group tabulated according to traditional reproductive regime: Zambia 1990, 2000 Census, 1992, 1996, and 2001-02 Zambia DHS 182
Table 6.10 Statistics describing fertility trends for each traditional reproductive regime 185
Table 7.1 Sample size for each of the four traditional regimes (grouping-variable) 190

Table 7.2 Location of regional residence for Zambian women aged 15-49 according to traditional reproductive regime, 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 193

Table 7.3 Parameters of the Box *M*- statistic for assessing homogeneity of variance-covariance matrices: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 204

Table 7.4 Parameters assessing covariance matrix equality: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 204

Table 7.5 Parameters of MANOVA test statistics assessing group contrasts between traditional fertility regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 205

Table 7.6 Variable ordering for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses 206

Table 7.7 Variable ordering for the four traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS 207

Table 7.8 Tests for dimensionality for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 208

Table 7.9 Linear discriminant functions at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 208

Table 7.10 Structure *r's* for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses 210

Table 7.11 Structure *r's* for the four traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS 210

Table 7.12 Parameters of MANOVA test statistics assessing group contrasts between the high traditional fertility regime patrilineal regime and other Zambian traditional fertility regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 212

Table 7.13 Structure *r's* for the high traditional fertility patrilineal regime versus the other Zambian traditional reproductive regimes: Zambia 1990 and 2000 Censuses 212

Table 7.14 Structure *r's* for the high traditional fertility patrilineal regime versus the other Zambian traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS 213

LIST OF FIGURES

Figure 2.1 Provincial demarcation of Zambia before and after independence 8
Figure 2.2 Official national and provincial total fertility estimates: Zambia, 1950-2002 19
Figure 2.3 Proportions of single and childless women by age according to province: Zambia, 1980 Census 25
Figure 2.4 Observed fertility estimates for urban women according to region of ethnic origin: Zambia, 1951-54 USS 27
Figure 2.5 Diagram showing how determinants of fertility are related 42
Figure 2.6 A proposed framework for integrating cultural features underlying traditional fertility 45
Figure 2.7 Diagram showing the research problem, possible explanations and the proposed methodology of pursuing this question 61
Figure 3.1 Age distribution of Zambian women aged 15-49: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 70
Figure 3.2 Distribution of women aged 15-49 according to parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 74
Figure 3.3 Corrected distribution of women aged 15-49 according to parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 76
Figure 3.4 Linear relationships between the proportion of women with unstated parity and those childless as well as plots of residuals for fitted equations by age group: Zambia 1990 Census 77
Figure 3.5 Mean parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS 79
Figure 3.6 Per cent distribution of women reporting the number of births in the twelve months before enumeration by parity: Zambia 1990 and 2000 Censuses 83
Figure 3.7 Actual and estimated proportions of women reporting a single birth in the twelve months before the census, by parity and age group: Zambia 1990 and 2000 Censuses 84
Figure 3.8 Standardised age-specific fertility schedule: Zambia 1990 and 2000 Censuses; 1992, 1996, and 2001-02 Zambia DHS 89
Figure 3.9 Lexis diagram showing the cumulated fertility information up to age 40 available in the Zambian DHS 91
Figure 3.10 Cumulated fertility up to age 40: 1992, 1996 and 2001-02 Zambia DHS 93
Figure 4.1 Ethnic societies found in Zambia 98
Figure 4.2 Zambian major ethnic societies according to region of origin and migration route 99
Figure 4.3 Regional clusters of ethnic societies according to location of ethnic settlement and kinship systems relative to provincial boundaries 113
Figure 5.1 Variance accounted for by successive principal components according to attributes underlying reproduction in traditional societies 141
Figure 5.2 Plots of eigenvalues by total variance—the scree test—according to attributes underlying reproduction in traditional societies 142

Figure 5.3 Cluster composition of traditional societies in Zambia based on all ordinal coded attributes ... 147

Figure 5.4 Cluster composition of traditional societies in Zambia that result from applying cluster analysis to the three sets of attributes underlying reproduction in traditional societies ... 148

Figure 5.5 Traditional reproductive clusters in Zambia as described through application of cluster analysis to Murdock's Ethnographic Atlas data ... 149

Figure 5.6 Profiles of the four clusters on the three sets of attributes underlying fertility in traditional societies ... 152

Figure 6.1 Parts of the 1990 and 2000 Census questionnaires showing the questions on ethnicity ... 172

Figure 6.2 Mean parity by age group tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 178

Figure 6.3 Total fertility estimates by year tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 183

Figure 6.4 Cumulated fertility up to age 40 according to traditional reproductive regime: 1992, 1996 and 2001-02 Zambia DHS ... 184

Figure 6.5 Cumulated fertility up to age 40 by urban/rural residence classification according to traditional reproductive regime: 1992, 1996 and 2001-02 Zambia DHS ... 184

Figure 7.1 Zambian traditional reproductive regimes according to location of their villages relative to provincial boundaries ... 194

Figure 7.2 An illustration of the multivariate data set matrices representing each Zambian traditional reproductive regime ... 196

Figure 7.3 Linear discriminant functions (LDF_1 versus LDF_2) at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 209

Figure 7.4 Linear discriminant functions (LDF_1 versus LDF_3) at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 209

LIST OF TABLES AND FIGURES IN THE APPENDICES

Appendix 2.1.a: National and provincial fertility estimates for Zambia from 1950 to 1980 ... 247

Appendix 2.1.b: National and provincial fertility estimates for Zambia from 1990 to 2002... 248

Appendix 3.1.a: Per cent distribution of women aged 15-49 according to parity after application of consistency recoding to the 1990 Census data and removing non-parous women and those whose parity is not stated: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 249

Appendix 3.2.a: Proportions of births born last year (BLTM/BLY) by children ever born (CEB) according to age group – before recoding "not stated" BLTM/BLY as "0" births: Zambia 1990 and 2000 Censuses; 1992 Zambia DHS ... 250

Appendix 3.2.b: Proportions of births born last year (BLTM/BLY) by children ever born (CEB) according to age group – after recoding "not stated" BLTM/BLY as "0" births: Zambia 1990 and 2000 Censuses; 1992 Zambia DHS............ 251

Appendix 3.3.a: Per cent distribution of women reporting the number of births born last year (BLTM/BLY) by children ever born (CEB): Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS ... 252

Appendix 5.1.a: The codebook for Murdock's Ethnographic Atlas and frequency distributions for the Zambian traditional societies... 253

Appendix 6.1.a: Plot of the Y values of cumulated parity (P-points) and cumulated current fertility (F-points) before fitting the Relational Gompertz Function for each traditional reproductive regime: Zambia 1990 Census ... 270

Appendix 6.1.b: Plot of the Y values of cumulated parity (P-points) and cumulated current fertility (F-points) before fitting the Relational Gompertz Function for each traditional reproductive regime: Zambia 2000 Census ... 271

Appendix 7.1.a: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1990 Census ... 272

Appendix 7.1.b: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 2000 Census ... 273

Appendix 7.1.c: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1992 Zambia DHS.............. 274

Appendix 7.1.d: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1996 Zambia DHS.............. 275

Appendix 7.1.e: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 2001-02 Zambia DHS 276

Appendix 7.1.f: Proportions of never married and nulliparous Zambian women aged 15-49 by traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS... 277

Appendix 7.2.a: Variable description and codes... 278

Appendix 7.3.a: Means, standard deviations (in italics) and univariate analysis results of selected present-day determinants of fertility for Zambian traditional reproductive regimes ... 279

Appendix 7.3.b: Means, standard deviations (in italics) and univariate analysis results of selected present-day determinants of fertility for Zambian traditional reproductive regimes ... 280

Appendix 7.4.a: Error correlations of selected present-day determinants of fertility for Zambian traditional reproductive regimes... 281

ACKNOWLEDGEMENTS

I am aware that the Lord chose me, for me, to do this research. He provided me with his guidance throughout this thesis. I therefore, appreciate his goodness and mercy for all the days I was studying in Cape Town. However, the thesis would not have been possible without the assistance from the following:

My supervisor, Dr. Tom Moultrie, he provided me with the ultimate training and motivation. He trained me to think rigorously, calculate carefully and write-up clearly. Dr. Moultrie motivated me in a number of ways, for instance, bedtime stories "you can do this"; the nightmares "why did you do this" and wakeup calls "you have to do this". These and many more will forever echo in my mind and my heart as I appreciate his kind but firm leadership. Finally, I can only describe his dedication to my research as follows "even in my next life, I want Dr. Tom Moultrie to be my supervisor".

I would like to thank the Andrew W Mellow Foundation for their financial assistance in helping me study in Cape Town for three and half years. I received the balance of my funding from a close colleague and mentor who has unfortunately decided to remain anonymous. Thank you for reminding me that "…if I have a problem, I should not go underground because by the time I surface everyone will be unable to solve it".

Sometimes not, even ever, knowing whom they are helping and not ever intending to send a bill for their assistance but remaining so dedicated to helping me resolve my research problems. I am grateful to the following:

- ⇒ Professor Douglas White (University of California at Irvine) for making available an updated database of Murdock's Ethnographic Atlas.
- ⇒ Professor Darya Khaltourina (Institute for African Studies, Russian Academy of Sciences) for showing me the ropes of cross-cultural research.
- ⇒ Professors Bruce Maxwell and Frederic Pryor (Swarthmore College) for showing me the dos and don'ts of technical and applied multivariate cluster analysis.
- ⇒ Professor Michel Garenne for providing me with both the programme algorithm and the spreadsheets used to compute fertility trends.
- ⇒ Professors Jack Caldwell, Susan Watkins and Allan Hill for their encouraging remarks on some components of this research.

⇒ Greg Distiller, I shall forever cherish your advice in statistical applications and interpretations.

⇒ UCT Library members of staff, especially the inter-library loan section, for the running around to source the materials I needed and

⇒ UCT in general and specifically CARe members of staff for hosting me.

Lastly, my colleagues for being there when I needed you the most, I shall certainly not mention names here. I would like to thank my bride of two years, Rumbidzai Mupambirei, for her gentle encouragement and proofreading skills that were essential for me to complete this thesis. To my family—especially my parents, Kapya Joyce Kalebaila and Kambidima Eddie Wotela as well as my drop-gorgeous daughter, Chibula Wotela, and the mother Mwansa Cynthia Kunda—for condoning my absence from family obligations during my studies in Cape Town. Related to this, I have failed to come to terms with myself for missing my sister's funeral because I was out of the country attending to my studies. Not that it helps much, but **Imfwama Wotela (15th February 1974 to 25th June 2005), I dedicate this thesis to you.**

Kambidima Wotela
Cape Town, October 2008

1 INTRODUCTION

> ETHNIC DIFFERENCES IN demographic behaviour are often noted in social research, especially research on less developed societies. Yet such differences are rarely explored analytically. Either they are completely ignored, usually by disguising them behind the opaque terms "district" or "region"…" (Weinreb 2001).

Past studies on Zambian fertility have observed notable regional fertility variations. They have argued—but not convincingly—that regional fertility differentials are a reflection of ethnic fertility variations. By conflating regional and ethnic delineations, the literature suggests that these differentials may be long-term outcomes of ethnic reproductive behaviours (Central Statistical Office [Zambia] 1975; Ohadike and Tesfaghiorghis 1975; Hill 1985). Mitchell's (1965) study focusing on fertility differentials of urban inhabitants infers that fertility variations exist between women of different ethnic origin. Although not with direct reference to Zambia, both Caldwell and Caldwell (1987), as well as Lesthaeghe (1989a), have also advanced the view—in slightly different forms—that regional fertility variations may be an expression of ethnic fertility differentials.

However, the extent of ethnic demographic differences, if any, is unknown or undocumented. As Weinreb (2001) observes, the analysis of subnational demographic differentials in Africa hardly goes beyond the term "regional", "provincial" or "district" differentials. Therefore, this thesis aims to explore and account for subnational fertility differentials in Zambia. It intends to test the hypothesis that ethnic fertility disparities exist independent of regional effects and seeks to identify the features that account for ethnic fertility differentials in Zambia. This research problem has remained unanswered for forty years.

Further, the literature shows that researchers have not resolved the subnational or ethnic fertility variation question adequately because of lack of reliable data and suitable research procedures. Therefore, as Aborampah (1990: 270) observes, "…efforts to understand the social and institutional factors [underlying subnational fertility differentials]…have been minimal". These past studies have suffered from three fundamental limitations. First, they have described ethnicity normatively (name or language of a traditional society). This approach does not provide an avenue for identifying features underlying fertility in pre-industrial societies. Second, they have relied on kinship lineage organisation only to explain ethnic fertility differentials. As this thesis will show, monocausal explanations are inadequate for this task because they leave out some important traditional features.

Third, although the best at the time, the research procedures that prior studies applied are statistically inadequate to untangle such multidimensional problems. For example, Mitchell's (1965: 19) study uses "some sort of factorial design". These designs allow for studying the effect of the various levels of each factor (socio-economic status, degree of urbanisation, religion and tribal group) on the response variable (fertility) while holding other factors constant. The Zambian Central Statistical Office (1975) choose a much simpler design. They simply examined proportional distributions in contingency tables. They did not attempt to test for statistical significance of differences between variables included in the study.

Therefore, to understand ethnic fertility differentials, this thesis considers issues surrounding the integration of anthropological reasoning into demography. The thesis also applies multivariate cluster analysis and descriptive discriminant analysis to identify pre-industrial and modern features underlying Zambian fertility differentials. Lastly, the thesis invokes the central propositions of different fertility theories to explain the results. Overall, this approach, described by Szreter (1993) as contextualist and realist, seeks to identify features underlying ethnic fertility differentials in Zambia. The results show that ethnicity is an important determinant of subnational fertility differentials in Zambia. The thesis concludes that provincial fertility differentials are a result of different ethnic patterns of regulating fertility in traditional societies.

The literature review shows that Zambia has fertility data sourcing, quality and estimation issues common to other developing countries. Our analysis shows that the corrections the Zambian Central Statistical Office (CSO) apply do not capture all obvious data errors before estimating fertility. It is also difficult to evaluate the appropriateness of the corrections because the CSO does not document them. Similarly, the justifications for the adjustment methods they applied are seldom documented. Therefore, Chapter 3 addresses data quality concerns. The chapter identifies and corrects for fertility reporting errors in the 1990 and 2000 Censuses before applying suitable estimation techniques to produce a new set of national fertility estimates. In doing so, the chapter provides a platform for evaluating 'official' national estimates that the CSO have published. These estimates, as well as those derived from the Demographic and Health Survey (DHS) data, confirm that fertility in Zambia is high (over five children per woman) and its transition to low fertility has been slow.

In Chapter 4 and Chapter 5, the thesis describes a simple but comprehensive approach to account for features underlying ethnic fertility differentials in Zambia using procedures developed after Mitchell's (1965) attempt at resolving this research question. Chapter 4 discusses the history of Zambian ethnic groups as a precursor to integrating anthropological explanations into demographic analysis. The migration histories reveal that there are four main tribal groups in Zambia. On arrival, the first group settled in north-eastern Zambia while the second settled in the south-central region. These two groups were the earliest to settle in Zambia and migrated straight from the Great Lakes Region. The third group migrated from the Great Lakes Region but first settled as part of the Luba-Lunda Kingdoms—situated in what is now the Democratic Republic of Congo—before migrating to Zambia. This is the group with the largest number of ethnic societies and the largest population size in Zambia. The last group is comprised of ethnic societies (the Nguni) that also migrated from the Great Lakes Region but first settled as part of the Zulu Kingdom in South Africa. The group also includes other Zambian societies that South African societies have influenced.

Further, anthropological accounts indicate that the first group (north-eastern) comprises of societies that trace their relations through patrilineal kinship. The second group (south-central) have a dual kinship lineage. This means that these societies trace relations through the matrilineal kinship but place a strong emphasis on patrilineal inheritance. The third group is comprised of ethnic groups described as full corporate matrilineal kinship societies. The last group (south-western) is comprised of societies that trace their relations through cognatic kin relations—that is, they lack a unilineal kinship lineage.

Chapter 5 applies multivariate cluster analysis methods to ethnographic data (anthropological information on traditional features associated with reproduction in each pre-industrial ethnic society) to derive homogeneous traditional reproductive regimes. This thesis defines traditional reproductive regimes as groups of ethnic societies with similar anthropological features associated with reproduction in traditional societies. This multivariate re-expression of ethnicity avoids the pitfalls associated with defining anthropological concepts based on single features (such as kinships) or proxies (such as language).

For the nineteen Zambian societies for which data are available in Murdock's (1967a) Ethnographic Atlas, multivariate cluster analysis leads to the identification of four traditional reproductive regimes in Zambia. The names of the four regimes correspond to the expected relative pre-industrial fertility levels: low traditional reproductive regime (cognatic kinship societies), medium traditional reproductive regime (dual kinship societies), high traditional reproductive patrilineal regime and high traditional reproductive matrilineal regime.

Further, principal component and multivariate cluster analysis results highlight the features that account for important differences between traditional reproductive regimes. Anthropological accounts—independent of Murdock's ethnographic data—support these results. Modern data sources (census and DHS) confirm some anthropological accounts such as differences in age at marriage and types of marital unions. With this information, it is possible to identify traditional features underlying ethnic fertility variations in Zambia. The results associate high traditional reproductive regimes with societies whose control of fertility at community level is rigid. Meanwhile, the results associate the low traditional reproductive regime with societies whose control of reproduction at community level is weak. This suggests that societies in the latter regime control fertility at family level while societies in the former do so at community level. In addition, the results show that the impact of community and social arrangements on traditional reproduction are inversely related to traditional economic and political organisation. This supports family nucleation argument of the intergenerational wealth flows theory.

Chapters 6 and 7 use the derived traditional reproductive regimes as units of analysis—instead of regional or provincial units—to assess ethnic fertility differentials in Zambia. Chapter 6 uses census and DHS data to derive fertility estimates for each traditional reproductive regime. Fertility trends derived from the birth histories data collected in the DHSs show that, before 1980, large fertility variations existed between the derived traditional reproductive regimes. Fertility was higher in regimes identified as high traditional fertility regimes and lower in low traditional fertility regimes.

Over time, however, fertility estimates from the census and the DHS data show that fertility levels between Zambian traditional reproductive regimes have been converging. This is attributable to rapid fertility declines among women belonging to high traditional fertility regimes, especially the patrilineal regime. In turn, this suggests that fertility decline in Zambia is modest because it is only occurring among a small group of societies that previously had the highest fertility in the country. More importantly, it raises two additional research questions. First, to identify the present-day features that promote rapid fertility declines among women belonging to the two high traditional fertility regimes. Second, to find out why fertility has declined much more rapidly among women belonging to the high traditional fertility patrilineal regime.

Chapter 7 compares present-day features underlying fertility between traditional reproductive regimes in Zambia. In doing so, it identifies present-day features underlying fertility differentials between traditional reproductive regimes. Multivariate analysis of variance and descriptive discriminant analysis results show that rapid fertility declines among women belonging to the high traditional fertility regimes are due to large proportions of these women living in the most urbanised regions of Zambia. This supports propositions made by modernisation theories that urbanisation undermines traditional arrangements that support high fertility, resulting in a fertility decline.

The results also show that fertility declines are more rapid among women belonging to the high traditional fertility patrilineal regime because significantly higher proportions of these women are now using contraception. Since the high traditional fertility patrilineal regime had the highest pre-industrial fertility in Zambia, modest mortality declines could have easily increased the number of surviving children. Women with large families could have exhausted post-natal fertility control options and hence compelling them to impose prenatal fertility controls—as Mason (1997) suggests. Overall the results in Chapter 7 support Caldwell, Caldwell and Orubuloye's (1992) argument that historical and pre-industrial traditions have present-day demographic implications for fertility in sub-Saharan Africa.

The thesis fills the gap left by a lack of fertility research studies outside the work of the Zambian Central Statistical Office. A review of the demographic literature shows that compared with the last twenty years, Zambian fertility analyses were common in the 1960s through to the 1980s. Since 1985, researchers have published little on Zambian fertility outside the work of its Central Statistical Office. After Hill's (1985) work based on the 1969 and 1974 Census data—which critically explored the national fertility status of Zambia—there is no published literature on national fertility. As a result, there are no detailed analyses available to corroborate official fertility estimates.

More importantly, this thesis contributes to anthropological demography. It demonstrates that it is possible to integrate anthropology into demographic analysis whilst minimising the problems—such as defining ethnicity normatively or based on single features—associated with such integration using a multivariate approach. Focusing on traditional reproductive regimes rather than ethnic groups allows for features underlying fertility trends at subnational level in transitional societies to be identified. The thesis also provides an avenue for using both qualitative information and quantitative methods to resolve demographic research questions. It employs verified and validated ethnographic data to extract systematically similarities and differences between ethnic societies.

2 100 YEARS 10 ENUMERATIONS 1 PROBLEM: EXPLAINING SUB-NATIONAL FERTILITY VARIATIONS IN ZAMBIA

> "The problem is that although high fertility levels may be sustained by the ideals and values implicit in the traditional social organisation, we have very little knowledge about how these translate themselves into reproductive behavioural patterns…" (Aborampah 1990: 270).

This chapter reviews the literature upon which this research is based. It begins with a brief description of the country under study (Section 2.1). Section 2.2 reviews the literature on Zambian fertility and highlights some of the problems that have afflicted previous attempts to measure and analyse fertility in the country. In Section 2.3, we review the literature on conclusions drawn by researchers who have tried to explain features underlying regional fertility differentials in Zambia. We highlight the limitations of their approaches. Section 2.4 discusses the integration of anthropological concepts—ethnicity, culture and social organisation—into demographic analysis. The discussion in this section proposes an approach of using anthropological concepts to resolve a demographic research problem. To appreciate how this new view fits into the overall fertility analysis framework, Section 2.5 describes the fertility determinants framework. A summary of theories relevant to this thesis are in Section 2.6. The last Section (2.7) provides a road map of how this thesis intends to explore its main research question: "why does subnational fertility differ in Zambia?"

2.1 Introduction to Zambia

Zambia is a sub-Saharan country covering a total area of 752,614 square kilometres between 8ºS and 18ºS and 22ºE and 34ºE. It is landlocked and shares its borders with eight countries: the Democratic Republic of Congo and Tanzania in the north; Malawi and Mozambique in the east; Botswana and Zimbabwe in the south; Namibia in the south-west and Angola in the west. The 1969, 1980, 1990 and 2000 national censuses reported that the total population of Zambia was 4.1 million, 5.7 million, 7.8 million and 9.9 million people, respectively (Central Statistical Office [Zambia] 1995b, 2003b).

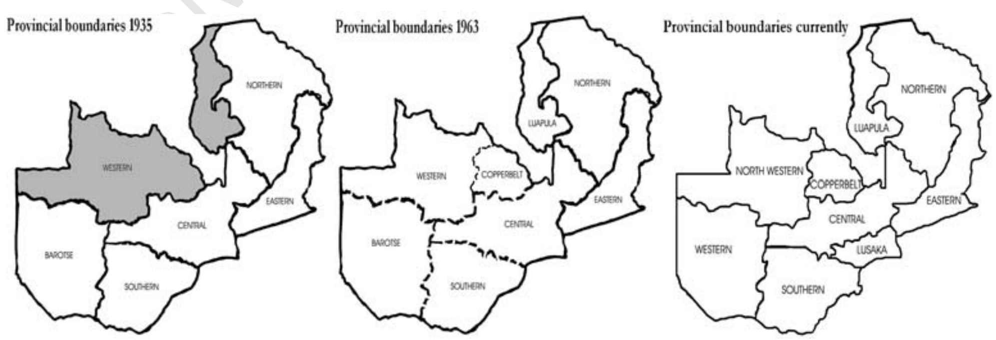
Historical and archaeological evidence indicates that inhabitants of the present-day Zambia are Bantu descendents from the Great Lakes Region (Brelsford 1965). Migrations into Zambia started before 1500 AD and arrivals continued until the late 19th Century (Chapter 4 discusses these in detail). Before the late 1800s, chiefs of various tribal areas ruled the present-day Zambia (Sheikh 1975).

Zambia was once a British colony. British interests in Southern Africa extended up to the Zambezi River in the west; Lake Malawi in the east; and Lake Tanganyika in the north. In 1889, the British South Africa Company obtained permission from the British Government to govern most of Northern and Western Zambia (Sheikh 1975). The company divided Zambia into two separate administrative regions—Eastern and Western. The Eastern Region had its central government in Chipata (Fort Jameson) while that for the Western Region was in Kalomo before moving to Livingstone. In 1911, the two regions merged into the present-day Zambia with the central government in Livingstone.

In 1924, Zambia fell directly under crown rule through the British Colonial Administration Office. The Zambian government moved to Lusaka in 1935. Britain further centralised administration of its territories in Central Africa in 1953 with an amalgamation of Malawi, Zambia and Zimbabwe[1] (the Federation of Rhodesia and Nyasaland). Harare (Salisbury) was the seat of the central government of the Federation. Britain disbanded the Federation in 1963—a year before Zambia's independence on 24 October 1964.

Figure 2.1 shows the provincial demarcations of Zambia before and after independence. In 1935, the British Colonial Administration Office divided Zambia into six provinces: Barotse, Central, Eastern, Northern, Southern and Western Provinces. Western Province included the present-day Copperbelt, Luapula and North-western Provinces (shaded portion) while Lusaka was part of Central Province.

Figure 2.1 Provincial demarcation of Zambia before and after independence



Source: Provincial maps scanned from Sheikh (1975) and CSO (2003b).

In 1963, the Zambian Government increased the number of provinces to eight after declaring Luapula and Copperbelt as autonomous provinces from the rest of

[1] Then, these three countries were called Nyasaland, Northern and Southern Rhodesia, respectively.

Western Province. After independence, the Zambian government renamed Western Province as North-western Province and Barotse as Western Province. Since 1973, Zambia has had nine administrative regions, after splitting Lusaka Province from Central Province. The nine provinces are Central, Copperbelt, Eastern, Luapula, Lusaka, Northern, North-western, Southern and Western.

Two more descriptions of Zambia need mentioning here because this thesis refers to them later. First, each ethnic society is associated with a specific province depending on where their ancestors set up villages on arrival in Zambia (Roberts 1966). For example, the Tonga are associated with Southern Province while the Lozi with Western Province. This, as discussed in Section 2.3, is probably the basis for the assertion by earlier commentators—such as Kuczynski (1949)—that provincial fertility differentials are a reflection of ethnic fertility differentials.

Second, most literature presents demographic parameters—including fertility estimates—for Zambia according to rural/urban residence. The Zambian CSO (1990) defines an urban area as a region comprising at least 5,000 inhabitants whose livelihood does not depend on subsistence agriculture. An urban area should have a police station, a post office and be serviced with piped water and electricity. According to the 2000 Census Report, Copperbelt (about 78 per cent of 1.6 million) and Lusaka (about 82 per cent of 1.4 million) are the most urbanised provinces in Zambia (Central Statistical Office [Zambia] 2003b). The report also shows that Central (24 per cent of one million) and Southern (about 21 per cent of 1.2 million) Provinces are also relatively urbanised because of their proximity to Copperbelt and Lusaka Provinces.

These four provinces lie on the so-called "traditional line-of-rail". This is the first railway line built by the British to transport Zambian copper to seaports for export (Gailey 1971). It is called the "traditional line-of-rail" to distinguish it from railway lines that were constructed later such as the Tanzania Zambia Railways (TAZARA). The "traditional line-of-rail" runs through major urban towns in Zambia from Chililabombwe in the Copperbelt Province through mining towns and Lusaka (the capital city) to Livingstone in Southern Province (Mitchell 1956).

2.2 Fertility estimation in Zambia

The first part of this section discusses the history of data collection in Zambia. The next part presents national and provincial fertility estimates. The last part describes national fertility trends and shows that subnational fertility differentials exist in Zambia.

2.2.1 A history of fertility data collection in Zambia from 1900 to 2000

The colonial government did not undertake a direct count of the official population of Zambia. Instead, they estimated the Zambian African population using annual tax returns and administrative information (Kuczynski 1949; Stone 1990). They published these figures in the Annual Report on African Affairs submitted to the British Colonial Administration Office (Brelsford 1965). The Native Tax Ordinance of 1901 required that each household head state the number of wives and children annually (Musambachime 1990). Village chiefs were required to provide information about the number and whereabouts of absent subjects. However, the main interest of this ordinance was tax-paying adult-males. Administrators had no incentive to count women and children accurately. Therefore, with limited demographic information, the colonial government could barely stratify the population by age and sex (Kuczynski 1949).

Besides its limited content, colonial administrative information on the Zambian African population is inconsistent and incomplete (Musambachime 1990; Stone 1990). First, administrators only collected this information when it was convenient to do so—for example, they did not collect accurate information during (or in areas with) outbreaks of sleeping sickness, small pox and Spanish influenza (Musambachime 1990). Therefore, the data lacks a consistent periodicity. Second, these data are incomplete because of migration and the conscious failure of some adult males to register in order to avoid paying tax (Kuczynski 1949).

The colonial government also tried unsuccessfully to collect birth statistics (Kuczynski 1949). Before 1930, African birth and death statistics in Zambia were to all intents and purposes non-existent—the 1908 and 1914 Native Authority Ordinance had made registration optional. Coverage was a mere three per cent in 1930 hence compelling the administrators to make registration compulsory (Kuczynski 1949). However, despite the change, administrative costs inhibited coverage of all villages. To cut cost but improve coverage, the colonial government amended the Notification of the Births of the Children of Africans Ordinance in 1939, which placed onus on parents to report any births in their households. Even this law did not improve coverage because individuals did not have any incentive to report births. Kuczynski (1949: 515) observes that during the colonial period "it is impossible to tell…whether births are exceeding deaths or not…[because]…all available population figures are untrustworthy…". He cautions that "readers should realise that all opinions on fertility, morbidity, mortality and population growth are based on impressions rather than facts" (Kuczynski 1949: 517).

Even after independence in 1964, the completeness of continuous registration of births in Zambia has remained unsatisfactory. In 1985, twelve years after the passing of the Birth and Death Registration Act in 1973, birth registration was still below 15 per cent of the number of births (Central Statistical Office [Zambia] 1985b).

Therefore, in line with most sub-Saharan African countries, censuses and surveys provide the main source for demographic studies on Zambia. Between 1900 and 2000, ten censuses and six major demographic surveys were conducted in the country—apart from smaller and limited purpose-specific surveys (often unpublished). Despite this seeming plentiful data, it is not possible to establish Zambia's demographic trends before the 1950s as the first six censuses (those conducted between 1911 and 1961 inclusive) did not count the Zambian-African population other than those employed in the urban areas (Sheikh 1975; Ohadike 1990). The Colonial Government had earmarked to include Zambian-Africans in the 1961 Census but "logistical problems" made this impossible (Sheikh 1975). Sheikh and other sources do not document the nature of the problems faced.

The 1950-1951 Demographic Sample Survey (1950-51 DSS)[2] is the earliest documented source of Zambian national and regional fertility estimates (Ohadike 1990). This survey collected information on the number of births to all adult women during the year preceding the survey. From this information, the Central African Statistical Office wanted "to determine…the average annual number of live births per woman over puberty…of the African population" (Sheikh 1975: 2). The CSO (1975) and Sheikh (1975) report that the Central African Statistical Office (Harare) published results of this survey in 1952. However, efforts to obtain a copy of this report failed[3].

The second survey, undertaken five years after the 1969 Census (discussed in subsequent paragraphs), was the 1974 Sample Census. This survey had an overall sampling fraction of about 14 per cent or 655,000 individuals (Hill 1985). The timing of

[2] Coale and Lorimer report a survey that covered the entire country in 1956 but the details of their data sources indicate that they were referring to the 1950-51 DSS.

[3] For this and other reports and documents I could not find, I had made repeated efforts to check the Zambian Central Statistical Office library. I also asked colleagues working for the CSO and other Zambian Government departments, including the archives. I could only find reports and documents published in recent years (after 1980). However, most immediate post-independence reports and documents cited in this thesis came from the University of Michigan Population Studies Centre (PSC) library. My suspicion is that these reports are in Harare since this is where the Federation Government of Rhodesia and Nyasaland had situated the headquarters of the Central African Statistical Office.

the 1974 Sample Census (five years after the 1969 Census) suggests that its objective was provision of intercensal (1969-1979) information—although the CSO conducted the next census after 1969 in 1980. The 1974 Sample Census had a separate detailed fertility questionnaire targeting women of reproductive age—12 years and older, without an upper limit (Hill 1985). For current fertility, unlike the 1969 Census, this survey asked women to report the number of children born in the last year or last twelve months before enumeration. Apart from analysis by independent demographers such as Althea Hill and Barney Cohen, the research literature rarely refers to the results from this survey. Efforts to get the official report or the data of this survey have been unsuccessful.

The third source—among the sample surveys—is the series of surveys conducted under the Demographic and Health Survey (DHS) Programme. So far, Zambia has had three DHSs in 1992, 1996 and 2001-2002. Chapter 3 discusses these further.

To complement the 1961 non-African Census (and to prepare for independence) the Colonial Government conducted the first population census in 1963 covering only black Africans (and not other Zambians). Although the CSO (1975), Ohadike and Tesfaghiorghis (1975), Sheikh (1975) and Hill (1985) all report that the CSO published the results of this census—in three volumes—in 1964 and 1968, efforts to find any of these reports have been unsuccessful.

The 1963 Census did not collect specific information on fertility. Therefore, the CSO officials could only derive the Crude Birth Rate[4] (CBR) and the Child-Woman Ratio (CWR) using the population distribution. However, Coale and Lorimer (1968) report that the 1963 Census was of poor quality because of age misreporting. They state that an undercount of females and an overstatement of the proportion of males aged below 15 years old distorted the population distribution of this census. Ohadike (1990) observes that the poor 1963 Census data returns were due to low educational levels among enumerators. The CSO (1975) notes, without providing details, that the 1963 Census fertility estimates are inaccurate because of errors—but most probably those highlighted by Coale and Lorimer (1968).

The 1969 Census of Population and Housing was the first national census after Zambia's independence and the first to set out to enumerate the entire population of Zambia. It was also the first census to collect information on lifetime and current

[4] Using the population under one year old and the total population—and even this is not entirely correct.

fertility. Enumerators asked women of reproductive age—15 years and older (without a upper limit) at enumeration—to state the number of children that they had had in their lifetime and the date of their most recent birth (Central Statistical Office [Zambia] 1974).

Both the CSO (1973; 1974) and Hill (1985) raise concerns about the quality of the data collected in the 1969 Census. Probably because it was the first to collect fertility data, the census misclassified childless women as women with unknown parity (Hill 1985). Hill (1985) observes that the census under-reported births that occurred in the last one year. The CSO (1973; 1974) reports also state that fertility data collected in the 1969 Census was inconsistent because of errors. They speculate that the inconsistencies may be due to misreporting age and the date of "last birth".

Since then, the Zambian Government has conducted censuses in 1980, 1990 and 2000 in accordance with the United Nations recommendations. However, the CSO (1985a; 1985b) report that despite efforts to improve data collection procedures in the 1980 Census, omission of births (especially infants dying immediately after birth and among older women) distorted the reported fertility data. They also report a second problem—the inability of women to recall accurately whether a birth occurred within the reference period, that is, in the 12 months before the enumeration. The net effect of these errors is under-reported lifetime and current fertility. Another problem affecting all respondents was age misreporting (Central Statistical Office [Zambia] 1985a).

Similarly, the CSO (1995b) reports that the 1990 Census fertility data are faulty due to inaccurate reporting of births. Women omitted children that had died (especially in infancy), those living elsewhere and those born outside their current sexual unions. Meanwhile, women's birth reports included stillbirths as well as step, adopted and grandchildren. However, the net effect of these errors is under-reported lifetime and current fertility especially among older women (Central Statistical Office [Zambia] 1995b). The CSO (2003b) also report that lifetime fertility in the 2000 Census was inaccurately reported due to omission of children by older women. They also state that observed current fertility was underreported.

There are no published or documented evaluations of the 1980, 1990 and 2000 Censuses data or the collection procedures other than those presented by the Central Statistical Office. Therefore, apart from those reported by the CSO, it is difficult to ascertain other flaws in the data that could have affected fertility estimation. However, this alerts readers that they should take caution when interpreting these estimates.

The United Nations (Population Division) and the World Bank also publish national fertility estimates for Zambia. They derive these estimates from official data sources. The United Nations assembles fertility estimates for each member country from official publications and correspondence. To facilitate comparisons, they recompute these estimates and publish them annually in the Demographic Yearbook (United Nations 1979, 1997). By contrast, the World Bank obtains fertility and related indicators from the United Nations and its specialised agencies, the United States Bureau of the Census and sometimes official results of member countries (The World Bank 2003). They publish their estimates in the World Development Reports. We do not present or discuss in detail the United Nations and the World Bank estimates because they are not materially different from those presented in the official reports.

2.2.2 National and provincial fertility estimates from 1950 to 2000

This section presents the national and provincial fertility estimates derived from the data sources described in the preceding section. The tables in Appendix 2.1.a and 2.1.b present all fertility estimates derived by the Zambian Central Statistical Office (CSO) from these data. Table 2.1 presents the estimates the CSO selected as 'official' fertility estimates for Zambia.

Table 2.1 Official national and provincial total fertility estimates: Zambia, 1950-2002

Year	National	Provincial estimates								
		Central	Copperbelt	Eastern	Luapula	Lusaka	Northern	NWestern	Southern	Western
1950	5.7	5.0	5.1	5.4	-	-	8.0	-	5.8	4.3
1963	6.7	7.0	7.7	6.4	7.3	-	7.0	7.2	7.1	5.0
1969[1]	7.1	7.6	8.5	8.5	6.8	-	8.3	6.1	7.8	5.2
1980[2]	7.2	7.5	7.9	6.9	8.0	7.5	7.7	6.5	7.1	5.7
1990[3]	6.7	6.3	6.6	6.9	7.2	6.0	7.5	6.9	7.0	6.2
1992	6.5	6.8	6.2	6.8	7.4	5.5	7.4	6.0	7.1	6.0
1996	6.1	6.3	5.6	7.1	6.8	4.9	7.2	6.2	6.2	5.5
2000[4]	6.0	6.1	5.2	6.7	7.1	4.6	7.0	6.6	6.3	5.9
2001	5.9	6.2	4.5	6.8	7.3	4.3	6.9	6.8	6.1	6.4

Sources: Central Statistical Office reports on these data sources.

Notes: 1. The 1969 Census official fertility estimates derived using the Brass P/F method based on corrected timescale error and age distribution.
2. The 1980 Census official fertility estimates derived using the Gompertz relational model with average age pattern of fertility schedules from from three models: The standard marital fertility schedule, Relational Gompertz model and the Coale-Trussel model fertility schedules.
3. The 1990 Census official fertility estimates derived using the Gompertz relational model.
4. The 2000 Census official fertility estimates derived using the Trussel Brass P/F Ratio method of estimating total fertility based on the average of P2/F2, P3/F3 and P4/F4.
5. Estimates from the remaining data sources are observed fertility rates i.e. not adjusted for underreporting.

The 1950-51 DSS and the 1963 Census did not have specific questions to measure fertility. Therefore, these sources only provide crude estimates of fertility—observed Crude Birth Rate (CBR), Child-Woman Ratio (CWR) and General Fertility Rate (GFR). To assist comparison with standard fertility measures, these crude fertility estimates are converted to total fertility rates using the Bogue (1993) regression parameters. However, this conversion may produce imprecise estimates because of the unconventional calculation of GFR and CWR from these data sources by the CSO. For instance, the General Fertility Rate (GFR) derived from the 1950-51 DSS is defined as the average number of live births per woman over puberty (Sheikh 1975: 2). It is age imprecise because "over puberty" means women aged from approximately 12 years to beyond 49 years. In addition, by definition, crude fertility measures—especially the Child-Woman Ratio (CWR)—suffer from unreliable age-sex distribution and omissions of children (especially those that die during infancy). Lastly, the Bogue parameters have an inherent limitation because they are based on regressions on actual data. Therefore, they only provide a rough estimate of total fertility converted from a crude rate because not all populations meet all the underlying assumptions.

Cohen (1993) reports that the CSO obtained a national total fertility estimate of 6.9 children per woman from the 1969 Census data after applying the Brass P/F ratio method. It is not possible to verify this figure and the reported method because efforts to find Cohen's source[5] have been unsuccessful.

Because of errors identified in the 1980 Census, the CSO sought to analyse critically these data when estimating fertility. Therefore, they applied almost all fertility estimation techniques available at the time (Appendix 2.1.a). However, the CSO (1985a; 1985b) does not state if they corrected data for obvious errors before applying adjustment methods. They report that omissions, misreporting and violations of assumptions—such as constant fertility in the recent past—affected the precision of almost all the estimates derived from the 1980 Census data (Central Statistical Office [Zambia] 1985a, 1985b). Specifically, the CSO (1985b) point out that inconsistencies between lifetime and current fertility affected estimates derived from the Brass P/F ratio and Arriaga methods. Violation of assumptions also affected the stable population model fertility estimates. After examining estimates from all models, the CSO (1985b) selected fertility estimates they derived from the Relational Gompertz model as the most appropriate for Zambia in 1980 because—they suggest—this method violated the fewest assumptions. This is contrary to Cohen's (1993; 1998) report that the CSO applied the Brass P/F ratio method to derive official fertility estimates.

[5] Central Statistical Office [Zambia]. 1985. *The 1980 Population and Housing Census of Zambia: Analytical Report Volume II: Fertility and Mortality Levels and Trends*. Lusaka: Central Statistical Office [Zambia].

Apart from the CSO, other independent researchers (that is independent of government institutions) have derived fertility estimates from some of the data sources described. Using a fertility schedule for Black Americans, Myburgh (1956) computes a total fertility estimate of 5.9 children per woman from the 1950-51 DSS data. He notes that this estimate is inaccurate because of data problems, especially omission of children.

Coale and Lorimer (1968) compute a total fertility estimate of 6.6 children per woman from the 1963 Census data. To do so, they used a stable population (West, female) model and mortality level based on assumed life expectancy at birth of 37.5 years—i.e. level eight. They state that their estimate is not reliable because they did not subject the data to detailed analysis and their assumptions are 'an informed guess'. Using the same data, Ohadike (1969) estimates a national CWR of 769 children (0-4.5 years) per 1000 women aged 15.5-45.5, which converts to a total fertility rate of 5.8 children per woman after applying the Bogue (1993) regression parameters. This estimate is different from the 1963 Census official estimate. This is most certainly because of different age ranges and the crude nature of measures used to derive these estimates.

Table 2.2 presents national fertility estimates derived from the 1969 Census data as reported by other authors. Ohadike and Tesfaghiorghis (1975) report that after correcting the 1969 Census fertility data for obvious errors (without providing details of the errors), they obtain fertility estimates ranging from 6.7 to 7.5 children per woman. Given the range of their estimates, they propose the average—7.0 children per woman—as the best estimate of fertility in 1969.

Table 2.2 National fertility estimates according to author and method: Zambia, 1969 Census

Author	Method	TFR
Ohadike and Tesfaghiorghis (1975)	Reverse survival and Brass P/F ratio methods	6.9
Ohadike and Tesfaghiorghis (1975)	Based on child mortality l_2 and c(15)	6.9
Ohadike and Tesfaghiorghis (1975)	Stable population model	6.7
Okorakor and Ohadike (1973)*	Brass P/F Ratio method	7.4
Okorakor and Ohadike (1973)*	Stable population model based on C(x) and r	7.5
Okorakor and Ohadike (1973)*	Stable population model based on l_2 and c(15)	7.1
Coale and Page (1972)*	Not Stated	6.8
Hill (1985)	Brass P/F Ratio method based on CEB and BLY first birth mothers	6.8
Hill (1985)	Stable population model	6.8

Note * cited in Ohadike and Tesfaghiorghis (1975).

Hill (1985) applies both the Brass P/F ratio method (comparing the number of women reporting a first-born child with proportion of mothers) as well as a stable population model to estimate fertility. She reports an estimate of 6.8 children per woman for both methods. In her later publication, (Hill 1990), she estimates national total fertility for the period 1965 to 1969 to be 7.0 children per woman (not presented in Table 2.2). Other than mentioning that she applied indirect techniques to age-specific fertility data, she does not state the method she used (Hill 1990: 23).

Hill (1990) suggests that fertility was constant between the late 1960s and early 1970s. Using data from the 1974 Sample Census, she computes a national total fertility estimate of 7.0 children per woman for the period 1970-1974 from the 1974 Sample Census data. Again, no details of the methods used are given. Cohen (1993; 1998) reports applying the Coale method to the 1974 Sample Census fertility data and getting national total fertility estimates of 7.1 and 7.3 children per woman for 1967 and 1973, respectively. These estimates are close to the 1969 Census fertility estimates.

Other than these, there are no other published fertility estimates derived from the 1974 Sample Census. In one instance, Cohen (1993: 21; 1998: 1457) reports that Hill (1985) computed a total fertility estimate of 6.7 children per woman using the 1974 Sample Census data. Meanwhile, Hill (1985: 48, 50) states that "total fertility could not be estimated because the 1974 Sample Census current fertility data were not available and an estimate based on the age distribution was not attempted because age data from this source was not reliable." However, when summarising, Hill (1985: 51) states that "an estimate of between 6.5 and 7.0 children per woman is based on the 1969 and 1974 Census data". Her summarising statement could be the possible source of Cohen's (1993; 1998) reporting oversight.

Using the 1980 Zambian Census data, Hill (1990) reports a national total fertility estimate of 6.8 children per woman for the period 1975 to 1979. She does not specify the method applied. Cohen (1993) applies the Coale method to the same data and gets a national total fertility estimate of 7.4 children per woman for year 1973. After 1980, there are no other published estimates other than 'official' fertility figures provided by the Zambian CSO.

2.2.3 Fertility trends and provincial fertility differentials in Zambia

This section describes provincial fertility trends and differentials derived from the official fertility estimates presented in the previous section. Two reasons justify the use of official estimates to summarise Zambian fertility trends. First, estimates from independent researchers (that is independent of government institutions) are not available for any point after 1980. Prior to this, only national estimates are available from independent researchers. Second, estimates derived by independent researchers are similar to official estimates, apart from the 1963 Census fertility estimates.

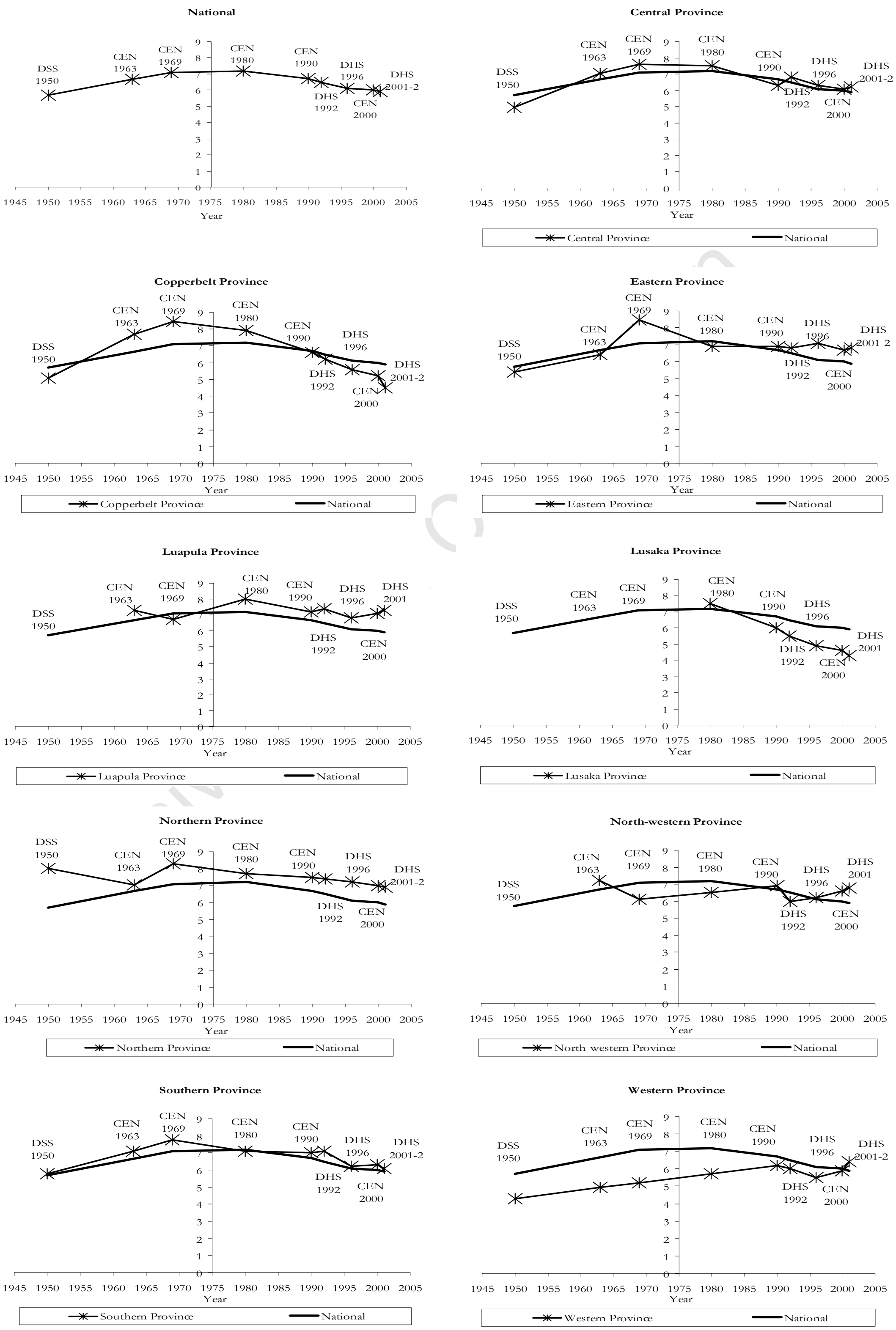
Figure 2.2 shows that national fertility appears to have increased between 1950 and 1969 from 5.7 to 7.1 children per woman before stabilising between 1969 and 1980. Since 1980, fertility has been declining gradually from 7.2 to 5.9 children per woman in 2002. This trend conforms to that observed in other sub-Saharan countries. According to Garenne (2008: 4) "…many sub-Saharan countries followed a typical pattern of a roughly constant, or modest increase in fertility before 1950; a substantial rise in fertility in the 1950s and 1960s; and then a decline …". The increase in the 1950s was due to improvements in nutrition, hygiene and health leading to a decline in infertility and sterility (Garenne 2008).

However, the apparent increase in Zambian national fertility between 1950 and 1969 could also be a reflection of improvements in data collection and fertility estimation. First, it is almost certain that the 1950-51 Demographic Sample Survey and the 1963 Census underestimated fertility because of problems associated with crude estimates of fertility—and the conversion of GFR and CWR to total fertility estimates. Second, Hill (1985: 45) states that Zambian fertility data collected before 1969 are inadequate, unreliable and "…remain subject to some residual uncertainty".

Figure 2.2 also shows that fertility levels and trends differ between Zambian provinces. However, firm conclusions on provincial fertility differentials cannot be drawn from these data because of data problems in the censuses and small sample sizes in the DHSs. The CSO (1974; 1975) point out that not all provincial fertility estimates derived from earlier enumerations are comparable for the same reasons as the national estimates: the 1950-51 DSS and the 1963 Census [crude] provincial fertility estimates are inaccurate due to unreliable age-sex population distributions. These errors are most obvious in North-western and Western Provinces, the most rural provinces of Zambia. Unless standardised, these regional fertility estimates are not comparable.

Further, Figure 2.2 shows that the 1969 data points for Eastern and Luapula Provinces diverge noticeably from their respective provincial trends. The CSO (1975) reports differences in the degree of misreporting current fertility between provinces (especially Eastern Province). They also state that provincial fertility estimates of Eastern, Luapula, and North-Western Provinces are not comparable (Central Statistical Office [Zambia] 1975). Hill (1985) argues that these provincial fertility estimates are not comparable because of the sampling procedures the CSO employed—she expresses concerns that the CSO may not have drawn the rural 10 per cent sample correctly (Hill 1985).

Figure 2.2 Official national and provincial total fertility estimates: Zambia, 1950-2002



After 1969, Figure 2.2 shows three broad patterns of provincial fertility differentials between 1980 and 2002. First, fertility in Copperbelt and Lusaka Province, which was previously high, has declined rapidly. In 1980, fertility in Lusaka and Copperbelt Provinces was higher than the national level. However, by 1990, it was below national level. Since then, fertility in these provinces has continued to decline rapidly. The 2000 Census report attributes these trends to urbanisation (Central Statistical Office [Zambia] 2003b). Fertility has declined rapidly in Lusaka and Copperbelt Provinces because individuals in these areas benefit from urban features that depress fertility. These include easy access to reproductive health services and education.

To the contrary, Eloundou-Enyegue, Stokes and Cornwell (2000) argue that rather than easy access to reproductive health services and education, fertility declines in urban areas may be "crisis driven". For example, structural adjustment programmes—most prominent in urban areas of developing countries—encourage reduced government spending on public services including health and education. These cuts pass on the bill to parents, therefore, making individuals to reduce desired family size in the face of increased health and schooling costs (Caldwell, Orubuloye and Caldwell 1992). Regardless, the effects of economic crisis on fertility change are difficult to untangle. Caldwell, Orubuloye and Caldwell (1992: 237) observe that while "… most contraceptors say that an important factor in their practice is hard economic times. This would have been more convincing if there were more "stoppers" [compared with spacers]". Crisis-driven urban fertility decline is a possible explanation of Zambian fertility decline in urban areas. When the Zambian Government could no longer cope with the cost of health and education, it gave a mandate to its National Commission for Development Planning (NCDP) to influence socio-cultural features that promote high fertility and thus its rapid population growth (Lucas 1992). It is, however, difficult to find any substantive research materials that argue for 'economic crisis' driven fertility decline in Zambian urban areas.

Second, fertility in Central and Southern Provinces was close to the national average between 1980 and 2002. These two are semi-urban provinces because they are close to and easily accessible by road and rail from the most urbanised provinces. Specifically, fertility in Central Province was slightly above national level. Fertility in Southern Province was slightly below the national estimate in 1980 but by 1990, it rose slightly above the national average.

Third, fertility in Eastern, Luapula and Northern, all rural provinces, was higher than the national average. In 1980, fertility in Eastern Province was slightly below the national level but in 1990, it was above the national level. Since then it has remained above the national average and constant despite average national fertility declining steadily. Although higher, the fertility trend for Luapula and Northern Provinces follows the national pattern. The unexpected trough in the Luapula Province trend suggests that the 1996 DHS could have underestimated fertility for this province. Equally, this and other fertility fluctuations in Luapula Province could be due to random fluctuations because of the small sample size.

Fertility trends for Western and North-western (rural provinces) seem implausible and incomprehensible. The 1990 Census and 1996 DHS show that fertility in North-western Province was at national level but the 1992 DHS shows that it was below the national level. Fertility in Western Province appears to have been the lowest in Zambia but it has been increasing. The 2000 Census shows that it was above Lusaka Province and the 2001-02 DHS shows that it was the highest in the country. The 1996 DHS also shows an unusual trough in the Western Province fertility trend. The 2001-02 DHS report suggests the fertility trend in North-western Province might be a reflection of improvements in data collection rather than an increase in fertility (Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 2003).

Other literature also suggests that fertility trends in Western and North-western Provinces might be reflecting decreasing sterility and infertility levels. The CSO (1985a) suggests that infertility explains the historically low fertility in North-western and Western Provinces. The 1990 Census and the 1996 DHS reports point out that infertility is the cause of low fertility in Western Province only (Central Statistical Office [Zambia] 1995b; Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 1997). Hill (1985) also predicted that Zambian fertility would increase as modernisation reduced sterility and infecundity levels especially in the two western provinces. Likewise, Shapiro (1996) inferred that increasing fertility trends in the Democratic Republic of Congo (DRC)—a neighbouring country to the west of Zambia—were due to decreasing levels of sterility.

There is some evidence that sterility, infecundity and infertility levels were high in this part of Zambia. Colonial administrators had reported high levels of venereal diseases such as congenital syphilis as well as the use of abortifacients in these provinces (Kuczynski 1949). Spring (1976) suggests that traditional medicinal therapies that North-western Province women used could have increased infecundity and foetal mortality levels. However, since Spring's (1976) study was limited to one ethnic society—the Luvale of North-western Province—her conclusions may not be generalisable. Similarly, colonial administration reports note that, relative to other Zambian ethnic societies, congenital syphilis—a venereal disease that causes sterility and infertility—was higher among the Ila of Southern Province (Kuczynski 1949).

Despite poor data and methodological drawbacks in estimating national and provincial fertility, subnational fertility variations exist in Zambia—as the CSO (1975), Ohadike and Tesfaghiorghis (1975), Hill (1985) and Ohadike (1990) also suggest. Luapula and Northern Provinces have the highest fertility relative to the rest of the country. The lowest fertility is found in North-western and Western Provinces. Hill (1985: 53) infers that "Northern Province has by far the highest fertility and very low levels of childlessness…Eastern and Luapula come next…below finally are the two provinces in the west, Western and North-western, which have markedly low fertility…".

This section has highlighted two potential sources of these differentials: data quality and sterility or infertility. However, before isolating a feature that needs further investigation, other potential sources of subnational fertility variations in Zambia are considered. The next section reviews studies that have explored features underlying fertility variations in Zambia.

2.3 Explanations of sub-national fertility differentials in Zambia

The literature in this section provides some answers to why subnational fertility differs in Zambia. Further, the section identifies gaps and controversies that the current research will attempt to address and resolve. First, we review past research studies that have explored features—including ethnicity—underlying regional fertility differentials. Thereafter, we review those studies that have exclusively examined features underlying fertility variations between ethnic groups in Zambia.

2.3.1 Materials on regional fertility differentials in Zambia

After reviewing provincial fertility differentials derived from the 1950-1951 Demographic Sample Survey (1950-51 DSS) as well as the 1963 and 1969 Censuses, the CSO (1975) conclude that Zambian provincial fertility variations are a reflection of ethnic fertility variations[6]. To justify their conclusion, the CSO (1975) tabulate the 1950-

[6] Much earlier, Colonel Sir Steward Gore-Browne (the Administrator in-charge of Native Interests) also made a similar observation to the Legislative Council Meeting held on 28-29 August 1945 (Kuczynski 1949).

51 DSS fertility estimates by tribal group. They do not do so for the 1963 and 1969 Censuses because these data sources did not capture information on tribal or ethnic groups. Table 2.3 presents fertility estimates according to province and ethnic origin of respondents derived from the 1950-51 DSS.

Table 2.3 Observed fertility estimates by province and tribal ethnic group: Zambia, 1950-51 DSS

Region of homeland	Tribe	GFR	TFR
Central	South-central tribes	196	6.1
Copperbelt	North-western tribes: Lamba and Kaonde	171	5.4
Eastern	Chewa and Ngoni	196	6.1
	South-eastern tribes: Nsenga	177	5.6
Luapula	North-central tribes: Luapula peoples	174	5.5
Northern	North-eastern tribes: Mambwe	322	10.1
	Bemba and Bisa	223	7.0
North-western	North-western tribes: Ndembu and Luvale	103	3.3
Southern	Tonga, Ila, Lenje	194	6.1
	Others	136	4.3
Zambia		181	5.7

Source: Central Statistical Office (1975).

Notes: 1. TFR converted from observed births per adult woman using the Bogue (1993) regression parameters.

3. Central province encompassed the contemporary Lusaka province.

4. Copperbelt region includes North Western provinces and parts of Central province.

5. Western province was called Barotse province.

6. Other tribes include some tribes in Central, Eastern, Northern and North-western provinces.

Not all Zambian ethnic groups are covered (Chapter 4 covers this in detail), and it is not clear which tribes they included in their tribal groupings—for example, South-central ethnic groups. Estimates of total fertility have been derived from the reported GFRs using the Bogue (1993) regression parameters. Fertility was highest among the North-eastern ethnic groups (Mambwe, Bemba and Bisa) and lowest among the North-western ethnic groups (Ndembu, Luvale, Lamba and Kaonde). Apart from the information in Table 2.3, the CSO use estimates derived by Mitchell (1965), Ohadike and Tesfaghiorghis (1975) to consolidate their argument that regional fertility differentials in Zambia reflect ethnic fertility variations.

The CSO (1975) also attempted to identify features underlying regional fertility differentials. They use contingency tables to measure associations between provincial fertility estimates and some perceived determinants of fertility. Section 2.5 describes these determinants (proportion of parous women, age at first birth and the length of birth intervals) further. By simply noting frequencies in each cell, they argue that only the proportion of parous women is consistent with the observed regional fertility differentials (Central Statistical Office [Zambia] 1975). For example, they note that provinces with high proportions of childless women have low fertility. The CSO (1975) then tries to find out the determinants of fertility (both proximate and background) underlying regional differentials of parous women. They review regional patterns of birth control, nuptiality, religiosity, diet, disease and genetics—stating that these are major features underlying fertility (Central Statistical Office [Zambia] 1975). However, they state that their results failed to identify the features underlying regional fertility differentials.

The CSO (1975) study was undermined by data quality and the approach. First, the discussion in Section 2.2.3 shows that it is not entirely accurate to conclude that provincial fertility variations exist given the errors in the data sources they used—namely, the 1950-1951 Demographic Sample Survey (1950-51 DSS) as well as the 1963 and 1969 Censuses—and the crude nature of estimates they derived from these data. According to Ohadike (1969: 38), "while the differences between provinces might reflect actual effective fertility variations, … the differences might very well have been associated [sic] with differential under-enumeration, childhood migration, infant and early childhood mortality between provinces".

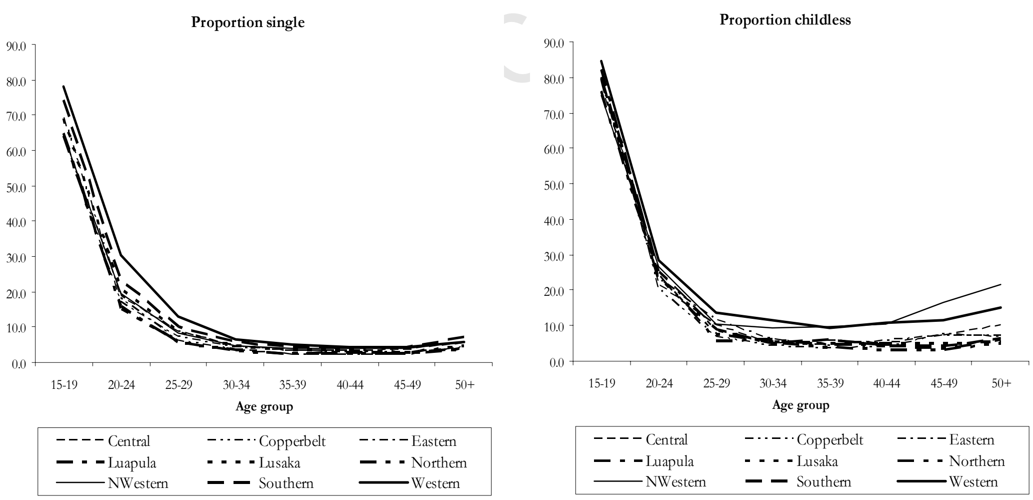
Second, for the 1963 and 1969 Censuses, the CSO (1975) use data sources not intended to measure ethnic fertility differentials. These sources did not collect information on tribe or ethnicity of respondents. Therefore, without this information, the conclusion that regional fertility differentials are a reflection of ethnic variations is difficult to justify because provinces are a composition of many ethnic societies. Kreager (1997: 139) states that "data collected according to standard administrative units like provinces generally give an incomplete and approximate picture of the distribution of national constituents of ethnic and linguistic groups." This would certainly seem to apply in Zambia.

Lastly, instead of ethnic-based-estimates, the CSO (1975) uses regional-based-estimates to identify features underlying ethnic fertility variations. Again, for the reasons stated above, it is almost impossible to attribute any of these features to ethnic differentials because the estimates are regional and not ethnic (The next section covers this discussion in detail).

Subsequent Zambian census reports have discussed provincial fertility differentials but not in detail. Using the 1980 Census data, the CSO (1985a; 1985b) examined features underlying provincial fertility differentials. Without much detail, both reports—CSO (1985a; 1985b)—speculate that differences in durations of breastfeeding and postpartum sex abstinence as well as access to reproductive health services explain regional fertility differentials.

The CSO (1985a; 1985b) also examined and compared provincial proportions of single and childless women by age group. Figure 2.3 presents, for each province, information on proportions of women who are single and childless by age group derived from the 1980 Census. The figure shows that high fertility provinces (Northern, Luapula and Copperbelt) had the lowest proportion of never-married and childless women aged 30 years and above. They conclude that celibacy and infertility may also explain provincial fertility differentials.

Figure 2.3 Proportions of single and childless women by age according to province: Zambia, 1980 Census



Source: CSO (1985b).

Using the 2000 Census data, the CSO (2003b) compute fertility estimates for Zambian language groups. Their results show that, regardless of region of settlement, the Bemba and Mambwe speaking women (Northern Province) have high fertility. However, they caution that these results are not conclusive because the "analysis is based on the reported language grouping of women and their respective fertility…" (Central Statistical Office [Zambia] 2003b: 107). Using mother tongue as a proxy for ethnic group may be a problem, as the CSO (1975; 2003b) point out. Language is not an accurate proxy for ethnicity especially in multilingual populations. Kaufman and James

(2003) describe the use of language to define ethnic societies as ambiguous and subjective—stating that multilingualism makes the use of language inadequate for purposes of capturing similarities and differences between traditional societies.

Since Zambia is a multilingual country—as the its linguistic map (presented and discussed in more detail in Chapter 4) suggests—it faces a similar multilingual problem. Before colonisation, Zambia was a "Babel" of more than fifty languages (Posner 2003). The colonial government, its missionary activities, educational policies and labour migrations to the mining industry have shaped the present-day linguistic arrangements. The early missionaries choose four languages—Bemba, Lozi, Nyanja (Chichewa) and Tonga—only since it was not possible write down all the languages before translating the Bible. Posner (2003) does not provide details why the missionaries and the colonial government choose these languages—Bemba in the north, Lozi in the west, Nyanja in the east and Tonga in the south—as languages of instruction at the expense of others. The Native Education Department of the colonial government also supported only these languages because it was costly to produce literature in all Zambian languages. Migrants with various linguistic backgrounds had to learn one of the four languages because communication was important for social and job interaction in the Copperbelt. In summary, colonial government actions and policies consolidated Zambian languages from dozens to just four language groups (Posner 2003). This also means that self reported mother tongue might be a particularly poor predictor of ethnicity.

Up to this point, apart from data quality as well as sterility and infertility suggested in Section 2.2, the literature reviewed in this section insinuates that subnational fertility differentials in Zambia are a manifestation of ethnic fertility variation. However, these studies have not reached definite conclusions. It is only the 1980 Census report that attributes regional fertility differentials to variations in practices related to ethnicity—breastfeeding and postpartum sex abstinence practices (Central Statistical Office [Zambia] 1985a, 1985b).

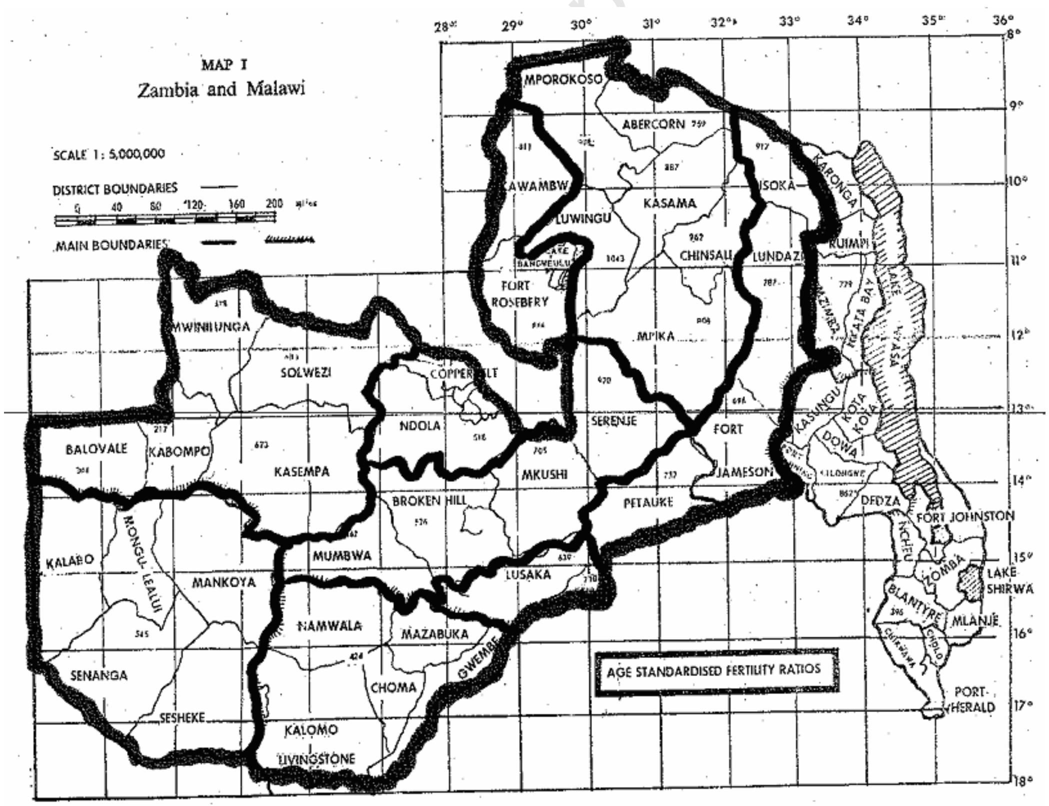
Conflating regional fertility differentials with ethnic fertility variations is probably the most serious limitation that the above studies have suffered. Both fertility estimates and attributes used in their analysis do not capture ethnicity accurately. The CSO computed the estimates and attributes at a regional level and assumed them to approximate ethnic parameters. As Kreager (1997) argues, the use of administrative units does not reveal the diversity of individuals belonging to different ethnic groupings that have been aggregated. This is addressed in the next section.

2.3.2 Ethnic fertility differentials in Zambia

Differential fertility among urban residents of different ethnic origin

Mitchell (1965) used the 1951-1954 Urban Social Survey (1951-54 USS) data study to focus on fertility variations by ethnic background between women who had settled in urban areas. The study collected information on children ever born and the date of the most recent birth from ten per cent of all African women aged 15 and older living in towns other than Livingstone along the "traditional line-of-rail". The women also reported the region of their ethnic indigenous homelands. From this information, Mitchell (1965) computed age standardised child-woman ratios for each reported district or region of ethnic origin (Figure 2.4[7]).

Figure 2.4 Observed fertility estimates for urban women according to region of ethnic origin: Zambia, 1951-54 USS



Source: Mitchell (1965).

[7] Because of the nature of the original copy, it was impossible to produce a clearer scanned copy.

Table 2.4[8] presents fertility estimates for urban women according to province of ethnic origin derived from the 1951-54 USS (Figure 2.4). The first row shows observed age standardised child woman ratios (CWR). The second row contains total fertility estimates converted from the CWRs using the Bogue (1993) regression parameters. The table indicates that urban total fertility in the early 1950s was 5.2 children per woman. This figure is lower than the 1950-1951 Demographic Sample Survey (1950-51 DSS) equivalent (7.7 children per woman). However, it is impossible to know if Mitchell (1965) underestimated urban fertility. Although he does not describe the 1951-54 USS in detail, this survey is not comparable to the 1950-1951 DSS. The former covered urban towns along the "traditional line-of-rail" while the latter covered other urban towns as well. Besides, Mitchell (1965) points out that age misreporting and under-reporting of children ever born affected the 1951-54 USS fertility data. It is most likely that these and other problems affected these two sources of fertility data differently.

Table 2.4 Observed fertility estimates of urban women by province of ethnic origin: Zambia, 1951-54 USS

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
CWR	701.0	649.5	518.0	783.5	813.5	684.0	894.2	456.4	424.0	545.0
TFR	5.2	4.8	3.7	5.9	6.2	5.1	6.9	3.1	2.9	3.9

Source: Mitchell (1965).

Notes: 1. Observed age standardised child-woman ratios converted to TFR using Bogue (1993) regression equations.
2. Age standardised child woman ratios for province of origin obtained by averaging ratios for district of origin given in Mitchell's (1965) article (some ratios unclear due to poor print).
3. The objective of the survey was to measure urbanisation and not fertility.

The table shows that women belonging to ethnic societies with indigenous homelands in eastern Zambia—Eastern, Luapula and Northern Provinces—had the highest fertility. Mitchell (1965) concludes that ethnic fertility variations among urban women were due to differences in cultural customs, after his analysis had failed to support his original thesis that ethnic fertility differentials were due to regional variations in disease and diet[9]. This is after he found that women from indigenous homelands affected by diseases and poor diet had higher fertility—contrary to his hypothesis.

Mitchell (1965) also explores background features—such as religion, urbanisation, education and occupation—underlying ethnic fertility variations amongst

[8] Since actual data is not available, we obtained these estimates by averaging district estimates for each province. Further, Figure 2.4 does not provide information on total population of each province, therefore, making it impossible to weight the data points.

[9] Some diseases (for example, syphilis, gonorrhoea and malaria) and poor dietary content of proteins and calories can suppress fertility through reducing fecundity as well as increasing miscarriages and stillbirths.

these women. His results show that only religion is different between women belonging to different ethnic societies. Those with indigenous homelands in eastern Zambia are mostly Catholics. Therefore, he speculates that this probably explains higher fertility among these women. However, he fails to explain why other Catholic believers have lower fertility. He also admits that he could not identify cultural customs underlying ethnic fertility differentials.

Differential fertility among Lusaka residents of different ethnic origin

Using the 1968-1969 Lusaka Urban Socio-demographic Sample Survey (1968-69 LUSDSS) data, Ohadike and Tesfaghiorghis (1975) report fertility variations among women of different ethnic languages. This survey collected information on ethnicity using mother tongue.

Table 2.5 presents parity estimates for women living in Lusaka tabulated by mother tongue. Despite the disadvantages of using language as a proxy for ethnic group—pointed out in Section 2.3.1—the results are consistent with Mitchell's (1965) results. The table shows that women who spoke Tumbuka, Mambwe and Nyanja (languages of north-eastern tribal societies) had higher fertility. The lowest was among women that spoke Lozi and Nkoya (languages of south-western tribal societies). According to Ohadike and Tesfaghiorghis (1975: 51) these differentials "…reiterate the essential view-point that persons originating from either low or high fertility areas tended to transfer their fertility behaviour patterns with them when they moved."

Table 2.5 Observed fertility estimates of women residing in Lusaka by mother tongue: Lusaka, Zambia, 1968-69 LUSDSS

Region of homeland	Mother tougue	CEB
Eastern	Tumbuka	4.2
	Nyanja	3.8
Luapula/North-central	Bemba/Lala/Lamba	3.5
North-eastern	Mambwe	3.9
North-western	Lunda/Luvale	3.3
	Kaonde	3.7
Southern	Tonga, Ila	3.2
Western	Lozi	3.1
	Nkoya	2.5
Lusaka		3.7

Source: Ohadike and Tesfaghiorghis (1975).
Note: CEB refers to average children ever born for all ages.

Ohadike and Tesfaghiorghis (1975) examine proximate and background determinants underlying fertility in Lusaka. However, they do not analyse these features according to ethnic or linguistic groups. In addition, their study did not explore cultural features underlying fertility differentials between ethnic societies.

Hill (1985) reviews the findings presented in Mitchell (1965), the CSO (1975) as well as Ohadike and Tesfaghiorghis (1975). She agrees with these authors that "the basis for these geographical differentials is variation in fertility by ethnic groupings which appear to persist to some extent even in the urban areas" (Hill 1985: 59). She further observes that these levels are similar among kindred ethnic groups of bordering countries.

However, due to the data problems discussed earlier, the fertility estimates presented in this section should be interpreted with caution. It follows that regional and ethnic fertility estimates presented by these studies may not be accurate. Use of language—apart from Mitchell (1965)—as a proxy for ethnic identity does not present an accurate picture. The studies are also undermined by approaches available to them at the time they attempted to identify features underlying ethnic fertility differentials in Zambia. Therefore, none of these studies pinpoints cultural features that underlie ethnic fertility differentials in Zambia.

The need to explain subnational and ethnic fertility differentials in Zambia has been pertinent for some time. The 1937 Native Affairs Report recommended that anthropologists of the Rhodes-Livingstone Institute should investigate ethnic fertility differentials in Zambia (Kuczynski 1949). Ohadike and Tesfaghiorghis (1975: 51) observe that "a review of existing literature shows clearly that the observed regional variations in fertility have been known for many years and yet no firm predictions of their causality have as yet been made". Ten years later, Hill (1985: 59) observes that "the causes of these differentials have been studied…but no firm conclusions have yet been possible". The question then is "what features account for subnational fertility differentials in Zambia?" Are these differentials a reflection of either data quality or sterility/infertility or ethnic fertility variation? The resolution of these two questions is an essential component of this thesis.

Rather than addressing regional fertility or sterility/infertility differentials, we explore ethnic fertility variations for two reasons. First, as Hill (1985) cautions, the impact of venereal diseases on fertility differentials needs much more data and detailed investigations before drawing any conclusions. Therefore, before venturing into these investigations, there is a need to eliminate the most obvious explanations first. Second, the literature review suggests that regional fertility differentials are a reflection of ethnic fertility differentials. However, past research has not addressed this issue adequately because efforts to integrate ethnic and cultural features to explain fertility trends and differentials have proven difficult. Since ethnic fertility hinges on cultural customs and norms, the next sections address the issues and concerns required to integrate anthropological reasoning into demographic analysis.

2.4 Integrating ethnicity and cultural features into fertility analysis: concepts, methods and issues

There is a growing agreement among some demographers and some anthropologists that integration of anthropology into demography improves explanations of demographic behaviour (Greenhalgh 1995; Townsend 1997). Despite this consensus, there are methodological issues surrounding the integration of these two fields of study (Hammel 1990; Hayes 1994). Roth (2004) argues that the technical and statistical tools of measuring fertility and its determinants have improved in the last fifty years but the methodological debates surrounding the integration of anthropology into demography has lagged far behind. This section discusses those issues relevant to this study. We also introduce the concepts required to resolve our research question. Lastly, the section proposes some methods of mitigating some limitations that may affect our approach to integrating anthropological concepts into demographic analysis.

2.4.1 Ethnicity: definition and issues

Broadly defined, an ethnic grouping is considered to be a collection of individuals who share a similar biological, historical, religious and cultural background (Warner and Lunt 1996). However, the definition of ethnicity varies with the subject of interest (Cohen 1996). For example, various chapters in a book edited by Sollors (1996) yield different definitions of ethnicity. This is because each author addresses differently the various attributes that define ethnicity. Social scientists use ethnicity to address issues of culture and internal social organisation of a collection of individuals (Warner and Lunt 1996). In our case, we seek to address ethnicity—a collection of individuals—with a view to understanding cultural customs and norms as well as the forms of internal social organisation that govern reproduction (next section).

However, the concept of ethnicity has some shortcomings that affect the quality of anthropological and demographic analysis. First, as observed in Section 2.3, researchers have often used language to identify a collection of individuals whom they presume to share a similar culture and internal social organisation. Language is not suitable for grouping similar traditional societies without considering other attributes.

Lesthaeghe (1989a: 3) argues that "…used as an explanatory variable, language absorbs many other affects…such as region and ethnicity and therefore politics [and economics]." Therefore, in multilingual populations, individuals speaking the same language may not necessarily share a similar culture and internal social organisation (Kaufman and James 2003). Given this deficiency, researchers should avoid using language as the <u>sole</u> variable to identify a collection of individuals that share a similar culture and internal social organisation.

Second and more important, in any population, individuals may over time change ethnic identities for various economic, political and social reasons (Kreager 1997). This means that such individuals identify themselves with ethnic groupings that they do not necessarily share similar culture and internal social organisation. Section 2.4.3 addresses this issue together with other similar concerns identified in the next section.

2.4.2 Cultural customs and norms

Hammel (1990) observes that the definition of culture eludes even those who have specialised in its study. This is because it is a complex term with many facets—such as language, politics, religion, art and music—and its very meaning changes with time. However, culture points to a system of social organisation of a collection of individuals. Kreager (1997: 144) refers to culture as "…sets of symbols, linguistic and otherwise, that are used by people to construct their collective life". Kuper (1999) and Naylor (1996) also state that culture is a way of integrating ideas, behaviour and products generated by a collection of individuals.

Societies create cultural customs and norms out of concern to produce social and physical ideas and products for survival (Naylor 1996). Both Lesthaeghe (1989a) and Hirschman (2004) state that societies design cultural customs and norms to achieve goals that are mainly centred on livelihood and survival of a group of people. Societies, then, use them for various functions including guidance and decision making (Hammel 1990). These group norms are important to individuals because they want to coexist with others for survival purposes. Therefore, they identify themselves with particular societies by adhering to group cultural customs and norms as a way of showing devotion (Kuper 1999). Societies ensure that non-adherence to cultural customs and norms results in punishment or disownment (Anderson 1983).

Placing our research problem into this framework, we summarise culture or social organisation as a collection of interrelated customs, norms, beliefs and social organisation of a collection of defined individuals—in this case an ethnic society. Individuals are motivated to adhere to norms of their ethnic group because they need to coexist with others for survival purposes. At this point, this thesis needs to address three issues. First, to identify the cultural customs and norms that influence reproduction in traditional societies[10]. Second, to highlight the problems that are associated with the study of cultural customs and norms. Lastly, to identify and select sources of information, preferably quantified, that can be used to compare cultural customs and norms between ethnic groups.

2.4.2.1 Cultural customs and norms underlying reproduction in traditional societies

Kertzer and Fricke (1997) observe that motives underlying demographic behaviour are embedded in sophisticated cultural settings of respective traditional societies. Lesthaeghe (1989a) also notes that these features are important because they account for large variations of fertility differentials between traditional societies. These traditional arrangements continue to be important even in transitional societies because, as Caldwell, Caldwell and Orubuloye (1992) state, they have an impact on present-day demographic trends and differentials although they were constructed back in time. For example, in a recent Nigerian study, Wusu and Isiugo-Abanihe (2006) infer that changing childbearing and fertility practices result from strain placed on traditional family and kinship structures by social, political and economic changes.

The literature shows that apart from the obvious—governance of courtship and sexual relations—there are two broad groups of features capable of influencing reproductive outcomes in traditional societies. The first group consists of economic and political features while the second group comprises of social and community features. We present the literature on this material chronologically to demonstrate why and how the propositions on these features have evolved over time.

Food production and availability

Models that emphasise human survival models—such as those described by Malthus and Darwin—were the first to link production (economics) to reproduction (Lesthaeghe 1980). These models argue that pre-industrial societies had to regulate fertility to ensure that the human population size remains within the available food supply to avoid deaths

[10] In this context, traditional or pre-industrial societies are those deemed not to have progressed consciously or unconsciously to using modern methods of fertility regulation. This definition is derived from Karl Marx's impression of inevitable progressive development (Parsons 1966), a debate that is outside the scope of this thesis.

resulting from famine, epidemics, wars—as well as involuntary emigrations that would otherwise curb population growth (Malthus 1798; 1826).

The nutritional or environmental theory was the second to link production and child spacing in pre-industrial societies. According to this theory, "child-spacing through prolonged lactation and postpartum abstinence was essentially seen as a cultural adaptation to environmental and technological constraints" (Lesthaeghe 1989b: 16). Earlier, Whiting (1964)—and later on Murdock (1967c) using data from Murdock's (1967a) Ethnographic Atlas—have evaluated the evidence in support of this link. Their results show that subsistence economic arrangements, agricultural technology, type of crops farmed and access to dairy products are important determinants of child spacing in traditional societies.

Both Whiting (1964) and Murdock (1967c) posit that the availability of alternative sources of proteins determines durations of breastfeeding and postpartum sex abstinence taboos, since proteins provide nourishment to mothers and their children. Low protein intake results in malnourishment of the mother and poor breast milk. This affects the health of breastfeeding infants and children. Therefore, traditional societies with few alternative sources of proteins have to depend more on infant breastfeeding to preserve nutrition and health of infants and children. They argue that to achieve this, traditional societies institute long lactation periods and extended postpartum sex taboos. Extended lactation causes birth intervals to lengthen (R. Lesthaeghe, P. O. Ohadike, J. Kocher *et al.* 1981).

However, the association between subsistence means and reproduction is more complex than the explanation provided by the environmentalist approach (Schoenmaeckers, Shah, Lesthaeghe *et al.* 1981). As Lesthaeghe (1989b: 19) states, "it is obviously not enough to detect a serious reason for the introduction of a particular practise or ingredient of the reproductive regime: there must also be a strong social support for its maintenance".

Social, community and political support

To respond in a coherent and uniform manner to their survival needs, traditional societies had to institute social arrangements. Whiting (1964) and Murdock (1967c) argue that due to environmental constraints, societies institute social and cultural arrangements (for example polygyny) to regulate reproduction. Caldwell and Caldwell (1987) also observe that traditional societies regulate reproduction using social and cultural arrangements to respond to environmental and means of production needs.

This is why, as Goody (1976) observes, different traditional economic arrangements have divergent socio-cultural customs and norms.

Saucier (1972) was the first to critically explore social and cultural arrangements underlying reproduction in his sample of four traditional societies using twenty-three propositions[11] (Lesthaeghe 1989b). His results show that, compared with patrilineal and patrilocal societies—the Abipon (Paraquay) and the Venda (South Africa), matrilineal and matrilocal societies—the Ashanti (West Africa) and the Tenetehara (Brazil)—had shorter postpartum sex abstinence taboos.

According to Saucier (1972), traditional societies practicing long postpartum sex taboo farmed extensively, and therefore required a large labour force. To ensure their livelihood, they tended to live in large communities and therefore, their population sizes were comparatively large and population densities medium. Unskilled female labour was used to ensure subordination. To get subordinate female labour, brideswealth or exchange of a sister is required to marry. The transaction is an effective way of isolating brides from their relatives to go and live under the control of their husband's family (patrilocal marital home). To maintain this custom, they treat wives as outsiders—so that males remain devoted to their respective lineages and not their wives (Lesthaeghe 1980). Therefore, they impose sexual or physical distance between couples by discouraging intimacy. They also isolate young men at puberty and perform circumcisions to discourage them from nucleating with the opposite sex as they enter adulthood.

Saucier (1972) describes these societies as polygamous. Their polygyny results from excess available subordinate female labour. Further, Saucier (1972) also associates polygyny and brideswealth with unilineal kinship organisation (matrilineal or patrilineal) and localised kin groups. He then states that such societies are not politically well-organised because localised kin groups hand down assets and authority to immediate family members rather than through elections. Finally, politically unorganised traditional societies prefer cross-cousin marriages and believe in a high God unconcerned with human affairs (Saucier 1972).

Governance of courtship and sexual relations

Like Saucier, Goody (1976) uses a social organisational approach to link means of production and reproduction. His analysis focuses on differences between African and

[11] Propositions derived from Carr-Saunders (1922), Kluckhohn and Anthony (1958), Stephens (1962) and Young (1965).

Eurasian (European and Asian) traditional arrangements governing reproduction. Although Goody's model "has little to say about the postpartum abstinence rule and child-spacing in general," (Lesthaeghe 1989b: 26) it shows that traditional economic, political and social arrangements as well as norms of premarital sex behaviour are important arrangements that govern reproduction in pre-industrial societies.

Goody (1976) states that traditional societies set up social arrangements to govern courtships and sexual relations. For example, to control the flow of family wealth through inheritances, traditional societies have to govern courtship and sexual relations. Some societies even encourage endogamy to keep property within the family. Further, to regulate courtship and sexual relations, adults restrict contact between children of opposite sexes and discourage premarital sex.

Since Goody, features linking reproduction in pre-industrial societies to traditional economic, political, social arrangements have found a great deal of support. Examples can be found in Lesthaeghe (1980); Lesthaeghe, Ohadike, Kocher *et al.* (1981); Mabogunje as well as (1981) Schoenmaeckers, Shah, Lesthaeghe *et al.* (1981). More recently, Potts and Marks (2001), Zulu (2001) as well as Wusu and Isiugo-Abanihe (2006) indicate that cultural arrangements such as extended family and kinship lineage systems are still important determinants of fertility in traditional societies. Therefore, traditional features should be "…taken as the historical roots…upon which later changes are grafted—…i.e. changes such as alteration of the land tenure system, growth of the wage sector, rapid urbanisation…." (Lesthaeghe 1989a: 3).

There is a possibility that because of non-availability of data, past research may not have identified other similar traditional arrangements. Despite this drawback, the identified features have confirmed the fundamental relationship between traditional arrangements and fertility in pre-industrial societies (Goody 1976). More recent research—for example, Zulu (2001)—shows that these features are sufficient to explain features underlying fertility outcomes in traditional societies. Unfortunately, data to measure their effect on fertility are not available because coding anthropological data and measuring proximate determinants of fertility is problematic.

2.4.2.2 Sources of data for comparative cultural research

The Yale Human Relation Area Files, Murdock's Ethnographic Atlas and the Standard Cross-Cultural Sample provide ethnographic data that can be used in cross-cultural research. Sometimes researchers—for example Schoenmaeckers, Shah, Lesthaeghe *et al.* (1981) as well as Pryor (2005b)—have coded their own data based on these sources and other historical and anthropological reports including the Yale Human Relation Area Files. However, Goodenough (1964) points out that coding ethnographic data requires special skills that take a long time to acquire. Acquiring such skills and then coding one's own ethnographic data on these societies is beyond the scope of this thesis as the drawing of cultural comparisons in Zambian ethnic societies is not an end in itself. Instead, this study considers using the data set from the Yale Human Relation Area Files, the Standard Cross-Cultural Sample and Murdock's Ethnographic Atlas.

Each source contains cultural and social information on traditional societies across the world. Such ethnographic information is suitable for comparative or cross-cultural research (Lesthaeghe 1989b). Yale University has managed the Yale Human Relation Area Files—compiled from the Cross-Cultural Survey conducted during the 1930s and 1940s—since 1949. These files contain comparable information on several ethnic societies of the world. The Ethnographic Atlas compiled by Murdock (1967a) from the Yale Human Relation Area Files is a classification of ethnologies for several traditional societies that had anthropological information available when coding the data in this Atlas. The Atlas provides for quantitative comparisons of 862 societies of the world on about 90 cultural attributes (Murdock 1967a).

Murdock and White (1969) derived the Standard Cross-Cultural Sample from Murdock's Ethnographic Atlas based on sampling principles discussed in Murdock (1967b). The purpose of the Standard Cross-Cultural Sample was to make the information in Murdock's Ethnographic Atlas comparable for interregional cross-cultural research. This source has data on one or two societies of each major cultural region of the world—the entire sample covers 186 societies. About two-thirds of the Standard Cross-Cultural Sample for the sub-Saharan traditional societies relates to information collected in the first half of the twentieth century.

The Yale Human Relation Area Files and Standard Cross-Cultural Sample are inadequate for this research for two reasons. First, we require cultural information for as many Zambian societies as possible. The Standard Cross-Cultural Sample has information on only two Zambian traditional societies (the Bemba and the Lozi). Second, for comparison, we require culture described in a quantitative format. The Yale Human Relation Area Files data are not readily available in a statistical database format. This study, therefore, uses the data from Murdock's Ethnographic Atlas because it contains quantitative information for 21 traditional societies found in Zambia.

Goodenough (1964) provides an account of how Murdock's Ethnographic Atlas was assembled, including an assessment of the strengths and weaknesses resulting from the compilation procedure employed. Since the Atlas covers a wide range of cultural attributes for several societies, it allows for evaluation of cultural complexity at a minimal cost. Another advantage, as implied by Levinson and Malone (1980), is that ethnographic information is objective because it is usually compiled by researchers or their assistants who are not involved in its collection.

One major issue affecting the use of ethnographic data—also observed by Pryor (2003; 2005b) when he applies cluster analysis to derive economic regimes—is that the data in Murdock's Ethnographic Atlas were collected at different times by different anthropologists each focusing on different issues and societies. Cultural features practiced in one particular society may have changed by the time the data were collected in another society. As a result, these data may not be accurate for cross-cultural research especially between the major regions of the world. For developing regions, societies whose ethnographic information was collected much later are affected by what Murdock and White (1969: 340) term as "culturative effects because of increasing contact with the Europeans". Against this, Murdock and White (1969) argue that any newly introduced cultural norms and customs tend to take a long time to be integrated into the mainstream of any culture. They state that industrialisation occurring in the early twentieth century did not immediately destroy traditional cultures (Murdock and White 1969).

Another, more important, issue affecting data in Murdock's Ethnographic Atlas is the accuracy of coding of anthropological attributes, especially those that require quantification—for example, the length of the postpartum taboo (Schoenmaeckers, Shah, Lesthaeghe *et al.* 1981). Some authors have argued that the sources of information that Murdock used to code cultural attributes in his Atlas are questionable because non-professionals collected them. Others—for example, Pryor (2003)—question the methods Murdock used to arrive at some of his codes. For example, to code the proportion of subsistence coming from animal husbandry, Murdock based his estimates on the bulk or weight of the food and not nutritional content. The next section deals with these and other concerns.

2.4.3 Dealing with the concerns of integrating anthropology and demography

The preceding sections reveal some problems that may affect our study. These include shifting or multiple identities, incorrect coding of some attributes and perhaps all attributes on some societies. Structure versus agency is another important complexity that we should add to this list (Kreager 1997). In general, the former term implies that cultural arrangements determine the actions of individuals. By contrast, agency implies that individuals act freely and without group customs and norms. Anthropological and sociological debates on this term are almost terminal. However, both exist because of the other. Fricke (1997) argues that individual behaviour floats between personal opinions and group norms. Usually individuals act in their own self-interest but at the same time, society compels them to subordinate their own and household interests to collective interests. This implies that cultural norms and customs create what the individual is while the individual helps create group norms and customs. This is probably why Hammel (1990) has argued that it is not correct to represent cultural norms and customs as a static reality because culture is always changing. This section discusses how this study intends to deal with these and other problems related to integrating anthropological and demographic analysis.

Using both methodological approaches

Anthropological analysis is based on qualitative and participant observation methods while demography uses quantitative approaches (Hill 1997; Heady 2007). Each field has its advantages and disadvantages. With anthropological analytical methods, it is possible to identify several features—including unexpected causal connections—underlying reproduction in different traditional societies. However, as Georgiadis (2007) argues, the social and theoretical background of the anthropologist and that of their data collectors may influence the research conclusions. Anthropologists frequently draw conclusions from non-quantitative and non-statistical methods. By contrast, demographic conclusions arise from quantitative analysis of data that are usually generalisable to the rest of the population (Hill 1997). However, Greenhalgh (1995) and Fricke (1997) point out that demographic analysis often fails to establish accurately 'qualitative' features underlying human behaviour.

Due to these methodological differences, some authors—for example, Kertzer (1995) and Fricke (1997)—have doubted the compatibility of these two fields. In this study, we use both qualitative and quantitative research methods to explain subnational fertility differentials in Zambia. As Johnson-Hanks (2007) puts it, we should let demography show the outcomes of people's actions and cultural anthropology explain reasons for people's actions. The latter is important for this study because "…there is less need to count and a much greater need to understand how and why demographic events happen, rather than how many and when…" (Coast, Hampshire and Randall 2007: 503).

Re-expressing ethnicity using several attributes underlying fertility in traditional societies

This study re-expresses ethnicity using several attributes that govern fertility in traditional societies and then merges those that are multidimensionally similar. We do this for two reasons. First, the literature has established that some proxies used to describe ethnicity—for example, language—are absorbed in other effects (Lesthaeghe 1989a). Therefore, Fricke (1997) proposes use of social groups that share institutional and social backgrounds such as history and culture when grouping individuals. Similarly, Lesthaeghe (1989a) suggests using features that govern fertility to predict fertility outcomes in traditional societies. Second, the discussions show that there are several interlinked arrangements that underlie fertility. Therefore, one should avoid explanations based on single features (Schoenmaeckers, Shah, Lesthaeghe *et al.* 1981). Instead, one should apply a multivariate approach because a full set of all conditions relevant to a demographic outcome might capture life circumstances that tailor demographic practices comprehensively (Johnson-Hanks 2007).

To integrate all features identified in Section 2.4.2.1, this thesis opts for a multidimensional definition of culture adapted from anthropological economics (Pryor 2003, 2005b, 2005a). This approach re-expresses ethnicity based on several features underlying fertility in traditional societies. We use the term 'traditional reproductive regime' rather than 'ethnicity' because the units of analysis are formed from clusters of societies with similar multidimensional features that govern reproduction in traditional societies.

Apart from not using proxies to define traditional reproductive regimes, such an approach avoids "explanatory frameworks…edging on monocausality [yet] their joint consideration provides the required set of core institutional and cultural variables" (Lesthaeghe 1989b: 15-16). There is a possibility that this approach also minimises other errors. Individuals shift identities in response to changing socio-economic and political circumstances (Kreager 1997). However, they tend to identify themselves with ethnic groups that are almost similar to theirs (Jenkins 1997). Therefore, like in demographic analysis, where grouping single-ages into groups minimises single-age reporting errors (Arriaga 1994), grouping ethnic societies into clusters with similar multidimensional features, might ameliorate the limitations due to shifting identities.

Related to this, data in Murdock's Ethnographic Atlas does not capture all attributes accurately. Therefore, it is most likely that the effect of poorly-coded variables and attributes is suppressed by those that are correctly coded in a multivariate environment—as implied by Levinson and Malone (1980), when they assessed theoretical findings of 305 cross-cultural studies. Not all problems can be resolved with the data and methods at hand. Regardless, as Johnson-Hanks (2007: 11) observes, "the problems of aggregation and meaning-making are both the challenge and the premise of a truly new body of theory in anthropological demography".

Supplementing ethnographic data using independent historical and anthropological accounts

Anthropological features are not easy to classify and there is no single method of coding ethnologies (Georgiadis 2007). Therefore, as recommended by Coast (2003), this thesis uses additional information to supplement the ethnologies in Murdock's Ethnographic Atlas. Supplementation evaluates ethnologies against other anthropological accounts and provides support for anthropological arguments—such as the importance of kinships in traditional societies (Coast, Hampshire and Randall 2007). Johnson-Hanks (2007: 8) observes that "…there is no use in thinking about intentions, goals, or choices without considering the social processes through which the categories of intentions and choice are formed".

The supplementation includes a detailed understanding of the origins and histories of Zambian ethnic societies and how they have evolved over time. McNicoll (1994) observes that reproductive behaviours depend on and are adapted from institutional arrangements that individuals inherit from the past. As a result, history and new expectations determine institutional arrangements underlying reproductive behaviours (van de Kaa 1996). Therefore, as Caldwell (1976) argues, unless the fundamentals of the societies being subjected to new forces are understood, it is impossible to appreciate the dynamics of reproductive behaviour. Accordingly, failure to place reproduction in a historical context has placed a fundamental limitation on microeconomic theories of fertility (Greenhalgh 1995).

The next section discusses how the cultural customs and norms underlying fertility in traditional societies fit in the overall framework of fertility determinants.

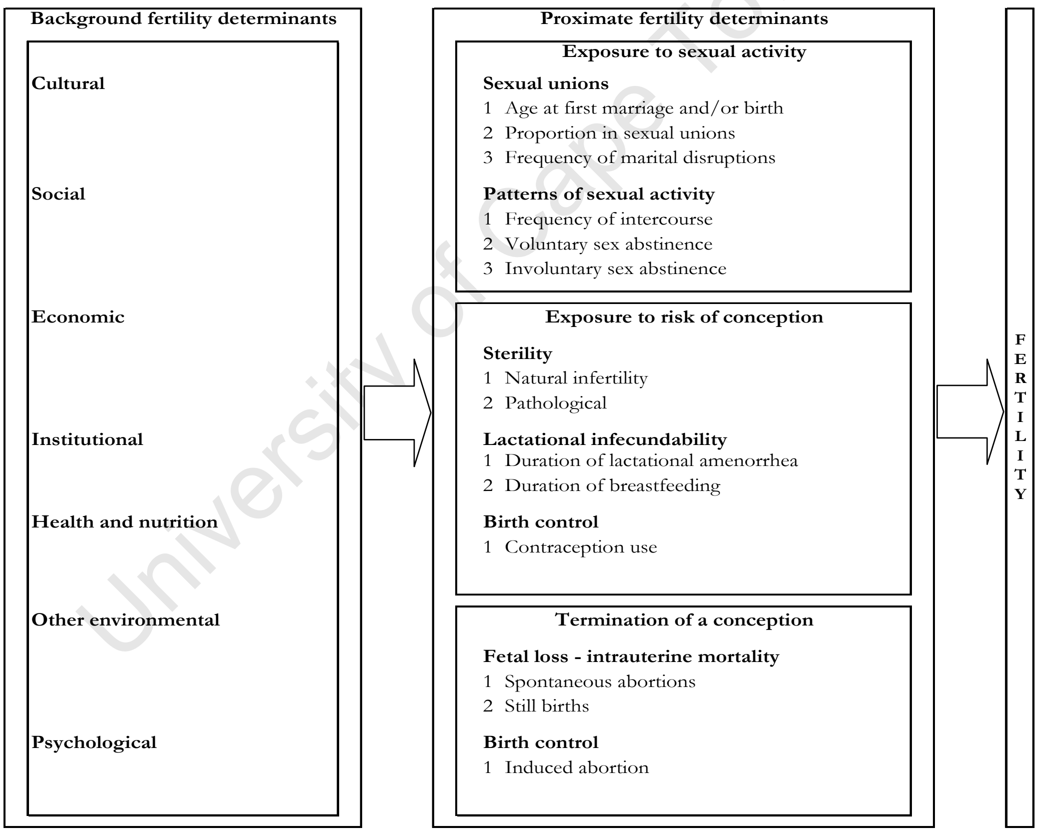
2.5 The determinants of fertility

Various features—physiological, environmental, economic, cultural, social and religious—influence fertility outcomes (Bongaarts, Frank and Lesthaeghe 1984).

Changes in determinants of fertility influence fertility trends and differentials. The scope and impact of determinants of fertility also differs between societies and over time in each society (Bongaarts 1978).

Demographers have divided features influencing fertility outcomes into two components—proximate and background (Davis and Blake 1956). Proximate determinants influence fertility directly while background determinants act through proximate determinants to influence fertility indirectly. Therefore, explaining fertility trends and differentials should focus on how background fertility determinants influence proximate determinants. Figure 2.5 shows the relationship of background and proximate fertility determinants to fertility.

Figure 2.5 Diagram showing how determinants of fertility are related



Source: Derived from Davis and Blake (1956) as well as Bongaarts, Frank and Lesthaeghe (1984).

2.5.1 Proximate determinants of fertility

Broadly speaking, there are three groups of proximate determinants of fertility (Bongaarts, Frank and Lesthaeghe 1984). These are exposure to sex, exposure to conception and ability to carry a pregnancy to a successful parturition. Some proximate determinants are behavioural while others are physiological (Davis and Blake 1956). Behavioural features comprise characteristics that individuals can manipulate—for example, patterns of sexual unions, exposure to sexual activity and use of contraception. Physiological or biological features are not under the control of individual motivation—for example, intrauterine foetal mortality and sterility. Instead, genetic, health, nutrition and environmental conditioning influence physiological features (Bongaarts 1978). Frank and Lesthaeghe (1984) provide descriptions of each proximate determinant. We do not review them here because our primary focus is the background determinants of fertility.

2.5.2 Background determinants of fertility

Compared with the proximate determinants, there are many background determinants of fertility. This is why some studies do not even list them (for example, Davis and Blake (1956)) while others list only a few (for example, Bongaarts, Frank and Lesthaeghe (1984)). Some background features encourage high fertility while others depress fertility. For example, health and nutritional features may delay conception but cultural features allowing for early marriages may counter the affects of the former (Bongaarts 1978). Sometimes the same background feature can influence fertility upward in one proximate determinant and downwards in another. For example, education may reduce post-partum infecundability but increase the age at marriage or first birth and use of contraception. Different societies might attain the same fertility level via different background features. Further, many background determinants of fertility are not intended to influence fertility *per se* but "are by-products, being unanticipated and unrealised by members of the society" (Davis and Blake 1956: 214). This is why most low fertility traditional societies in sub-Saharan Africa do not necessarily make concerted efforts to reduce their fertility (Bongaarts, Frank and Lesthaeghe 1984).

Due to data and measurement problems, empirical work on background determinants of fertility has focused on present-day features such as urbanisation, education and employment or economic status (Farooq and DeGraff 1988). Numerous studies have shown that urban, educated and employed women have lower fertility because of higher age at marriage or first birth and more use of effective contraception (Bongaarts, Frank and Lesthaeghe 1984; Farooq and DeGraff 1988).

Other important background features include religion and social status. Zimmer and Goldscheider (1966) as well as Trent and Hoskin (1999) argue that Protestants have lower fertility than the Catholics because of the latter's position on the use of contraception and abortion. Setel (1995) argues that women with higher social status (usually measured using household status) are likely to have lower fertility because they are better able to negotiate their own child-bearing. Due to data constraints, this research applies only these present-day background determinants of fertility including some selected proximate determinants of fertility (age at first marriage and birth, marital status and contraceptive use) when evaluating features that account for recent fertility trends between traditional reproductive regimes in Chapter 7.

The other set of background features of importance to this study are the cultural features discussed in Section 2.4. Townsend (1997) and Mabogunje (1981) argue that sometimes explanations provided by modern features fail to explain a significant proportion of fertility variations in developing countries. For example, in these societies, women live in rural areas, they are uneducated, unemployed outside the home and do not use modern contraception. Therefore, the reasons for fertility variations between women of different ethnic backgrounds should be sought elsewhere (Bongaarts, Frank and Lesthaeghe 1984). Davis and Blake (1956: 211) argue that traditional societies "…differ markedly in social organisation and that these differences appear to bring about variations in fertility" because of their influences on preferences for the number and sex of children. Caldwell and Caldwell (1987) as well as Lesthaeghe (1989b) have supported this argument.

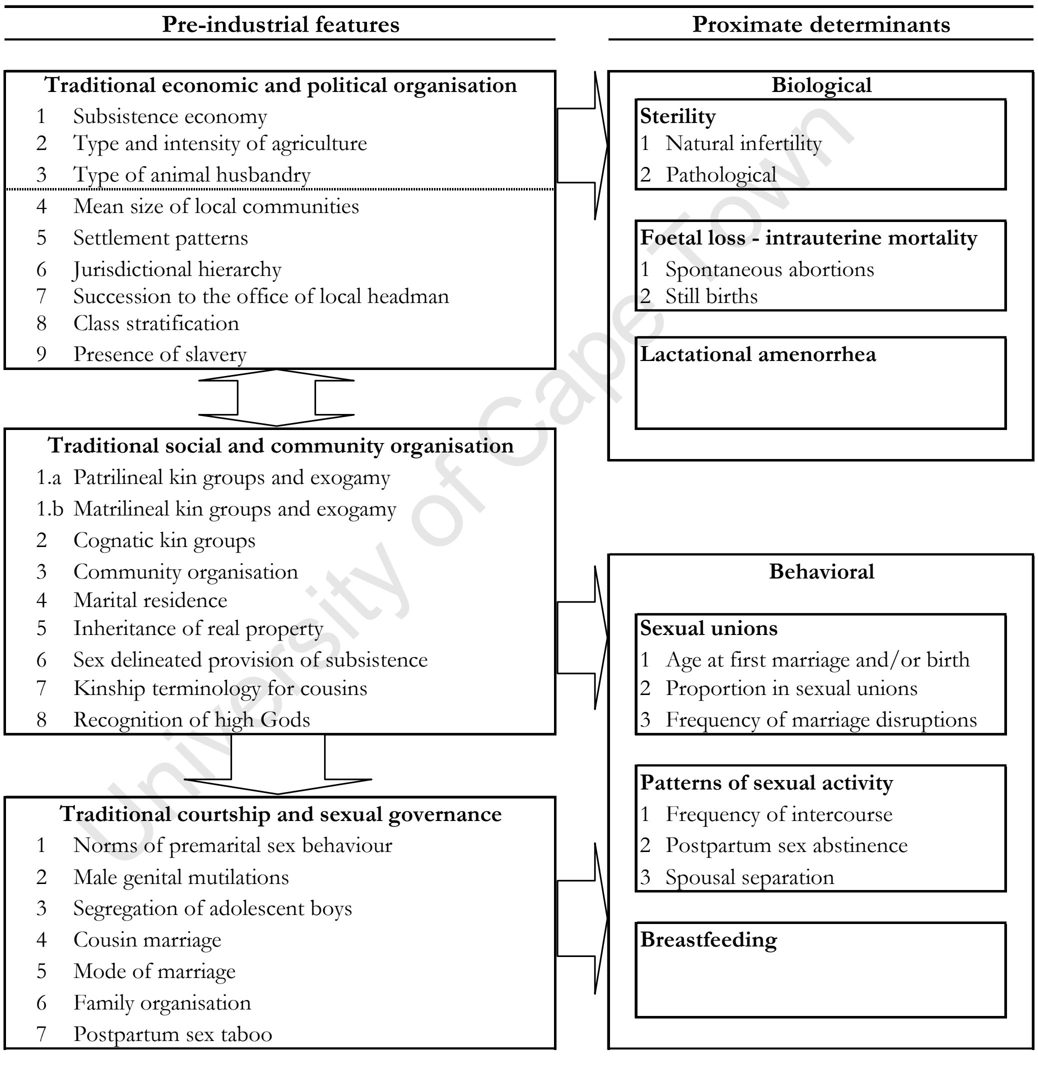
However, due to data limitations, there are no existing standard procedures for measuring the effects of cultural features on proximate determinants and thus fertility outcomes. Section 2.4 has already discussed the modalities of how Chapters 4 and 5 intend to integrate these features to identify features that explain ethnic, and therefore subnational, fertility in Zambia. The next section discusses the cultural background of fertility in detail.

2.5.3 Identifying and linking cultural customs and norms underlying reproduction in traditional societies to fertility outcomes

Using, mostly, the material presented in Section 2.4.2.1, this section identifies attributes underlying reproduction in traditional societies in Murdock's Ethnographic Atlas. The section also uses other literature—for example, Goodenough (1964)—to supplement the material presented already (Section 2.4.2.1), especially when identifying political attributes. The section, then, relates attributes underlying reproduction in traditional societies to the proximate determinants of fertility. Thereafter, the discussions identify aspects of this attributes that encourage high fertility and vice versa.

For presentation, we group arrangements underlying reproduction in traditional societies as follows: economic and political features, social and community features as well as arrangements governing courtship and sexual relations. Figure 2.6 shows the features underlying reproduction in traditional societies that are in Murdock's Ethnographic Atlas and a proposed link of these features to proximate determinants of fertility.

Figure 2.6 A proposed framework for integrating cultural features underlying traditional fertility



Source: Derived from Davis and Blake (1956), Murdock (1967c) as well as Bongaarts, Frank and Lesthaeghe (1984).

Traditional economic and political arrangements

Whiting (1964) and Murdock (1967c) have demonstrated that economic arrangements have an impact on biological proximate determinants of fertility because they promote provision of nutrition to women and infants. More recently, Pebley, Huffman, Chowdhury *et al.* (1985: 440) found that in Bangladesh, "mother's nutritional status,…, appears to be related significantly to foetal mortality". Likewise, Meredith John (1993: 381) observes that, "…the nutritional status of a woman may play a direct role in determining the length of post-partum amenorrhea…".

Fertility tends to be high in traditional societies with less advanced economic arrangements but lower in those with advanced economic arrangements (Goody 1976). In part, this is most probably due to greater demand for labour and old age support in less advanced economies (Anker and Knowles 1982; Caldwell and Caldwell 1987). Caldwell, Orubuloye and Caldwell (1992) argue that women need children, especially males, to secure their marriages and uplift their status. These needs fall off as economic arrangements shifts from food gathering to intensive agriculture. Advances in economic arrangements further enhance adherence to high fertility traditional arrangements because individuals and families become more independent (Lesthaeghe 1989b; Wusu and Isiugo-Abanihe 2006).

Goody (1976) observes that there is a close link between economic and political arrangements in traditional societies. Hammel (1995: 225) also states that "political organisation, working through control of economic resources, had an effect on demographic behaviour" in pre-industrial Europe. This is because, as observed by Fortes and Evans-Pritchard (1940), regional environmental and ecological features define economic arrangements while economic features define political, social and community arrangements. Therefore, political arrangements have an indirect impact on biological proximate determinants of fertility. Goody (1976) also argues that societies with advanced economic arrangements are usually politically advanced as well because managing such economies requires well-organised political arrangements. Therefore, comparatively traditional societies with advanced economic and political arrangements have low fertility.

Further, there is a direct relationship between traditional economic and political arrangements and traditional social and community features. According to Radcliffe-Brown (1940), traditional societies employ social and community arrangements to restore balance imposed by shifts in economic and political features. Goody (1976) also argues that economic and political arrangements define social and community arrangements in traditional societies.

Traditional social and community arrangements

Traditional social and community arrangements have a direct impact on behavioural proximate determinants of fertility (R. Lesthaeghe, P. O. Ohadike, J. Kocher *et al.* 1981). Whiting (1964), Saucier (1972) and Goody (1976) discuss links between several cultural arrangements and reproduction in pre-industrial societies. For example, societies enact spousal separation arrangements to impose sexual or physical distance between couples. In addition, marriage rules are defined by, and differ between, different kinship arrangements and these in turn affect sexual behaviour (Radcliffe-Brown 1950). However, the most important feature is kinship lineage. Kinship lineage is "a complex set of norms, of usages, of patterns of behaviour …" observed by a group of people related by blood or marriage (Radcliffe-Brown 1950: 10). Societies pass down authority, traditions, morals, religion, knowledge, skills, manners and tastes from one generation to another within kinship relations. This social arrangement allows people of similar origin to integrate. Africans use kinship lineage to identify relations and family networks (Hull 1980).

Lineage is important because it provides "for the understanding of any aspect of the social life of any African people—economic, political, or religious—it is essential to have a thorough knowledge of their kinship and marriage" (Radcliffe-Brown 1950: 1). Caldwell, Caldwell and Quiggin (1989) also observe that kinship lineage is an important traditional arrangement because it defines courtship and marital residence. It also determines arrangements for wealth and property inheritance (Hull 1980).

There are four types of kinship lineages: father-right (patrilineal), mother-right (matrilineal), dual and cognatic (Radcliffe-Brown 1950). The first two, jointly called unilineal kinships, are relations perceived from a common ancestor through the male or the female line—that is, patriline or matriline, respectively (Hull 1980). In patrilineal arrangements, sons (together with their wives and children) belong to and live with their father's family (Radcliffe-Brown 1950). Meanwhile, in matrilineal kinships, daughters (with their husbands and children) belong to and live with their mother's family. In dual kinship lineages, individuals trace their relations through both male (patrilineal) and female (matrilineal) lines. Finally, in cognatic kinship lineages, "…relations are based on cognatic kinship traced equally through males and females…there is minimal emphasis on unilineal kinship, so that lineages can hardly be said to exist as features of social structure" (Radcliffe-Brown 1950: 78).

The method of recognising relatives (kinship lineage) reveals the degree of societal organisation (Gluckman 1950). Kinship lineage based on simple recognition of relatives (cognatic kinship) are family oriented and less complex than those based on unilineal kinships (Radcliffe-Brown 1950; Schoenmaeckers, Shah, Lesthaeghe *et al.* 1981). However, as kinship and associated features become complex, they transcend from narrow to wide range (from single to multiple communities). In wide range kinships, individuals adhere more to collective arrangements to facilitate collective living for survival purposes.

Patrilineal kinship societies are the most organised. Radcliffe-Brown (1950: 41) observes that "the patrilineal clans are 'compact', i.e. the male members with their families live together in one delimited area; whereas the matrilineal clans are 'dispersed', the various members being scattered through the village settlement…". As a result, matrilineal kinship societies are not 'corporate' kinship societies because "the members…are scattered throughout the tribe; they do not ever come together to take any kind of collective action, and have no single authority…" (Radcliffe-Brown 1950: 42).

Fertility desires and outcomes differ between traditional societies with different kinship lineages. As kinship lineages become more complex, fertility control shifts from the nuclear family to the kinship (Radcliffe-Brown 1950; Lesthaeghe 1980). Community-controlled fertility is higher than that controlled in a nuclear family because the community is involved in a family's reproductive decisions and kinships share the cost of raising children (Wusu and Isiugo-Abanihe 2006). Zulu and Kalipeni (2003: 122) observe that "… other people play a greater role than the husband in initiating the use of traditional methods" of contraception and birth control in both matrilineal and patrilineal kinships. However, the "weakening bond among members of the kinship group culminates in a slow but steady erosion of certain traditional childrearing practises" that support large families (Wusu and Isiugo-Abanihe 2006: 150). Put differently, "the influence of elderly women in reproduction depreciates by relocation of contraception from the village to the clinic" (Zulu and Kalipeni 2003: 123). Therefore, fertility is expected to be higher in unilineal kinships than the dual or cognatic kinships lineages because unilineal kinship arrangements are comparatively complex. Mason (1997: 451, 452) observes that "…plausible is the idea that the strong lineage structures … placed even more premium on large numbers of surviving children than did the household-based family systems…[therefore] …fertility is likely to remain relatively high in Africa until lineage organisation becomes more thoroughly undermined".

Besides, the degree of kinship lineage organisation has a role in determining fertility outcomes because "the determining factor of a kinship system is provided by the range over which these relationships are effectively recognised…" (Radcliffe-Brown 1950: 6). This means that regardless of the type, fertility is expected to be higher in more complex kinship lineages. This probably is one of the reasons why fertility is higher in patrilineal kinships societies (Lesthaeghe 1989b).

Traditional arrangements that govern courtship and sexual relations

Traditional arrangements governing courtship and sexual relations are a reflection of, or determined, by social and community arrangements (especially kinship lineage) and traditional economic and political organisation. Broude (1975: 381) observes that "societies take what are essentially straightforward, biologically-grounded dispositions, for example puberty, or pregnancy, or menstruation, and weave around them the most intricate webs of custom, attitude, and belief." Some of these arrangements—for example, postpartum sex abstinence—are part of the behavioural proximate determinants of fertility. Others—such as premarital sexual behaviour of young women—have a direct effect on the behavioural proximate determinants of fertility.

Fertility is expected to be lower in traditional societies with strict rules governing courtship and sexual relations (Ruzicka 1976). Caldwell, Caldwell and Orubuloye (1992) observe that limited sexual outlets are traditional feature of sub-Saharan societies with lower fertility. However, fertility outcomes depend on the purpose of these controls (Harrington 1968; Broude 1975). For example, some societies restrict premarital sex to ensure virginity of young women at marriage while for others it is meant to avoid premarital pregnancy (Broude 1975; Goody 1976). Meanwhile, some societies allow premarital sex to allow young women to develop physically and sexually in preparation for marriage (Burbank 1987). Therefore, in the absence of contraception, fertility is expected to be higher in traditional societies that allow premarital sex.

Similarly, male genital mutilations (circumcision, supercision and subincision) and separation of adolescent young men serves physiological and social purposes in traditional societies (Harrington 1968). Patrilineal kinship societies use male genital mutilations and separation of adolescent young men to prevent male-female nucleation among young adults (Saucier 1972). More recently, young males who undergo initiation perceive this to mark the beginning of having sex (Muntali and Zulu 2007). This is because "…the rites stress the sexual maturity of the participants … the novice ensures by the rites that he will be fully capable in sexual capacity" (White 1953: 43). However, White (1962) and Turner (1979) argue that this was a social symbolic transition from childhood to adulthood without any sexual or fertility connotations. Among the Balovale societies of Zambia, the rite merely places the circumcised in opposition to the uncircumcised and therefore aligns the latter with women until they are circumcised (White 1953). Further, White argues confusion of its sexual or fertility connotations arises from the way young men are encouraged to attend circumcision rites. Traditional societies claim attendance of these rites is the only way to manhood and fecundity.

Some societies encourage polygyny and impose physical distance between spouses to promote long postpartum sex abstinence taboos and early stoppage of childbearing (Saucier 1972; Lesthaeghe 1989b). There are traditional societies that do not allow endogamy for moral reasons because it is "…emotionally felt to be a sort of symbolic incest" (Radcliffe-Brown 1950: 63). All these are methods of limiting sexual outlets that might translate into low fertility. However, for whatever purpose, fertility outcomes will also depend on the effectiveness of implementing these arrangements.

This thesis benefits from and echoes these traditional practices. Chapter 5 elaborates on the practices that underlie fertility differences between ethnic societies in Zambia. The next section reviews the theories of fertility change with particular focus on strands of various frameworks that may explain Zambian ethnic fertility differentials.

2.6 Explaining fertility variations between ethnic societies in Zambia

This section introduces frameworks that demographers have developed and applied to explain changing fertility. Further—using detailed summaries provided in Hirschman (1994), Greenhalgh (1995), Kirk (1996), van de Kaa (1996) and Mason (1997)—the section discusses the usefulness of these theories especially the conditions under which they apply. Lastly and more important, Section 2.6.2 discusses further strands of these frameworks that may be relevant to this study.

2.6.1 Theories of fertility transition

The Malthusian equilibrium—introduced in Section 2.4.2.1—is supposedly the oldest generalisation of fertility transition (Kirk 1996). Malthus' (1798; 1826) concern was population growth outstripping food available for its survival. To avoid unwanted births and therefore avoid undesired natural positive checks on population growth, he proposed moral restraint—postponement of marriage coupled with pre-nuptial sexual abstinence. The greatest flaw of this generalisation is Malthus' inability to foresee technological improvements that produce food enough to feed large numbers of individuals (Petersen 1979). Kirk (1996: 369) observes that "… economic development has usually kept pace with, or exceeded population growth and has reduced fears about the adverse effects of population growth …". Despite its drawbacks, Malthus' paradigm forms a base to the several theories of fertility transition (Willis 1994). Greenhalgh (1995) and van de Kaa (1996) classify these frameworks into five groups while—although not different—Mason (1997) classifies them into six groups. In almost all discussions, authors begin with the classical demographic transition theory.

The classical demographic transition theory

Warren Thompson and Adolphe Landry first described this theory in 1929 and 1934, respectively—with the latter being the first to use the term 'transition' (Kirk 1996). Then, it was a mere comparison of mortality and fertility levels of Western Europe with other populations (Thompson 1929). Unaware of the work of these authors, Kingsley Davis and Frank Notestein stated the theory in its current form in 1945 (Kirk 1996). After a further review in 1953, Notestein's demographic transition theory dominated fertility transition explanations until the mid 1970s (Greenhalgh 1995; Kirk 1996).

Both Davis (1945) and Notestein (1945) postulate that pretransition societies elect traditional arrangements that promote high fertility to counter the effects of high mortality. With modernisation (industrialisation and urbanisation), conflicts, wars and violence decline and standards of living, hygiene, nutrition, diagnosis and prognosis improve. Signs of modernisation include a decrease in dependence on agriculture and increasing proportions of the literate population (Davis 1945). These improvements bring about mortality decline leading to rapid population increase which necessitates increased fertility constraints (Notestein 1945). Consequently, traditional extended family arrangements that promote large families succumb to increasing constraints, resulting in fertility declines. This transition moves a society to a new demographic balance—low mortality and low fertility. Self-development, individualism and increased child-rearing expenses characterise transitional and post transitional societies.

Classical demographic transition theory is comprehensive and nests several other fertility frameworks (van de Kaa 1996). This theory has always predicted correctly that a transition will occur in any society undergoing modernisation (Kirk 1996). Mason (1997) observes that, in the long-term (on a millennial time scale), this theory provides probable explanations to fertility declines of many Western European countries. Similarly, with adjustments (not stated by Mason), the theory has been able to explain fertility declines of some Asian and Latin American countries in the medium term (centennial scale).

A major weakness of demographic transition theory is that it does not define adequately the term 'modernisation' nor does it address questions of causation (Kirk 1996). Regarding the latter, Szreter (1993: 685) stated that the theory is "…intrinsically incapable of generating empirically refutable hypotheses concerning the sources of change". For instance, the Princeton University European Fertility Project found that socio-economic development (or mortality decline) is not always a sufficient or necessary condition to trigger fertility decline. Therefore, in some cases either fertility and mortality declined simultaneously or fertility declined before mortality.

The framework does not consider or account for variations of natural fertility in different societies which are due to differences in traditional institutions, that is, various economic and political arrangements in pre-industrial societies (van de Kaa 1996). Instead, it assumes that traditional arrangements are not important and fertility behaviour in pretransitional societies is irrational—an argument that, according to Mason (1997), is implausible. After the 1970s, these weaknesses led to development of alternate frameworks to explain fertility transitions.

Microeconomic theories of fertility change

Microeconomic theories of fertility change are based on the assumption that modernisation changes the economics of childbearing. The theories are divided into two groups: neoclassical theories and Easterlin's framework. Demographic literature attributes the former to Gary Becker and Theodore Schultz while the latter to Richard Easterlin and Eileen Crimmins.

Becker (1960) analysed economic features underlying family size decisions. He used the utility maximization model to analyse the demand for children. He argues that current income, child costs, contraception knowledge, tastes as well as uncertainty determines family size and thus the demand for children. Similarly, Schultz (1973)[12] postulates that parents respond to economic considerations (marginal sacrifices versus marginal satisfactions) when deciding the number and quality of their children. At

[12] Much of the contribution on this topic came from a paper written by Robert J. Willis (1973). Theodore Schultz was merely summarising the contents of this edition of the journal.

higher income, they spend more on each child's rearing and education. Therefore, sometimes, parents substitute quality for quantity. However, due to unforeseen circumstances, parents with more or less children than they desired.

Apart from economics, Easterlin's (1975: 54) framework includes "principal concepts of demographers, sociologists and other scholars of human fertility". He argues that determinants of fertility, including modernisation, work through both supply and demand of children and the cost of fertility control. Therefore, fertility outcomes depend on the comparative state of natural fertility, the demand for children if fertility control were costless and costs (both monetary and non-monetary) of fertility control (Easterlin 1975, 1978).

Easterlin (1978) as well as Easterlin and Crimmins (1985) argue that features underlying fertility in traditional societies determines natural fertility—the number of children born without deliberate fertility control. Income and cost of children compared with other goods as well as preference for children rather than consumable goods determines the demand for children (the desired number of children if fertility control was costless). If supply is less than the demand for children, then there is no need to control fertility. In this case, fertility is equal to natural fertility. The contrary is also true, in which case, a need to control fertility arises to avoid unwanted children. However, motivation to avoid unwanted children depends on the monetary and non-monetary costs of fertility control.

Natural fertility varies in traditional societies because of different socio-economic arrangements (Easterlin 1978; Easterlin and Crimmins 1985). The lack of fertility control in these societies is due to high infant and child mortality. Therefore, supply of children is less than their parent's demand. Usually, monetary or non-monetary costs of regulating fertility are also high. On the other hand, in modern societies, declines in mortality (infant and child) and desired family size shifts excess demand for children to an excess supply of children. Mortality declines result from improved health as well as hygiene and nutrition while that for desired family size from education and changes in tastes. An excess supply of children prompts the need to regulate fertility. As these transformations are occurring, innovations that come with modernisation are also necessitating a reduction of both monetary and non-monetary costs of providing and accessing modern fertility control.

Economic theories are conceptually and mathematically grounded (Kirk 1996). Empirically, the theories have proved in several countries that early modernisation leads to a fertility increase before there is a decrease at higher and sustainable levels of modernisation. However, most of these theories are narrow and mechanistic—for example; they do not distinguish between a child and a consumer good. They do not spell out the socio-economic features underlying natural fertility or the demand for children. These are difficult theories to apply because of their data demands (van de Kaa 1996).

The Intergenerational Wealth Flows theory

This theory—attributable to Caldwell—like others that follow, searches for the causes of fertility transitions outside modernisation (Kirk 1996; Mason 1997). Caldwell (1976; 1982) argues that in pretransitional societies, children are economically and socially important because economic and social wealth (in form of labour, emotional and old age social security) flows from children to parents. Over time, children provide their parents with more resources compared with what they receive from them. As a result, high fertility—subject to social sanctioning—is economically rational in these societies. Survival of generations (lineages) depends on coexistence among networks of relatives who provide economic, political and social security (Caldwell 1976).

Meanwhile, in transitional societies, parents receive fewer benefits compared with what they give up for their children. This shift is due to increased costs of children's' education and foregone income and employment (Caldwell 1976, 1982). Therefore, with reversed interfamilial flow of benefits (from parents to children); low fertility is economically rational in these societies. Westernisation augments these new reproductive behaviours by promoting family nucleation and cultural change through mass media and mass schooling. This shift means that societies do not obligate individuals to coexist within the extended family especially the broader kinship lineage and beyond (Caldwell 1982).

As van de Kaa (1996: 415) states, Caldwell's "… attempt to restate [the] demographic transition theory, can in essence be interpreted as a massive effort to anchor the whole narrative in less developed (and historical) societies…". This is because, unlike modernisation theories of fertility change, Caldwell's model describes, in detail, fertility variations in pretransition societies (Hirschman 1994). Caldwell (1976; 1982) focuses on West African pretransitional societies in the 1950s when extended family and kinship lineage norms were effective or rigid and benefited from high fertility (Kirk 1996). Intergenerational Wealth Flows theory states that modernisation is a necessary condition for fertility decline. Instead, fertility can decline through adopting Western life style. This theory has found support in fertility declines that occurred in Bangladesh and southern Africa at low levels of modernisation. The theory provides probable explanations to fertility declines in sub-Saharan Africa (Caldwell and Caldwell 1987; Caldwell, Orubuloye and Caldwell 1992; Caldwell and Caldwell 2003).

Some of its components, such as the value of children and intergenerational net wealth flows are not quantifiable (Hirschman 1994; van de Kaa 1996). Caldwell has also failed to explain why Westernised family norms appeal to individuals living in societies with low levels of modernisation (Kirk 1996). By putting so much emphasis on the social dimensions, Caldwell failed to recognise the main role played by economic features (van de Kaa 1996). Lastly, the theory has failed to explain fertility transitions in other regions (Hirschman 1994; Mason 1997).

The neoclassical demographic transition theory

This theory—attributable to Lesthaeghe, Wilson and Surkyn (van de Kaa 1996)—searches for the causes of fertility transitions in cultural and ideational features (Kirk 1996). It is a major modification of the 'economic' component of the classical demographic transition theory. Lesthaeghe (1983) argues that nuptiality and fertility transitions result from long-term shifts in the way individuals comprehend life. Over time, individuals and couples increasingly transfer decision-making on sexual matters (abortion, and voluntary fertility control) and courtship (marriage, cohabitation and divorce) from society to themselves. "The underlying dimension of this shift is the increasing centrality of individual goal attainment…" (Lesthaeghe 1983: 429). Eventually, the shift ends in individualism, self-fulfilment, wealth, secularisation, emancipation, self-reliance because of capitalism (associated with rapid economic growth and increases in real income), emergence of nuclear families and increasing maximisation of children's welfare (Lesthaeghe 1983). The shift allows for economic considerations (such as increased employment opportunities that lower economic vulnerability) when deciding on the number of children. Some individuals even opt for voluntary childlessness.

Although economically driven, "such a shift tends to be transmitted and amplified through the socialisation process" (Lesthaeghe 1983: 430). Lesthaeghe and Wilson (1986) state that, for individuals to control fertility, expected economic and social benefits should make reduced fertility seem to be rewarding. Apart from expected economic and social advantages, moral and ethical acceptability of fertility control is also a major determinant of fertility transitions. Therefore, "any sustained reduction in fertility … requires a concurrent development of moral acceptability … embedded in a much broader ideological development" (Lesthaeghe and Wilson 1986: 290, 292).

Lastly, Lesthaeghe and Surkyn (1988) provide a fertility transition framework that simultaneously evaluates prominent features of both economic and cultural models. They argue that ideational changes can influence nuptiality patterns and reproductive behaviours if they are grounded in a well-structured social, economic and political base that integrates emerging social institutions to govern courtship and sexual relations.

This generalisation is theoritically weak because it does not always provide a clear link between fertility decline and its cultural and ideational causal features (Kirk 1996). Like the classical demographic transition theory, this model only provides better explanations for societies in advanced stages of fertility transitions (Mason 1997).

Social interaction (ideational and diffusion) theories

Although social interaction frameworks are common in demographic literature, demographers identify these theories with John Cleland and Christopher Wilson (Hirschman 1994; van de Kaa 1996). Cleland (1985) as well as Cleland and Wilson (1987) argue that, despite its absence due to ignorance, there is a demand for fertility control in pretransitional societies. A transition occurs when these societies through social development pick up new ideals, knowledge, attitudes and social norms. The new norms should include the possibility and acceptance (moral and method) of fertility control. Depending on the strength of the motive, the innovations about fertility control spread quickly among individuals.

In sum, mortality decline with changes in social norms about birth control and sufficient information flow about these changes can trigger a fertility transition (Cleland and Wilson 1987). They doubt if economic shifts are necessary for a fertility transition to occur. Instead, they suggest that ideational determinants are more likely because such changes are consistent within linguistic and cultural boundaries. Information about new norms of fertility control flows rapidly among individuals belonging to homogenous populations and then other groups and regions once the new idea becomes more acceptable.

These theories have explained why similar fertility transitions occur among groups with similar ethnic and linguistic backgrounds (Hirschman 1994). Van de Kaa (1996) argues that diffusion of information plays an important role in fertility transitions and explains why uniform fertility changes occur among individuals with similar ethnic or linguistic backgrounds. According to Kirk (1996: 377), "… without the assumption of diffusion it would be difficult—if not impossible—to explain the rapidity and pervasiveness of fertility declines." Kirk and Pillet (1998) infer that rapid declines of desired family size and fertility in Kenya are due to diffusion of fertility control ideas and social interaction.

While this theory might be easy to model (Greenhalgh 1995), some relationships—especially the link between culture and diffusion—are difficult to measure empirically. Besides, Mason (1997) and van de Kaa (1996) argue that the theory is incomplete and narrow because it does not account for the role of economic development, modern contraceptive use and urbanisation. Instead, it presumes that individuals can adopt new norms and modern technology based on knowledge only (Greenhalgh 1995). In summary, the framework lacks conceptual clarity and attention probably because of the limited number of studies exploring the role of information diffusion in fertility transitions.

Institutional theories of fertility decline

McNicoll (1994) argues that fertility transitions occur when institutions change. He defines institutions as written or unwritten behavioural rules that govern human actions and relations. Societies design institutions to deal with recurrent problems and to simplify coexistence (McNicoll 1994). Individuals inherit these arrangements from their respective societies through socialisation. According to Hammel (1990), social and cultural institutions as well as ideologies that shape human behaviour in the short-term are formed and relayed by social actors in the long-term. This suggests that over time individuals may change cultural institutions that they inherit to suit current problems and challenges. However, apart from new circumstances, the adjustment depends on their history—put differently, they are path-dependent (McNicoll 1994). Therefore, any study of culture, or indeed any social and biological research, should provide for explaining what and how institutions have changed over time—that is, making history or path dependency an integral part of any institutional change analysis.

It is this framework that compels McNicoll (1980; 1994) to argue that path-dependant institutional changes condition fertility transitions since fertility is an institutional phenomenon. While it is not always simple to identify institutions (or to apportion their relative weights) underlying fertility, overall cultural and institutional arrangements condition the environment in which individuals decide on family size. As these arrangements change, individuals also alter their desired family size. In turn or simultaneously, individuals are also adjusting these arrangements (institutional change) to suit new circumstances (realities, hopes and expectations) that their local communities, national governments and the international community project.

Certain combinations of cultural and institutional arrangements allow for fast transitions to low fertility while others slow the transitions (McNicoll 1994). The rate of fertility transitions also depend on economic and social benefits of low fertility and adaptability of cultural and institutional arrangements to pressures impinging on them.

According to McNicoll (1994), the institutional change explanation of fertility decline is all encompassing because institutional changes go with economic development and improvements in channels that promote ideational determinants. The approach also accounts for both individual and group decision-making. This theory however centres on institutional determinants of fertility change that are not easily generalisable (van de Kaa 1996) or using Fricke's (1997) phrase "thick demography".

2.6.2 Strands of fertility theories that may explain fertility variations between ethnic societies in Zambia

Each fertility transition has several facets—socio-economic, socio-cultural, biological and physiological which vary with time at different levels of political and economic development as well as the stages of a fertility transition (Greenhalgh 1995). For these reasons, no single theory can offer a comprehensive explanation of fertility change. McNicoll (1980) argues that despite this seeming clear and persuasive body of theories, none of the frameworks can offer a full explanation of fertility transitions because fertility determinants are multifaceted and intertwined. Therefore, van de Kaa (1996) advises that explaining fertility behaviour should invoke all relevant components of 'subnarratives' because each framework is typically effective at different thresholds of a fertility transition.

Observed fertility differentials (Section 2.2.3) are a signal that, at any period, ethnic societies in Zambia are at different stages of fertility transitions. Therefore, to understand pretransitional and transitional fertility differentials in Zambia, the thesis invokes a combination of relevant strands of various fertility transition theories. To begin with, historical institutions of ethnic societies in Zambia and their transformation with modernisation are important ingredients of this thesis because it intends to explain both past and present ethnic fertility differentials. This means applying the approach assumed by path-dependence and institutional change framework. This 'subnarratives' assumes that pre-industrial societies use traditional arrangements to control reproduction however, with modernisation, these configurations transform.

Second, all fertility transition theories—except the classical demographic transition theory—take into account or recognise that wide fertility disparities exist between pretransitional societies. For example, Becker (1960) argues that social and economic arrangements in each traditional society influence individuals to govern reproduction unintentionally. This is usually through nuptiality as well as premarital and postpartum sex abstinence patterns. Similarly, Lesthaeghe (1983) observes that pretransitional societies control fertility in varying forms and intensities because of their different institutional and cultural arrangements. Consequently, it is these arrangements that explain the "… conspicuous variation in [natural] fertility within and among …" pretransitional societies (Schultz 1969: 153). Therefore, "… inquiry into premodern fertility should be primarily along the lines followed by … students of cultural … determinants of natural fertility" (Easterlin 1978: 132). However, not all fertility transition frameworks—except for Caldwell's framework—discuss in detail the configurations of traditional arrangements that result in pretransition fertility variations. Therefore, this research will apply the Intergenerational Wealth-flows theory to explain pretransitional fertility differentials between ethnic societies in Zambia. Caldwell (1982) argues that the economic rationality in pretransitional societies that influences social outcomes depends on how advanced their traditional economic arrangements are.

Third, to explain transitional fertility differentials, modernisation frameworks are more suitable. McNicoll (1980) observes that while modernisation frameworks cannot predict fertility variations in pretransition traditional societies, they capture notable variations in several modern societies. The classical demographic transition theory proposes that fertility declines result from socio-economic development—urbanisation and education—because it stimulates use of contraception. Therefore, the research expects that Zambian ethnic societies with educated and urbanised individuals are using contraception and experiencing relatively rapid fertility declines. It is not possible to apply prominent components of the microeconomic theories of fertility change because data are not available.

Lastly, the thesis will supplement the modernisation models with the social interaction (diffusion) framework. This explanation predicts that diffusion of innovations within cultural boundaries triggers rapid transitions. Diffusion of an innovation ascends through established communication usually arenas of common language and culture. This framework also underlines social development, such as women's education and status. Since this thesis is evaluating ethnic fertility differentials, the social interaction (diffusion) framework is appropriate for two reasons. First, beyond modernisation, the onset and pace of fertility transitions is usually along cultural boundaries (Cleland and Wilson 1987). Second, unless one assumes major diffusion of the innovation, it is difficult to explain widespread and rapid adoption of family planning within linguistic and cultural areas in which levels of modernisation differ widely (Kirk 1996). In sum, as stated by Knodel and Walle (1979: 219), "cultural setting influenced the onset and spread of fertility decline independently of socioeconomic conditions".

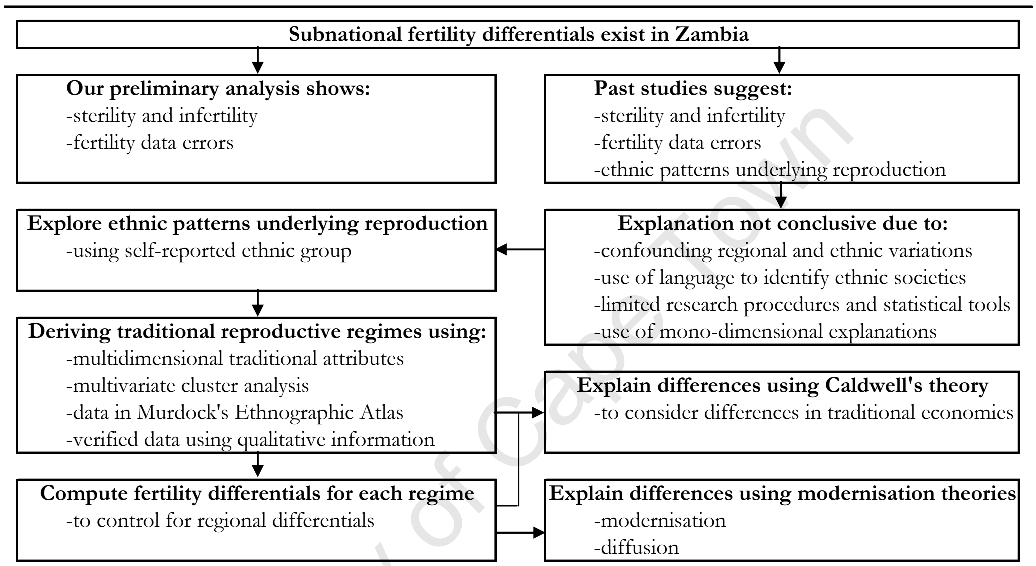
2.7 Evaluating ethnic fertility differentials in Zambia

This chapter began by reviewing the various sources of national and provincial fertility estimates on Zambia. Like most developing countries, censuses and surveys are the most prominent sources of demographic data on Zambia. Before the 1980s, several researchers outside the government analysed Zambian fertility. They, including the Central Statistical Office, point out that Zambian fertility data are marred with errors. Despite data problems, national estimates suggest that Zambian fertility was rising steadily before the 1970s—a finding that is in tandem with other sub-Saharan countries. Regional estimates show that large regional fertility differentials exist between Zambian provinces described in Section 2.1. However, both the national and regional trends are almost certainly exaggerated by high levels of pre-transitional sterility and poor data. This thesis explores the origins of regional differences in Zambian fertility.

Figure 2.7 shows a summary of how the research question links-in with the literature that traces its origin and the literature that is spelling out the procedures of resolving the question. Our preliminarily analysis (Section 2.2) and past research studies (Section 2.3) suggest that fertility data errors or sterility or infecundity or infertility underlie regional fertility differentials. In addition, other researchers have suggested that regional variations may be an expression of ethnic fertility differentials. It could be that the observed regional fertility differentials in Zambia are the long-term outcomes of ethnic reproductive behaviours. Caldwell and Caldwell (1987) as well as Lesthaeghe (1989a) have advanced this view in slightly different forms.

However, so far, studies that have discussed fertility differentials in Zambia have not provided a definite explanation. Some studies have confounded regional and ethnic fertility differentials. Meanwhile, those that have tried to study ethnic fertility variations have suffered a fundamental limitation—the integration of anthropological concepts into demographic analysis. First, they use language to identify individuals belonging to each ethnic group. Second, the studies apply limited research procedures and statistical tools to resolve such a complex problem. Lastly—probably arising from the second—they provide monodimensional explanations to a multidimensional problem.

Figure 2.7 Diagram showing the research problem, possible explanations and the proposed methodology of pursuing this question



At this point, we state our research question as “do differences in traditional governance of fertility of various ethnic groups contribute substantially to subnational fertility differentials in Zambia?” If so, “what features underlying reproduction in traditional societies account for ethnic fertility variations?” We downplay other features that may contribute to provincial fertility differentials for two reasons. First, the literature shows that sterility, infecundity or infertility only affects the western region of Zambia but provincial fertility differentials still exist outside these provinces. Therefore, this research opts to resolve the obvious and national problem rather investing into resolving a problem specific to a region. Besides, the research requires more data than are available to resolve regional differentials that are due to sterility, infecundity or infertility differentials.

Second, the research can resolve (to an extent) the problem of data error giving rise to spurious differentials while pursuing our research question by computing fertility estimates according to ethnic group and not according to region. Besides, computing fertility estimates for each ethnic group using approaches that are more robust can eliminate other data errors. Chapter 3 of this thesis details and applies these approaches nationally before applying them to Zambian 'ethnic groups' in Chapter 6.

This thesis uses 'self-reported ethnicity' to avoid some limitations associated with integrating anthropological reasoning into demographic analysis. First, 'self-reported ethnicity' does not confound regional and ethnic variations. Second, it avoids the shortfalls associated with the use of language. 'Self-reported ethnicity' suffers from shifting identity—that is, sometimes for various reasons, individuals may identify themselves with ethnic societies that are not necessarily theirs. Further, the term is a basic normative term that may not immediately provide detailed understanding of a ethnic group is show socially organised.

The work of Whiting, Murdock, Sancier and Goody informs the research of the several interlinked cultural customs and norms underlying reproduction in pretransitional societies. The broad groups of these features are economic and political organisation, community and social arrangements as well as governors of courtship and sexual relations. On face value, it appears that identifying features that explain Zambian ethnic fertility differentials may be clear and tenable. However, there are issues—such as data, measurement and procedures—that hamper the integration of anthropological features into demographic analysis. Therefore, this chapter (Sections 2.4 and 2.5) proceeded to review in detail the tools and approaches required to integrate anthropological concepts into fertility analysis.

The thesis resolves to draw on Frederic Pryor's innovative and important study of traditional economic systems in which he evaluates multidimensional groups derived from anthropological data (Pryor 2003, 2005b, 2005a). This means applying multivariate cluster analysis to several traditional attributes underlying reproduction in pretransitional societies to derive traditional reproductive regimes using data in Murdock's Ethnographic Atlas (Chapter 5). Deriving multidimensional traditional reproductive regimes evaluates simultaneously the several features that underlie reproduction in pretransitional societies. The procedure is recognising that the search for causes of fertility differentials between pretransitional societies is "dealing with a very complex and highly interrelated structure of causation …" (Kirk 1996: 386). This is because "in reality, cooperation occurs when and because different motivations reinforce each other" (Elster 1989: 131).

Further, the thesis evaluates the results derived from the Murdock's Ethnographic Atlas data by comparing them with information provided by independent sources (Chapters 4 and 5). Where possible, the present-day datasets confirm the credibility of some anthropological descriptions—for example, age at marriage, marital status and marriage arrangements (monogamy versus polygyny). This qualitative review of ethnic societies found in Zambia also simplifies the interpretation of multivariate cluster analysis results.

The thesis thereafter computes fertility estimates and trends for each regime (Chapter 6) and explains the current trends (Chapter 7). Rather than using regional fertility estimates and trends, regime based estimates are controlling for regional differentials of other features (such as data error) therefore, singling out ethnicity. The thesis applies the proposed relevant strands of fertility transition frameworks (Section 2.6) to explain pretransitional and transitional fertility differentials between traditional reproductive regimes.

3 CURRENT FERTILITY ESTIMATES AND PAST TRENDS IN ZAMBIA

3.1 Estimating fertility levels and trends

This chapter presents Zambian fertility levels and trends from 1981 to 2000 estimated from census and Demographic and Health Survey (DHS) data. The next section (3.2) describes the data sources employed to calculate fertility estimates. Section 3.3 describes the demographic and socio-economic characteristics of Zambian females of reproductive age as documented in each data source.

Section 3.4 presents the 1990 and 2000 Censuses lifetime and current fertility estimates alongside those from the 1992, 1996 and 2001-2002 DHS. Before presenting the fertility estimates, this section identifies errors in the children ever born (CEB) and children born in the last year (BLY) data from the censuses. The section also sets out and discusses corrections and adjustments made to improve the quality of fertility data. Past fertility trends for Zambia as indicated by the 1992, 1996 and 2001-2002 DHS birth histories data are in Section 3.5.

3.2 Describing the data sources

This thesis uses five data sources to estimate Zambian fertility. These are the twenty-five per cent random samples of the 1990 and 2000 Zambian Censuses obtained, with special permission, from the Central Statistical Office (CSO) in Lusaka, Zambia. Other data sources are the 1992, 1996 and the 2001-2002 Zambia Demographic and Health Surveys (ZDHS).

The census provides information on demographic and socio-economic parameters—such as size, age and sex composition—on the entire population of a defined region at a specific time (Bryan 2004). This information is useful for government planners to evaluate changes in demographic parameters from one census to another for purposes of altering incumbent development plans accordingly (Government of the Republic of Zambia 1989).

The DHSs provide detailed information on fertility, child mortality and reproductive health information of a sample of the population comprising mostly women of reproductive age (University of Zambia, Central Statistical Office [Zambia] and Macro International Inc 1993). The DHS also collects information on the demographic and socio-economic characteristics of its sample. Since DHS sampling is proportionate to size, this information should match that collected in the census for women of reproductive age and the age range of men selected for inclusion in the DHS. Unlike the census, the DHS collects full birth history data from women of reproductive age, thereby, allowing estimation of both current and (albeit increasingly censored) retrospective fertility. The following sections discuss each data sources in turn.

3.2.1 The Zambian census data

After approaching the CSO for the census data, it was established that they only had data for the second (1980) through to the fourth and most recent census (2000).[1] They provided all the 1980 Census data that they had and the 25 per cent samples drawn from the 1990 and 2000 Censuses data. The 1980 Census data are substantially incomplete—data for four of the nine Zambian provinces are missing and only some data for two other provinces are available. Efforts to trace the outstanding 1980 Census data have failed.

The CSO drew the 25 per cent samples from the household data; therefore, the samples comprise all members of every fourth household enumerated in the census. They did not provide sample weights and therefore, where necessary, results have been multiplied by four to scale the data to national levels.

3.2.1.1 The 1990 Census

Data collection for the 1990 Census lasted for two-weeks from 20th August to 5th September 1990 (Central Statistical Office [Zambia] 1995b). For remote areas, the CSO extended the enumeration period by a week. The CSO (1995b) defines the census night as the night before the day of canvassing the household. Regardless of this definition, the date the census began (20th August 1990), is the official census night for the 1990 Census (United Nations 2007).

The CSO undertook a post-enumeration survey (PES) for the 1990 Census in December 1990. The 1990 PES showed that the undercount of the national population was 5.5 per cent (Central Statistical Office [Zambia] 1995a). Central Province had the lowest undercount (3.1 per cent) while Western Province had the highest undercount (8.0 per cent). The undercount in Western Province was due in part to the inaccessibility of some areas as the terrain in this province is not suitable for road transport. The CSO (1995a) report that poor preparations also contributed to poor coverage of Western Province. Mapping and stratifying this province into Census Supervisory Areas (CSAs) and Standard Enumeration Areas (SEAs) was rushed. Distribution of the undercount by

---

[1] On their website (http://international.ipums.org/international/microdata_inventory.html), the IPUMS international project, which archives census data for a number of countries, confirm that the only the 1980, 1990 and 2000 Censuses data sets for Zambia exist.

age shows that infants and children under five (7.8 per cent), especially males, were the most inadequately captured in the 1990 Census (Central Statistical Office [Zambia] 1995a). The CSO did not provide a weighting variable to compensate for the undercounts and the information provided in the 1990 Census PES report is inadequate to calculate one.

To evaluate the quality of the 1990 Census age data, the CSO applied the Myers' blended method and the United Nations age-sex accuracy index. Hobbs (2004) describes these data evaluation methods. Myers' index varies from zero to ninety. Zero represents no digit preference while values close to zero represent less digit preference. Larger deviations from zero represent poor age reporting which suggests that the data may be highly inaccurate. There is also a need to examine the deviation from 10 per cent at each digit. In the absence of any digit preference, 10 per cent of each population will report at any digit ending 0, 1, …,9. Deviations from 10 per cent represent digit avoidance (less than 10 per cent) or digit preference (more then 10 per cent). The United Nations age-sex accuracy index is the mean of the absolute differences from age to age in reported sex ratios. The data are accurate if the index is less than 20, inaccurate if the index is between 20 and 40 and highly inaccurate if it is over 40.

The CSO obtained Myers' indices of 6.8 for males and 7.0 for females (Central Statistical Office [Zambia] 1995b). The most preferred digits in the 1990 Census were zero, two and eight. They also computed a United Nations age-sex accuracy index of 27.8, which classifies the reliability of the 1990 Census data as inaccurate (Central Statistical Office [Zambia] 1995b). Reanalysis of the 1990 data presented by the CSO in the 2000 Census report suggest Myers' indices for the 1990 Census data of 6.9 for males and 7.1 for females and a United Nations age-sex accuracy index of 31.7 (Central Statistical Office [Zambia] 2003b). They do not present a reason for the inconsistency between the measures.

The same techniques are used to evaluate the 25 per cent sample of the 1990 Census made available by the CSO. The indices obtained are 6.7 for males and 6.9 for females. The most preferred digits were zero and eight (the deviations from 10 per cent are 2.7 and 1.9, respectively). The estimated United Nations age-sex accuracy index (32.8) also suggests that the 25 per cent sample of 1990 Census data are inaccurate. All these indices (in both the 1990 and 2000 Census reports) are slightly different from those obtained by the CSO from the 1990 Census data—suggesting that the 25 per cent sample does not capture the 1990 Zambian population perfectly. Therefore, this and other problems discussed above are a signal that unless suitable methods of correcting and adjusting data are applied, fertility estimates derived from these data are likely to be inaccurate.

3.2.1.2 The 2000 Census

The 2000 Census fieldwork lasted a month from 16th October to 15th November 2000. The official census night is 25th October 2000 (United Nations 2007) which is different from that—16th October 2000—reported by the CSO (2003b). Efforts to get a reason for this revision (trivial as it is) from the Zambian CSO have failed. Unlike previous censuses—in which part-time personnel regardless of affiliation were employed—the CSO hired high school pupils (Grade 11s, roughly 18 years old) as enumerators and schoolteachers as enumeration supervisors. The objective of this arrangement was to lessen insubordination during fieldwork (Central Statistical Office [Zambia] 2003b). There is no report evaluating the outcome of this strategy. The CSO undertook a post-enumeration survey (PES) for the 2000 Census in February 2001 (Diangamo and Dzekedzeke 2001; Central Statistical Office [Zambia] 2003b). However, they have not published the report.

The CSO (2003b) evaluated the quality of the 2000 Census age data. They state that Myers' index for both males and females was 7.3. The most preferred digits were zero and eight for both males and females as well as five for males. They report a United Nations age-sex accuracy index of 28.7, which classifies the reliability of the 2000 Census data as inaccurate.

The 25 per cent sample of the 2000 Census made available by the CSO was assessed using the same metrics. The results are slightly different. The Myers' indices obtained are 7.1 (males) and 7.0 (females). The most preferred digits are zero and eight (deviations from 10 per cent are 3.1 and 1.9, respectively). A United Nations age-sex accuracy index obtained was 27.1—also suggesting that these data are inaccurate. This also suggests that the 25 per cent sample does not truly reflect the 2000 Zambian population.

Unlike the 1990 Census, the CSO subjected the 2000 Census data to editing. It has not been possible to gain access to the editing manuals or algorithms employed by the CSO to edit these data. Therefore, it is impossible to know the extent of errors in the data collected or the nature of corrections applied.

3.2.2 The Zambian DHSs

Three DHSs have been undertaken in Zambia; in 1992, 1996 and 2001-2002. In 1992, the University of Zambia and Central Statistical Office conducted the 1992 DHS with help from Macro International. The Central Statistical Office and Ministry of Health (Zambia) conducted the 1996 DHS with help from Macro International as well. The Central Statistical Office and the Central Board of Health (Zambia) conducted the 2001-2002 DHS with support from ORC Macro.

The fieldwork for the 1992 DHS was carried out from 18th January to 15th May 1992 (almost 4 months) while that for the 1996 DHS was conducted for almost five months (15th July 1996 to 6th January 1997). The 2001-02 DHS lasted even longer—about seven months from November 2001[2]. The mean survey dates are respectively 8th March 1992, 5th October 1996 and 23rd February 2002 (University of Zambia, Central Statistical Office [Zambia] and Macro International Inc 1993; Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 1997, 2003).

The 1992 and 1996 Zambia DHS employed a three-stage sample selection based on the 1990 Census Supervisory Areas (CSAs) and Standard Enumeration Areas (SEAs) stratified into urban and rural residence (University of Zambia, Central Statistical Office [Zambia] and Macro International Inc 1993; Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 1997). The 2001-02 DHS employed a similar sampling strategy but used the 2000 Census data (Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 2003). In all three DHSs, provinces with smaller population sizes were over-sampled to get a minimum number of individuals deemed necessary to estimate regional parameters. As a result, the Zambia DHS samples are not self-weighting at national level. Sample weights that the DHS provide with the data make the sampled population representative of that on which the sample frame was based.

3.3 Comparing census and DHS data sources

This section describes the female population aged 15-49 according to demographic and socio-economic attributes recorded by Zambian censuses and DHS data sources. Obvious differences between the data sources and their implications on fertility estimates are discussed.

Coverage of the DHS targets the *de facto* population of eligible women and men, thereby avoiding missing, incomplete and incorrect information from household

---

[2] The 2001-2002 DHS report does not provide the exact dates for this survey's fieldwork.

members who are absent during enumeration (Rutstein and Rojas 2003). Therefore, the descriptions and estimations in this and the next sections describe the *de facto* populations for both the census and the DHS samples.

Table 3.1 presents distributions of Zambian women aged 15-49 according to demographic and socio-economic characteristics. The following sections discuss these characteristics.

Table 3.1 Demographic and socio-economic characteristics of Zambian women aged 15-49: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

	CEN 1990		CEN 2000		DHS 1992			DHS 1996			DHS 2001-2		
					Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.
	Per cent	Number	Per cent	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number
Age													
15-19	27.5	121,297	25.3	139,550	28.1	1,984	1,964	25.0	2,003	1,982	23.7	1,811	1,806
20-24	21.5	95,048	22.2	122,459	20.4	1,441	1,435	22.8	1,830	1,823	21.7	1,664	1,648
25-29	16.0	70,886	17.2	94,944	16.7	1,179	1,178	16.0	1,286	1,280	18.0	1,376	1,361
30-34	12.4	54,786	12.4	68,707	13.0	915	922	13.5	1,081	1,083	12.7	972	972
35-39	8.5	37,515	9.9	54,755	9.3	656	660	9.5	758	768	10.0	766	778
40-44	7.9	34,685	7.5	41,345	7.2	505	511	7.1	568	569	7.9	601	606
45-49	6.2	27,334	5.6	30,726	5.4	380	390	6.2	494	516	6.1	467	487
Not stated	0.0	161	0.0	0	0.0	0.0	0	0.0	0.0	0	0.0	0.0	0
Average age		27.6		27.7			27.4			27.8			28.1
Residence													
Urban	41.1	181,546	37.7	208,484	51.5	3,636	3,358	44.9	3,604	3,001	40.1	3,073	2,551
Rural	58.9	260,166	60.6	334,883	48.5	3,424	3,702	55.1	4,417	5,020	59.9	4,585	5,107
Not stated	0.0	0	1.7	9,119	0.0	0	0	0.0	0	0	0.0	0	0
Province													
Central	9.7	42,677	9.9	54,694	8.8	622	565	8.1	653	748	7.3	562	891
Copperbelt	19.7	87,030	17.1	94,493	24.7	1,743	1,606	19.8	1,588	1,129	20.2	1,544	939
Eastern	12.7	56,129	12.4	68,689	10.3	729	658	13.4	1,075	1,118	12.1	926	894
Luapula	7.2	31,945	7.7	42,728	6.1	431	589	9.0	726	896	8.1	622	626
Lusaka	14.0	61,695	15.6	86,398	17.5	1,234	1,137	17.5	1,403	1,074	14.8	1,132	896
Northern	11.3	49,916	12.1	67,020	9.2	652	590	10.9	872	783	13.6	1,040	1,171
NWestern	5.2	22,759	5.6	30,774	2.6	183	387	3.6	288	567	4.6	354	881
Southern	11.9	52,481	11.7	64,859	14.8	1,045	947	10.2	816	846	10.6	814	707
Western	8.4	37,080	7.8	42,831	6.0	422	581	7.5	600	860	8.7	663	653
Education													
None	34.8	153,650	26.6	147,230	16.4	1,161	1,212	13.3	1,067	1,168	12.1	925	1,002
Primary	44.6	196,946	43.6	241,060	59.7	4,213	4,246	58.9	4,721	4,833	58.0	4,439	4,534
Secondary+	19.2	85,023	28.8	159,110	23.9	1,685	1,601	27.8	2,232	2,019	30.0	2,295	2,122
Not stated	1.4	6,093	0.9	5,086	0.0	1	1	0.0	1	1	0.0	0	0
Marital status													
Married	57.8	255,293	59.6	329,275	63.1	4,457	4,467	61.1	4,902	4,949	61.3	4,694	4,731
Marriage disrupted	9.2	40,813	12.3	68,119	11.5	811	828	13.5	1,086	1,084	13.9	1,067	1,076
Never Married	30.5	134,574	28.1	155,092	25.4	1,791	1,765	25.3	2,032	1,986	24.8	1,897	1,851
Not stated	2.5	11,032	0.0	0	0.0	0	0	0.0	2	2	0.0	0	0
Total	100.0	441,712	100.0	552,486	100.0	7,060	7,060	100.0	8,021	8,021	100.0	7,658	7,658

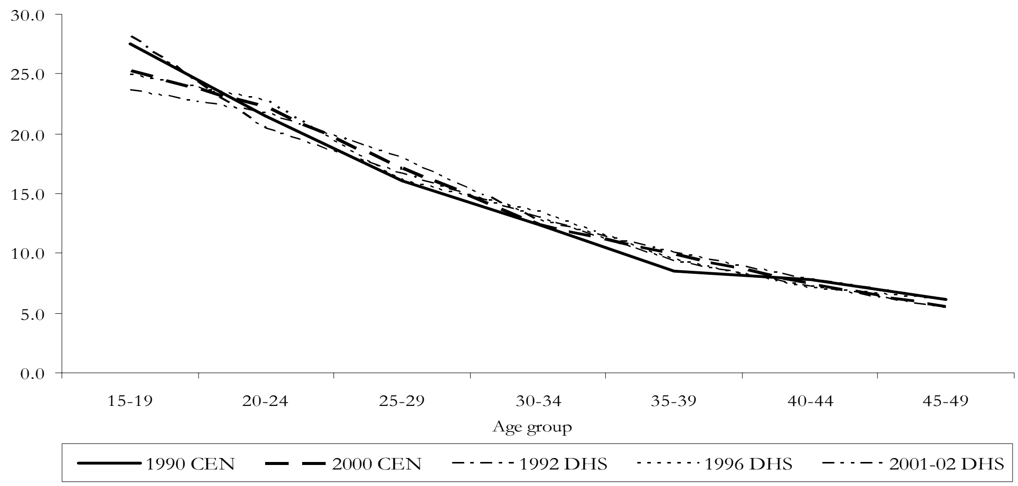
Source: 1990 and 2000 Census reports; 1992, 1996 and 2001-02 DHS.
Note: 1990 and 2000 Census figures are unweighted.

3.3.1 Age distribution

On average, the 1992 DHS describes a population that is slightly younger (by 0.2 of a year) than the 1990 Census. Meanwhile, the 2001-02 DHS describes a population that is slightly older (by 0.3 of a year) compared with the 2000 Census.

Figure 3.1 shows the age distributions of Zambian women aged 15-49. The age distributions show that the 1990 Census has an unexpected smaller proportion in the age group 35-39 countered by a larger one in the age group 45-49. The 1996 DHS failed to capture 15-19 year old women proportionate to the 1990 Census (which formed the sampling frame). Overall, the age reporting errors are not that severe to affect Zambian fertility estimates.

Figure 3.1 Age distribution of Zambian women aged 15-49: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS



3.3.2 Classification and province of residence

Distributions of residential classification suggest that the proportion of the population that is urban has been declining. This would appear to have occurred in two waves. The CSO (2003a) attribute the first—in the mid 1970s—to declining employment opportunities in urban areas especially mining towns after the prices of copper (its main export) fell on the world market. Similarly, they attribute the second (post 1990) to economic recession that resulted in closure of prominent industries and unemployment in urban areas. Comparatively, the DHS describes a more urbanised population than the census. The disparity is larger (10 percentage points) between the 1990 Census and the 1992 DHS in comparison to the difference between the 2000 Census and 2001-02 DHS. This is probably due to sampling bias in the 1992 DHS or an undercount in the 1990 Census.

Overall, most women live in the most urbanised provinces, namely Copperbelt and Lusaka. North-western, a rural province, had the least proportions in all the data sources. However, the DHS—especially the 1992 DHS—found larger proportions of women in the most urbanised provinces (including the Southern Province).

These urban/rural differentials have implications on fertility estimates. All else constant, fertility estimates derived from data describing a population that is more urban than actually exists, may be biased downwards (Potts 2005). Moultrie and Timæus (2002) make a similar suggestion when they compare the 1996 South African Census to the 1998 South African DHS. This is because, as stated in Chapter 2, urban women tend to have lower fertility relative to their rural counterparts due to higher ages at first birth and use of effective contraception. Therefore, it is possible that fertility estimates derived from the Zambian DHS data will be lower than those computed from census data.

3.3.3 Female education in Zambia

Table 3.1 shows that between 1990 and 2000 the proportion of women aged 15-49 without an education reduced by almost 8 percentage points in the census data sources and 4 percentage points in the DHS. However, the proportion of women with more than primary school education increased by 10 (census) and 6 per cent (DHS).

Though the rate of increment is lower in the DHS compared with the census, the former data source describes a more educated population. Therefore, fertility estimates derived from Zambian DHS data will, *ceteris paribus*, be lower than those derived from the census. This is because there is an inverse relation between educational attainment and fertility (Lloyd, Kaufman and Hewett 2000; Basu 2002).

3.3.4 Current marital status of Zambian woman

Both the DHS and the census asked respondents to state their marital status at enumeration. This study, regards cohabiting and married women as equivalents since cohabiting women (especially those with children from such arrangements) report themselves as married (Central Statistical Office [Zambia] 1995b).

Table 3.1 shows that as expected compared with the census, the DHS—especially the 1992 DHS—found larger proportions of cohabiting and married women. For the census, the proportion of married women appears to have increased between 1990 and 2000. However, this could be because the 1990 Census did not provide separate categorisation for cohabiting individuals. For the DHS, the proportion of married and cohabiting women, as expected, had reduced because of an increase in marital disruptions (separation, divorce and widowhood). Studies on marital disruptions, elsewhere, suggest that separations and divorces increase with increasing education and labour force participation among women (Martin and Bumpass 1989). This trade-off explains why, regardless of declines in the proportions of married women, the 'never married' category has remained more or less constant.

3.3.5 Comparability of the census and DHS data sources

Overall, fertility estimates derived from the 1990 and 2000 Censuses should be comparable with those derived from 1992 and 2001-02 DHSs respectively. First, fertility estimates derived from the 1990/2000 Census and the 1992/2001-02 DHS refer to roughly the same reference period. The reference dates for fertility estimates derived from the 1990 and 2000 Censuses are, on average, six months before enumeration—that is, in February 1990 and April 2000 respectively. The reference dates for the DHS estimates are 18 months before the survey since they are based on births reported in the three years before the survey. Using the mean survey date as the enumeration date, the reference dates for the three DHSs are September 1990 (1992 DHS), April 1995 (1996 DHS) and August 2000 (2001-02 DHS).

Second, differences in data quality and sampling errors may balance out the disparities of the census and the DHS estimates. Preparations and implementation of the DHSs are superior to the census and usually result in more complete and correct data (Cleland 1996). The team of fieldworkers in the DHS is smaller. This provides for intensive training and easy supervision during data collection. The sex of fieldworkers used to canvass is the same as respondents. The Zambian DHSs use female nurses to interview women. Therefore, female respondents may be more comfortable discussing sex and reproductive health issues (Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro 2003). The DHS does not use proxy respondents. Lastly, the DHS collect detailed data, for example, birth histories. They use these data to check and correct for internal consistency (Rutstein and Rojas 2003; Pullum 2004). However, Demographic and Health Surveys are prone to sampling errors and sometimes the small sample size limits the extent to which the data can provide subnational demographic estimates.

3.4 Estimating Zambian lifetime and current fertility

This section aims to produce reliable and verifiable Zambian lifetime and current fertility estimates from census data. To do so requires that we identify and correct errors in the lifetime and current fertility data before applying fertility estimation techniques. The section, then, compares derived fertility estimates with the official census estimates and those from the DHS data.

3.4.1 Lifetime fertility

Enumerators collect data on lifetime fertility (parity, or children ever born) by asking women (older than 12 years in the census and between 15 to 49 years in the DHS) about the number of live births they have had. Examination of the 1990 Census parity data reveals notable errors. These include a significant proportion of women without stated parity and those stating implausible numbers of children ever borne. The extent of parity data problems in the 2000 Census cannot be evaluated because of prior editing of fertility data by the CSO.

3.4.1.1 Data on children ever born in the 1990 Census: problems and corrections

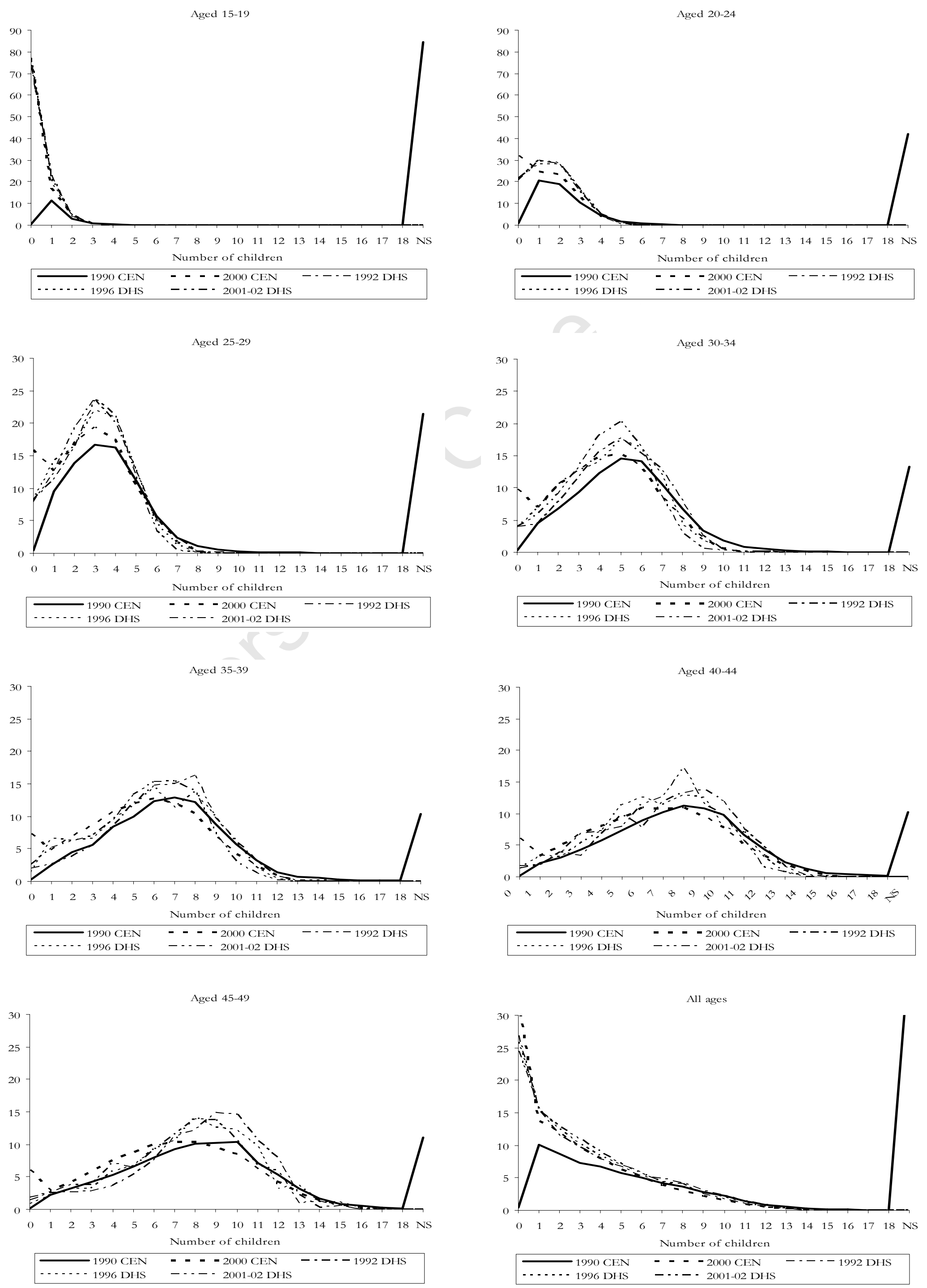
Errors in parity data arise from failure to correctly report or record information during enumeration or capturing of data. A large proportion (about 40 per cent) of women without stated parity and those with implausible figures of parity typify lifetime fertility data that has errors. Uncorrected, this distorts the proportions of childless and low parity women. The proportion of women with "parity not stated" increases when women who report implausible numbers of parity are classified as "parity not stated".

Figure 3.2 shows the distributions of women aged 15-49 (by age group) according to the number of children they are reported to have had. For the 1990 Census, more than 80 per cent of women aged 15-19, and 42 per cent of those aged 20-24, are in the "parity not stated" category. The proportion of this category reduces with age to about 10 per cent for women aged 45-49. Because of this skewed distribution of women with not stated parity, low proportions of women report that they have no children or have only one child especially for the first four age groups (15-34).

A three-stage consistency data recoding corrects for the problem of misreporting, misrecording and misentry. The first stage involves assessing the responses to the question that requires respondents to state whether they have had a live birth in their lifetime. All women in the 1990 Census subsample (women aged 15-49) are eligible to answer the question—the response is either 'yes' or 'no'. Therefore, the expected entries for this variable in the data set are either '1' or '2' to represent 'yes' and 'no' respectively. Any other entry is coded as '9' to represent missing information.

Women who report having had a live birth had to state the number of their children by sex: who were living with them, living elsewhere, or dead. Logically, women who had never experienced a live birth were not eligible to respond to these questions. Therefore, an algorithm was configured and applied to code '0' for entries to the six follow-up questions for all women who had never experienced a live birth. This correction increases the proportion of childless women from less than one per cent in all age groups to about 65 per cent (15-19) and 32 per cent (20-24). The effect of this correction decreases with age to about 7 per cent in the oldest age group (45-49). This is expected because younger women are more likely to be childless.

Figure 3.2 Distribution of women aged 15-49 according to parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS



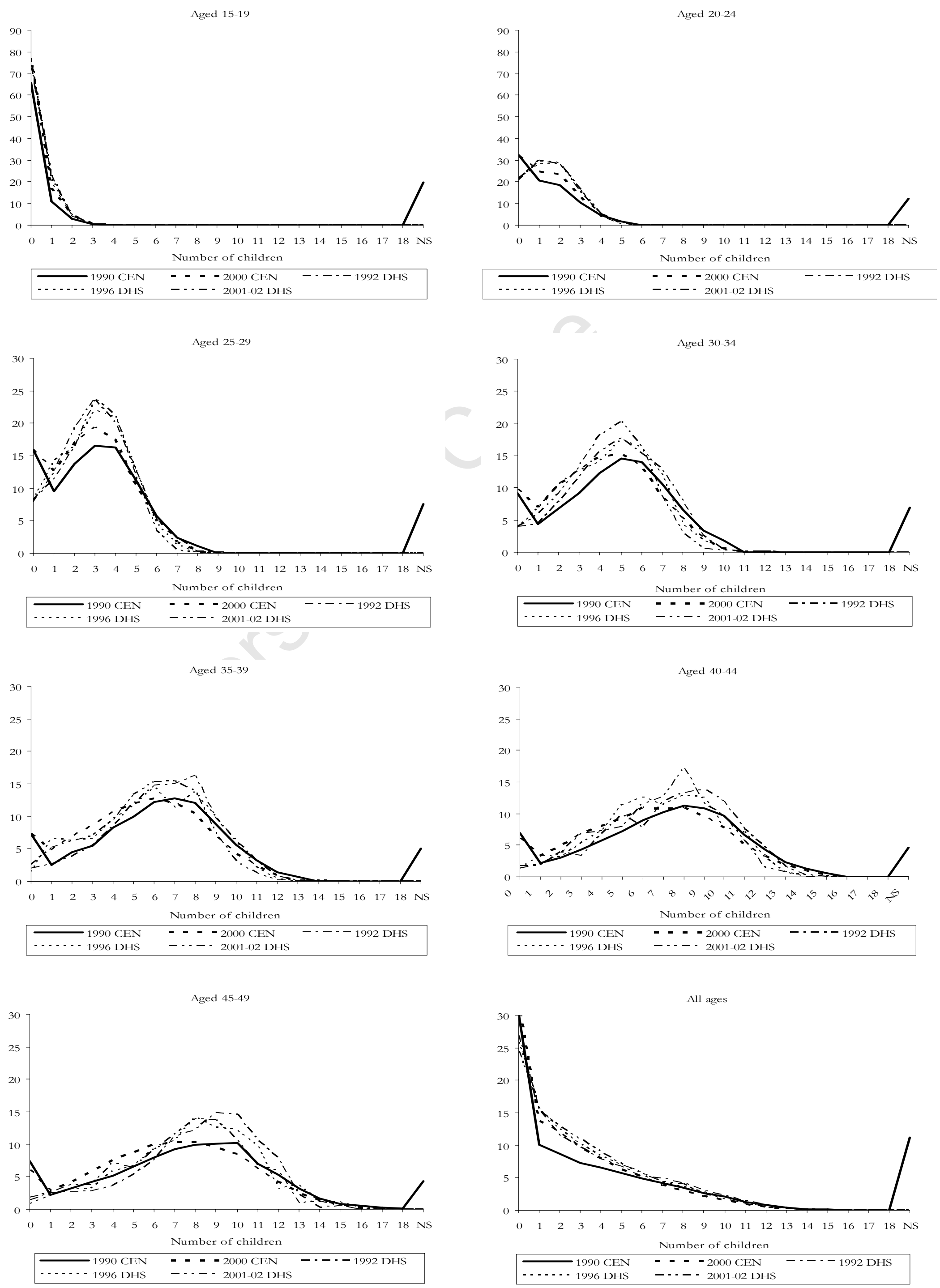
The last stage of parity data logical recoding is applied after summing the six questions to get the total number of children ever born to each woman. This stage involves deciding the total number of children a woman can possibly have at a certain age in her life. Since the age at menarche is typically less than 15 years in developing countries (Becker 1993), it is possible for a 15-year-old woman to have had at least one child (Riley, Samuelson and Huffman 1993). Apart from behavioural patterns, biological features define the minimum interval from one birth to another. These include the nine months of gestation, postpartum infecundability, intrauterine mortality, as well as waiting time and sterility (Bongaarts 1993). Considering delays due to behavioural expectations as well, a woman can have a birth at least once every two years. Therefore, after commencing childbearing at age 15, a woman can have up to eighteen children by age 49. This is in line with Bongaarts' (1978) suggestion that on average a woman can have a little over seventeen births. This information is used to set up and apply an algorithm such that a woman of a given age who reports having children more than the determined upper limit has her record coded as parity not stated.

Figure 3.3 presents the corrected distributions of women aged 15-49 (by age group) according to reported parity. Recoding the 1990 Census parity data, as discussed above, reduces the number of women with not stated parity by more than half. Meanwhile, it increases the proportions of childless women for all age groups. The resulting 1990 Census parity distribution by age is close to the 2000 Census parity distribution. However, the distributions derived from census data are not similar to those derived from the DHS data sets. Further, the distribution derived from the 1990 Census data—from '0' to '6'—is still lower than that derived from the 2000 Census because women with not stated parity still exist in the 1990 Census. Appendix 3.1.a shows that removing women with not stated parity results in similar distributions of parous women for both censuses.

The differences between the census and DHS parity distributions arise because the censuses found more childless women—approximately 15 per cent for the 25-29 age groups, 10 per cent for the 30-34 age group and less than 10 per cent for each of the remaining age groups. This is why Appendix 3.1.a shows that removing childless women results in similar distributions of parous women for all data sources.

Some women with not stated parity in the 1990 Census may be childless. Misclassification of childless women as women with 'not stated' parity arises from misrecording parity data—that is, leaving a blank or occasionally a dash to represent childless women (El-Badry 1961; Feeney 1998). Data entry personnel capture this information as 'not stated'. Further (but of lesser importance), during logical recoding, some childless women with implausible reports of children ever born were recoded as women with 'not stated'.

Figure 3.3 Corrected distribution of women aged 15-49 according to parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

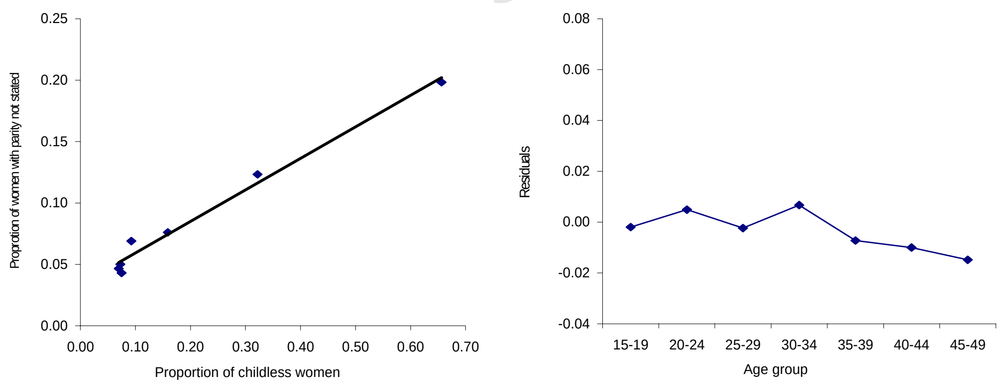


The El-Badry correction is a statistical method for apportioning women whose parity is not stated between childless women and those whose parity is 'truly' not stated (El-Badry 1961). The method assumes a linear relationship between the proportions of childless women and those with parity 'not stated'. Therefore, results from an El-Badry (1961) procedure are acceptable if the residuals of the fitted equations by age group are close to zero for all age groups of women of reproductive age (Feeney 1998).

Figure 3.4 shows the plots of residuals before (for women aged 15-49) and after (for women aged 15-39) fitting the El-Badry correction procedure to the 1990 Census parity data. A linear relationship exists between the proportion of childless women and those with not stated parity. The residuals of the fitted equations for all age groups are also close to zero. Therefore, the results from the El-Badry procedure are acceptable.

Figure 3.4 Linear relationships between the proportion of women with unstated parity and those childless as well as plots of residuals for fitted equations by age group: Zambia 1990 Census

Before fitting the El-Badry correction procedure (ages 15-49)



After fitting the El-Badry correction procedure (ages 15-39)

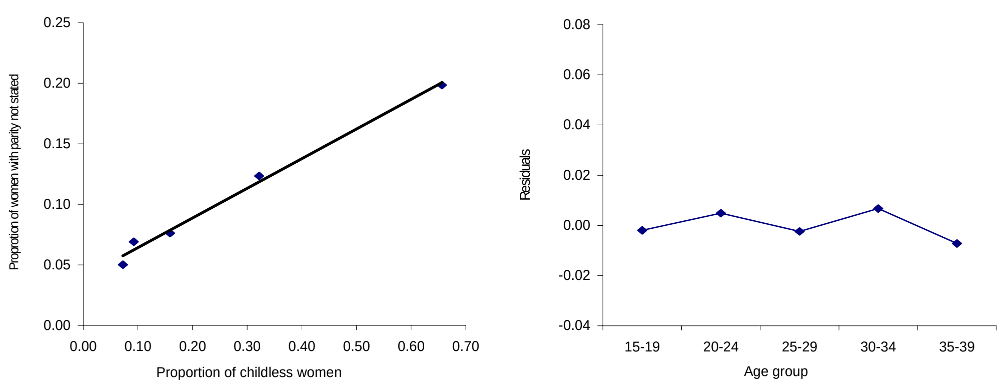


Table 3.2 shows the number of childless women before and after the El-Badry correction, by age group, in the 1990 Zambian Census. On average the estimated number of childless women increases by 7.3 percentage points after applying the El-Badry correction. As expected, the increase is largest among the youngest women and decreases with increasing age.

Table 3.2 Summary statistics showing the age distribution of women before and after applying the El-Badry correction: Zambia 1990 Census

Age Group	Women reported All	childless Number	childless Per cent	parity not stated Number	parity not stated Per cent	Estimated true childless women Number	Estimated true childless women Per cent
15-19	121,325	79,612	65.6	24,070	19.8	98,877	81.5
20-24	95,084	30,596	32.2	11,728	12.3	38,558	40.6
25-29	70,913	11,269	15.9	5,401	7.6	13,862	19.5
30-34	54,816	5,074	9.3	3,781	6.9	6,684	12.2
35-39	37,526	2,727	7.3	1,882	5.0	3,123	8.3
40-44	34,699	2,413	7.0	1,618	4.7	2,657	7.7
45-49	27,349	2,049	7.5	1,179	4.3	2,145	7.8
Total	441,712	133,740	30.3	49,659	11.2	165,905	37.6

Table 3.3 presents the mean lifetime fertility estimates derived from the 1990 Census before and after applying corrections. After evaluating and correcting the 1990 Census children ever born data, the next section presents parity estimates for Zambia from 1990 to 2002 derived from all data sources.

Table 3.3 Parity by age group before and after applying corrections: Zambia 1990 Census

Age Group	Census 1990 with No Correction	Census 1990 with Consistency Recoding	Census 1990 with El-Badry Correction
15-19	0.2	0.2	0.2
20-24	1.3	1.3	1.2
25-29	2.8	2.9	2.8
30-34	4.6	4.6	4.5
35-39	5.9	6.0	5.9
40-44	6.8	7.0	7.0
45-49	7.0	7.3	7.3

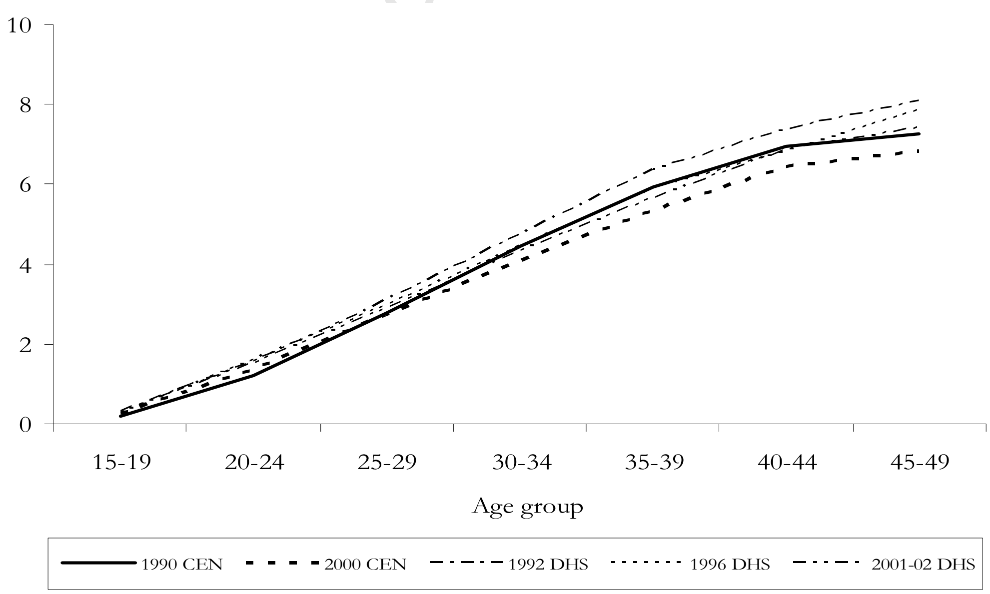
3.4.1.2 Lifetime fertility estimates: 1990 to 2002

Table 3.4 and Figure 3.5 present the mean lifetime fertility estimates derived from the two censuses and the three DHSs. The censuses suggest that lifetime fertility in Zambia was about seven children per women during the 1990s through to the early 2000s. In ten years, lifetime fertility among women aged 45-49 years reduced by 0.4 of a child—that is, from 7.3 (1990 Census) to 6.9 (2000 Census) children per women. The DHS data yields higher parity estimates. In 1992, lifetime fertility was about eight children per women and reduced by 0.7 of a child in ten years to 7.4 children per woman in the 2001-02 DHS. The difference between the censuses and the DHS (Figure 3.5) indicates child omission in the censuses or the DHS finding more parous women as discussed in Section 3.3—but most probably the former.

Table 3.4 Mean parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Age Group	Census 1990	DHS 1992	DHS 1996	Census 2000	DHS 2001-01
15-19	0.2	0.3	0.3	0.3	0.3
20-24	1.2	1.6	1.6	1.4	1.5
25-29	2.8	3.1	3.0	2.7	2.9
30-34	4.5	4.8	4.5	4.1	4.3
35-39	5.9	6.4	5.9	5.4	5.7
40-44	7.0	7.4	6.9	6.4	6.9
45-49	7.3	8.1	7.8	6.9	7.4

Figure 3.5 Mean parity by age group: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS



Lastly, the computed 1990 Census parities presented in Table 3.4 are slightly different from those obtained by the CSO (1995b). Their completed family size for women aged 45-49 years in 1990 is 7.1 children. Their estimates by age are also slightly different with those presented in Table 3.4. This suggests that the CSO did not probably correct the 1990 Census parity data.

3.4.2 Current fertility

Without full maternity or pregnancy histories such as those collected in the DHS, there are two main ways of collecting data on current fertility in censuses. The first requires women of reproductive age to state the date of their last live birth. If the birth date falls within one year (or some other desired interval) before the data collection exercise, it qualifies for inclusion in current fertility calculations. The second involves asking women the number of children born in the last year or in the last twelve months before the enumeration. Either of the two questions can capture current fertility data. In Zambia, both the 1990 and 2000 Censuses used the second question.

The next subsection discusses the problems of and corrections to census current fertility data. It also presents observed current fertility estimates derived from the 1990 and 2000 Censuses data. Section 3.4.2.2 discusses and applies adjustment techniques to observed fertility estimates. Section 3.4.2.3 presents and compares current fertility estimates derived from all data sources.

3.4.2.1 Data on children born in the last year: problems and corrections

Examination of the 1990 and 2000 Censuses data on current fertility reveals four notable problems. The first two apply to the 1990 Census data only, as the 2000 Census fertility data had already been edited by the Zambian CSO. The last two problems apply to both censuses.

The first problem, applicable to the 1990 Census only, relates to errors and inconsistency of responses in the data arising from the failure to report or record the correct information during enumeration. Recoding the data using logical rules attends to this problem. First, if a woman of reproductive age has never had a live birth then it follows that she cannot have had a birth in the twelve months before enumeration. Therefore, such women should have 'zero' entries to indicate no birth and not any other response such as 'not applicable' or 'not stated'. From this information, an algorithm is set up and applied to recode all entries to zero for all women who report that they have never had a live birth and those that never experienced a birth in the twelve months before the census enumeration. A second logical rule involves recoding entries with all births during the twelve months before enumeration that exceed the total number of children ever born to 'not stated'.

The second problem (also only applicable to the 1990 Census data) is missing current fertility information. Slightly more than half (54 per cent)[3] of current fertility data are not stated. When tabulated by age, missing current fertility information increases consistently with age from 27 per cent among the youngest age group (15-19) to 88 per cent among the oldest age group (45-49). This suggests that enumerators may have recorded women reporting 'no birth' during the last twelve months as women with missing current fertility information. Alternatively, enumerators may not have asked fertility questions to older women for fear of impugning their dignity.

The problem of missing or not stated current fertility data is resolved in two-stages. First, although the El-Badry method corrects for childless women misclassified as women with not stated parity, the method can also partially correct for missing or not stated current fertility. Some women may be misclassified as women with missing current fertility and yet they did not have a birth during the year before enumeration. Applying this correction (as discussed in Section 3.4.1.1) reduces the proportion of women with not stated current fertility by 8 per cent. The correction is heavily weighted towards older women—that is 87 percentage points among the oldest age group (45-49) but only 10 percentage points among the youngest age group (15-19).

Second, the table in Appendix 3.2.a shows the 1990 Census children born last year by children ever born according to age group. The table shows the equivalent distributions for the 1992 DHS and the 2000 Census. Comparisons with distributions that have no missing current fertility data (1992 DHS and the 2000 Census) shows that, at each parity, the proportions of missing current fertility in the 1990 Census is large and increases with age.

Since not stated current fertility in the 1990 Census is so heavily skewed towards older women, the strong assumption made is that all women with not stated current fertility had no birth in the year before enumeration. The table in Appendix 3.2.b presents distributions of children born last year by children ever born for each age group derived from the 1990 Census—after recoding 'not stated' current fertility records as 'zero' births. For comparison, Appendix 3.2.b presents similar distributions derived from current fertility data collected in the 2000 Census and the 1992 DHS. The proportional distributions, by age, obtained after recoding not stated current fertility as

[3] This indicates fundamental and serious flaws in these data and any results derived from these data should be treated with extreme caution.

zero births supports the assumption made[4]. The proportion of women in each age group who report a birth in the year before the 1990 enumeration is now similar to the 2000 Census. However, relative to the 1992 DHS, the proportions at each parity are smaller for both the 1990 and 2000 Censuses most likely because of the remaining problem of under-reporting of births in censuses (United Nations 1983a). Table 3.5 shows the number of women with known current fertility before and after correcting for missing current fertility data.

Table 3.5 Summary statistics showing the distribution of women with known current fertility before and after correcting for not stated BLTM/BLY data: Zambia 1990 Census

Age Group	Total Women	Women with known fertility					
		After consistency recodes		After El-Badry corrections		After recoding BLY	
		Number	Per cent	Number	Per cent	Number	Per cent
15-19	121,325	89,034	73.4	108,672	89.6	121,055	99.8
20-24	95,084	51,101	53.7	59,714	62.8	93,861	98.7
25-29	70,913	28,138	39.7	31,013	43.7	69,690	98.3
30-34	54,816	17,067	31.1	18,837	34.4	53,878	98.3
35-39	37,526	9,299	24.8	9,783	26.1	36,971	98.5
40-44	34,699	5,885	17.0	6,191	17.8	34,418	99.2
45-49	27,349	3,256	11.9	3,398	12.4	27,255	99.7
Total	441,712	203,780	46.1	237,607	53.8	437,128	99.0

Using the results from the El-Badry correction increases the proportion of women with known current fertility by 7.7 percentage points. As expected, the El-Badry correction is effective at the younger age groups. Recoding not stated current fertility as zero births increases the proportion of women with known current fertility by 45.2 per cent points. Unlike the El-Badry approach, this correction is most effective at older age groups.

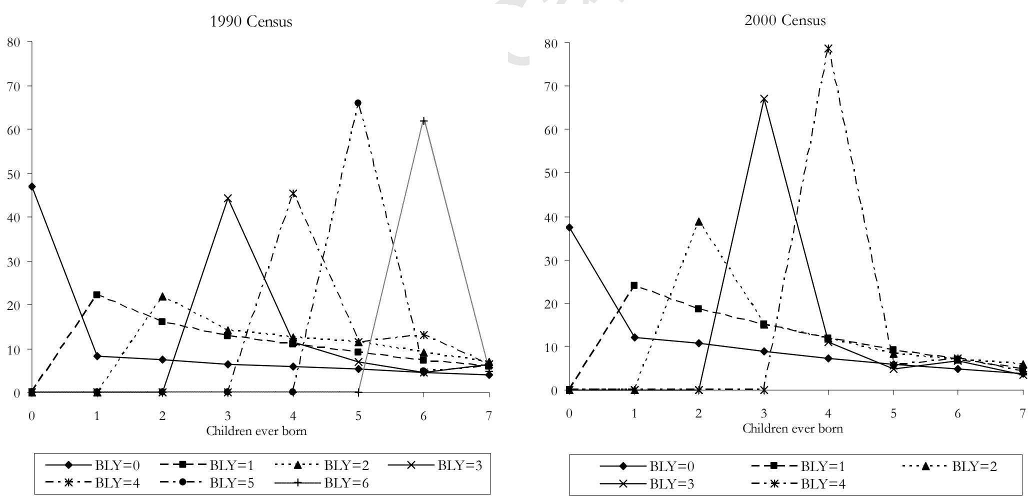
The third problem observed in the data relates to attribution of biologically implausible numbers of births within last year before enumeration. The table in Appendix 3.3.a presents the distribution of women's current fertility reports by parity. Compared with the DHS, larger proportions of women in both the 1990 and 2000 Censuses report having had up to six births within the twelve-month period before enumeration. This is a reporting, recording, or capturing error. First, it is not likely that a woman will have more than one confinement within any twelve-month period. Second, while it is possible that a woman can bear more than one child from a single confinement, this is rare. The DHS data show that not more than 2 per cent of confinements in Zambia result in more than one child. Multiple births are universally

[4] The age specific and total fertility estimates presented later after applying all corrections provide further support for this assumption.

rare: Hoem and Strandberg (2004: 422), for example, report that "… for Swedish women between the 1960s and 1990s…only about one per cent of births resulted in twins".

Women attributed with biologically implausible numbers of births within a year result from two possible reasons. First, women may have confused the questions on current fertility with those on lifetime fertility. As a result, women (especially older women) report the number of children they have had in their lifetime as the number of births they had in the twelve months before census enumeration. Therefore, for any parity, the proportion of women reporting a given number of births last year also peaks at that particular parity—as shown in Appendix 3.3.a. For example, the proportion of women reporting that they had three children last year is highest at parity three in both the 1990 and 2000 Censuses. Figure 3.6 illustrates the '*diagonal*' outcome resulting from confusing current fertility questions for lifetime fertility questions.

Figure 3.6 Per cent distribution of women reporting the number of births in the twelve months before enumeration by parity: Zambia 1990 and 2000 Censuses

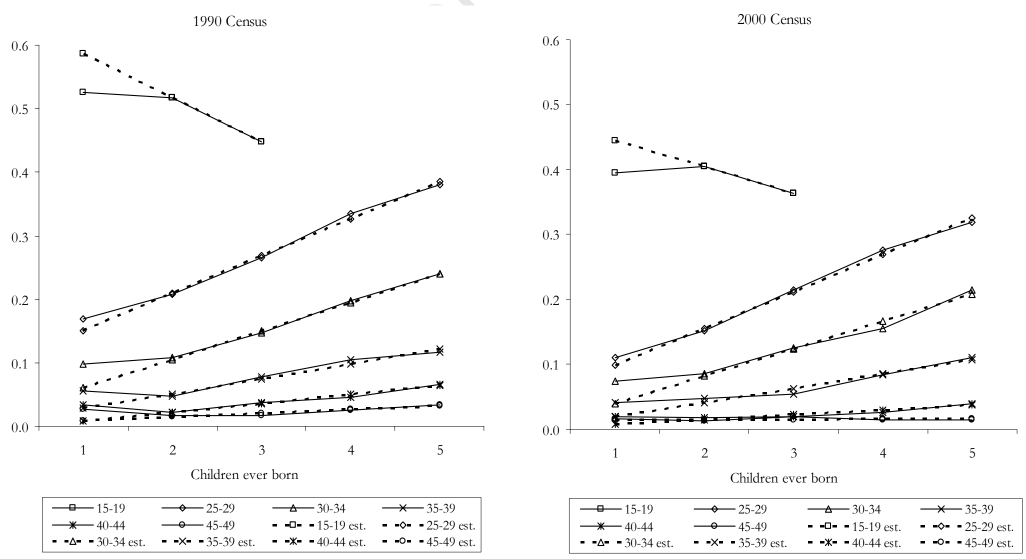


Second, women may have failed to comprehend the time reference of twelve months before enumeration. Women—especially uneducated women—may find it difficult to situate in time the required interval 'in the last twelve months'. This means that respondents may report children born outside the specified interval as children born within the twelve months before enumeration. This is true for censuses undertaken in developing countries where most women have no or little education (Hill 1990). These errors inflate current fertility and need correcting before estimating age specific and total fertility.

To correct for implausible numbers of birth reports, data suggesting two or more births within a single year are treated as missing. Thereafter, linear relationships (by age) of proportions of women of parity one who report a birth within last year are applied to correct for errors arising from confusing current fertility questions for lifetime fertility questions. This involves fitting a linear regression equation to the proportion of women of parity one who report having a birth within the last year before enumeration to those who report not having any birth by parity of up to five children except 'zero' and 'one' (Moultrie and Timæus 2002). The coefficients of the fitted linear equation are then used to estimate the number of women of parity one who had a birth in the twelve months before the census enumeration.

Figure 3.7 shows the observed and estimated proportions of women who report having had a birth in the twelve months before the 1990 and 2000 Census enumerations by parity and age group. The extrapolated (predicted) linear trends in the age group specific data, by parity, are used to revise the estimated numbers of women of parity one who had a birth in the twelve months before enumeration.

Figure 3.7 Actual and estimated proportions of women reporting a single birth in the twelve months before the census, by parity and age group: Zambia 1990 and 2000 Censuses



The excess numbers of older women (represented by an upward deviation of the observed from the predicted proportion) who reported a birth in the twelve months before the enumeration are added to the number of women who reported that they did not have a child during the stated period. Older women with one child are less likely to have had this child in the twelve months before enumeration (Moultrie and Timæus

2002). A converse correction is made to the youngest age group. Young women with one child are much more likely to have had this child in the twelve months before the enumeration. This correction is not applicable to women in the age group 20-24 because it is not possible to ascertain the number of women of this age group of parity one who had this child within twelve months before the survey.

After correcting the current fertility data, the final adjustment involves distributing the "not stated" records proportionally between women who had a birth and those that did not in the last twelve months before the enumeration. This redistribution assumes that the proportion of women who report a birth within last year among those with known current fertility is similar to those with not stated current fertility.

To show the specific effects due to each correction, Table 3.6 and Table 3.7 show the resulting estimates of age specific and total fertility after each correction. Overall, corrections to the 1990 Census current fertility data have a massive effect on observed fertility estimates. Corrections reduce observed total fertility from an implausible figure of 19.1 to 5.1 children per woman. The effect on the 2000 Census current fertility data is less significant. Observed total fertility reduces from 4.7 to 4.2 children per woman.

Table 3.6 Age specific and total fertility estimates by age group after application of each correction: Zambia 1990 Census

Age Group	Consistency Recodes Only	El-Badry correction	Not stated BLY = 0 Implausible BLY = not stated	Diagonal heaping corrected	Observed TFR Computed	Observed TFR Official
15-19	0.112	0.092	0.078	0.085	0.086	0.088
20-24	0.437	0.372	0.210	0.210	0.212	0.250
25-29	0.658	0.593	0.225	0.224	0.225	0.275
30-34	0.774	0.695	0.205	0.203	0.204	0.254
35-39	0.781	0.734	0.163	0.162	0.163	0.211
40-44	0.646	0.604	0.092	0.091	0.092	0.120
45-49	0.405	0.379	0.040	0.040	0.040	0.055
TFR	19.07	17.34	5.07	5.07	5.11	6.27

Note: The fertility estimates presented in this table are as observed, that is, before they are adjusted for underreporting.

Table 3.7 Age specific and total fertility estimates by age group after application of each correction: Zambia 2000 Census

Age Group	Consistency Recodes Only	El-Badry correction	Not stated BLY = 0 Implausible BLY = not stated	Diagonal heaping corrected	Observed TFR Computed	Observed TFR Official
15-19	0.092	0.092	0.088	0.097	0.097	0.093
20-24	0.210	0.210	0.187	0.187	0.188	0.212
25-29	0.213	0.213	0.187	0.185	0.186	0.212
30-34	0.184	0.184	0.163	0.161	0.162	0.185
35-39	0.143	0.143	0.126	0.125	0.125	0.142
40-44	0.070	0.070	0.062	0.061	0.061	0.071
45-49	0.030	0.030	0.025	0.025	0.025	0.029
TFR	4.70	4.72	4.19	4.21	4.23	4.71

Note: The fertility estimates presented in this table are as observed, that is, before they are adjusted for underreporting.

The CSO (1995b: 110) report that observed total fertility in 1990 was 6.3 children per woman. Their observed age specific fertility estimates before adjusting for under-reporting are also different from those in Table 3.6 (before and after corrections). Therefore, it is difficult to know the corrections the CSO applied to the data. For the 2000 Census, the observed total fertility estimate (4.7 children per woman) and accompanying age specific fertility estimates before corrections are almost equal to those reported by the CSO (2003b: 102). However, observed age specific and total fertility estimates after corrections are different. This is a signal that the CSO did not correct the data for errors of implausible reporting and mistaking current fertility for lifetime fertility. The next section adjusts observed age-specific and total fertility estimates for under-reporting.

3.4.2.2 Selecting a suitable approach to adjust understated fertility

In censuses, enumerators do not get all women to report their fertility resulting in underreported current fertility. Therefore, the observed total fertility estimates of 5.1 (Census 1990) and 4.2 (Census 2000) children per woman are certainly lower than actual. To produce reasonable estimates of Zambian fertility, we apply, first, the Relational Gompertz Model to correct the age pattern of fertility and then Feeney's variant of the Brass P/F ratio method to adjust the level. This approach produces more robust age specific and total fertility estimates because it minimises on the known weaknesses of these fertility estimation techniques.

The Brass P/F ratio method adjusts observed current fertility using reported lifetime fertility (United Nations 1983a). The method assumes that fertility has been constant in the recent past and that lifetime fertility reports among the young women are correct while under-reporting of current fertility is uniform across the reproductive age-span (Yimamu 1990).

Feeney (1999) proposes a reconceptualisation to the traditional Brass P/F ratio method that does not require fertility to be constant. If the other assumptions are met but fertility has been declining genuinely, the P/F ratios will increase with age (Feeney 1999). In such a case, the traditional P/F adjustment factor for younger women aged 20-24 or 25-29 will underestimate current fertility. Meanwhile, selecting an adjustment factor from older age groups will also yield unreliable current fertility estimates. This is because lifetime fertility omissions largely affect the P/F ratios of older women (United Nations 1983a). Feeney suggests applying the P/F ratio at the mean age of childbearing because, as Norman Ryder (1964) observes, cumulated total fertility roughly approximates lifetime fertility at the mean age of childbearing.

The Brass P/F ratio (Feeney factor) method is used to scale up observed Zambian fertility but not to correct the shape of the fertility distribution. While the Feeney procedure avoids the need to assume constant fertility, it is not possible to evaluate if it meets other assumptions such as the correct age pattern of current fertility and uniform errors in reporting current fertility. This means that the procedure may scale-up observed current fertility using empirical levels of lifetime fertility without correcting for other errors in the current fertility data. Instead, the Relational Gompertz Model is applied to correct the shape of the fertility distribution.

The Relational Gompertz Model is an advancement to the Brass P/F ratio method proposed by Brass (1974; 1981) but developed by Zaba (1981). It is relational because it relates empirical observations to a standard pattern of fertility described by Booth (1984). In its most common form, the method corrects both the shape and the level of fertility distributions. However, the model can also be used to correct only the shape of the Zambian distribution.

Table 3.8 (1990 Census) and Table 3.9 (2000 Census) shows the steps followed to adjust observed current fertility. The second and third columns contain observed lifetime and current fertility estimates respectively. The latter is cumulated in the fourth column and the fifth column presents the derived Brass P/F ratios. As expected in a population with declining fertility, the P/F ratios increase with age. However, for the 1990 Census, the last age group departs from this pattern, suggesting omission of lifetime fertility by older women or increasing fertility.

The sixth column presents adjusted current fertility estimates derived from the traditional Brass P/F ratio method. Table 3.8 and Table 3.9 also present estimates derived from the Brass P/F ratio (Feeney factor) method, the Relational Gompertz Model and the official estimates (last column). The second last column presents estimates from the adopted approach—using the Relational Gompertz Model to correct the shape and then the Brass P/F ratio (Feeney factor) method to scale the fertility level upwards. The estimates derived from the adopted approach suggest that current fertility in Zambia was 6.7 and 5.7 children per woman in 1990 and 2000 respectively.

Table 3.8 Adjusting current fertility using the Brass P/F Ratio method, Brass P/F Ratio (Feeney factor) method and the Relational Gompertz Model: Zambia 1990 Census

Age Group	Mean children ever born $\mathbf{P_i}$	Age spec fertility rates $\mathbf{f_i}$	Estimated parity equiva. $\mathbf{F_i}$	P_i/F_i ratios	Adjusted age specific fertility rates				
					Brass P/F	Brass P/F Feeney Factor	Relational Gompertz Model	Gompertz Brass P/F Feeney Fact.	Official estimates
15-19	0.194	0.086	0.189	1.026	0.123	0.135	0.098	0.136	0.094
20-24	1.194	0.212	1.045	1.143	0.266	0.293	0.265	0.286	0.267
25-29	2.785	0.225	2.171	1.283	0.273	0.301	0.303	0.304	0.294
30-34	4.461	0.204	3.242	1.376	0.244	0.269	0.276	0.270	0.272
35-39	5.920	0.163	4.143	1.429	0.191	0.211	0.217	0.211	0.226
40-44	6.970	0.092	4.705	1.481	0.102	0.112	0.117	0.108	0.129
45-49	7.264	0.040	5.078	1.431	0.041	0.045	0.020	0.016	0.059
TFR		5.11			6.20	6.83	6.48	6.66	6.70

Table 3.9 Adjusting current fertility using the Brass P/F Ratio method, Brass P/F Ratio (Feeney factor) method and the Relational Gompertz Model: Zambia 2000 Census

Age Group	Mean children ever born $\mathbf{P_i}$	Age spec fertility rates $\mathbf{f_i}$	Estimated parity equiva. $\mathbf{F_i}$	P_i/F_i ratios	Adjusted age specific fertility rates				
					Brass P/F	Brass P/F Feeney Factor	Relational Gompertz Model	Gompertz Brass P/F Feeney Fact.	Official estimates
15-19	0.288	0.097	0.221	1.304	0.154	0.159	0.124	0.154	0.141
20-24	1.385	0.188	1.039	1.333	0.258	0.265	0.263	0.267	0.277
25-29	2.732	0.186	1.995	1.369	0.250	0.257	0.266	0.260	0.269
30-34	4.096	0.162	2.856	1.434	0.214	0.221	0.226	0.216	0.232
35-39	5.356	0.125	3.562	1.504	0.162	0.167	0.170	0.160	0.175
40-44	6.433	0.061	3.966	1.622	0.076	0.079	0.088	0.078	0.083
45-49	6.853	0.025	4.209	1.628	0.028	0.029	0.015	0.011	0.030
TFR		4.23			5.71	5.88	5.76	5.73	6.03

Total fertility estimates derived from the other approaches (sixth to eighth column) are all within a close-range—6.2-6.7 (1990) and 5.7-5.9 (2000) children per woman. They describe slightly different age patterns of fertility. Compared with Brass P/F ratio methods, fertility schedules based on the Relational Gompertz Model suggest lower fertility among older women. This could be the effects of applying the Relational Gompertz Model to correct the fertility shape. Booth (1984) states that the Relational Gompertz Model fits the extreme ends of the reproductive age range better only if the proportion of childbearing at these ages is large. Similarly, methods based on the Brass P/F ratio method show rather high teenage fertility compared with those based on the Relational Gompertz Model. The CSO (1995b; 2003b) report using the Relational Gompertz Model (1990 Census) and the Brass P/F Ratio method (2000 Census) to estimate current fertility. Their age specific and total fertility estimates are almost equal to those derived using equivalent methods presented in Table 3.8 and Table 3.9.

3.4.2.3 Current fertility estimates: 1990 to 2002

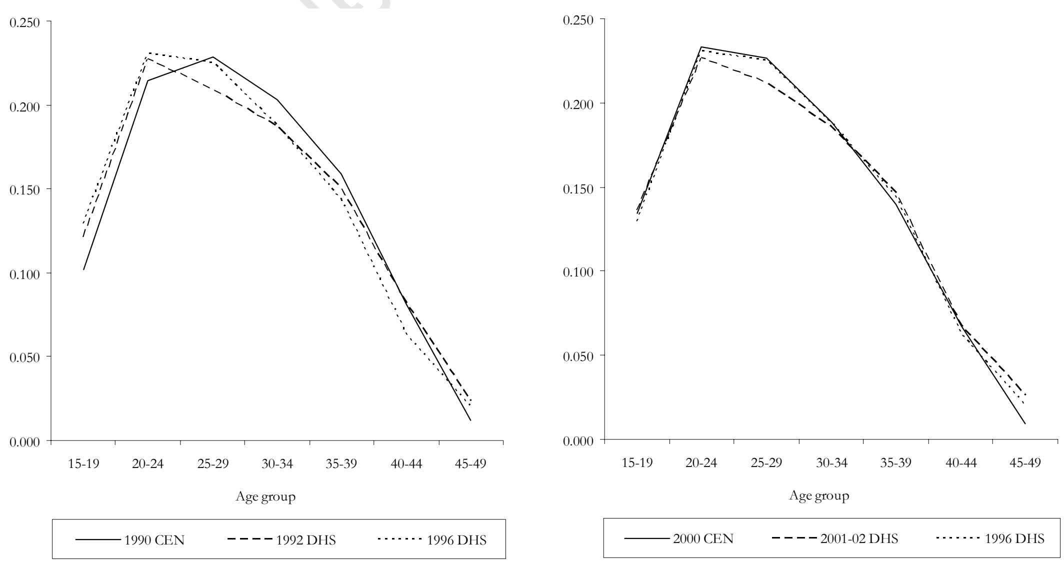
Table 3.10 presents the national age-specific and total fertility estimates for Zambia derived from the 1990 and 2000 Censuses as well as the 1992, 1996 and 2001-02 DHSs. Figure 3.8 presents the standardised (to a total fertility of one) schedules for fertility estimates derived from the five data sources.

Table 3.10 Age-specific and total fertility estimates by age group: Zambia 1990 and 2000 Censuses; 1992, 1996, and 2001-02 Zambia DHS

Age Group	Census 1990	DHS* 1992	DHS* 1996	Census 2000	DHS* 2001-02
15-19	0.136	0.156	0.158	0.154	0.160
20-24	0.286	0.294	0.280	0.267	0.266
25-29	0.304	0.271	0.274	0.260	0.249
30-34	0.270	0.242	0.229	0.216	0.218
35-39	0.211	0.194	0.175	0.160	0.172
40-44	0.108	0.105	0.077	0.078	0.079
45-49	0.016	0.031	0.024	0.011	0.030
TFR	6.66	6.46	6.08	5.73	5.88
Mean age at childbearing	29.5	29.3	28.8	28.5	28.9

*Source: 1992, 1996 and 2001-02 DHS.

Figure 3.8 Standardised age-specific fertility schedule: Zambia 1990 and 2000 Censuses; 1992, 1996, and 2001-02 Zambia DHS



Overall, fertility estimates derived from the 1990 and 2000 Censuses after correcting current fertility data compare well with the 1992 DHS and 2001-02 DHS estimates, respectively. This shows that corrections to the census current fertility data discussed above have worked well. The 1990 Census estimate is slightly higher (0.2 of a child) than that derived from the 1992 DHS. We expected this because the sample of the 1992 DHS comprises of women with characteristics that are slightly different from those in the 1990 Census (as Table 3.1 indicates). The 2000 Census versus 2001-02 DHS current fertility estimates do not compare as well as the 1990 Census versus 1992 DHS. The 2000 Census estimate is unexpectedly slightly lower than the 2001-02 DHS estimate despite Table 3.1 showing that the sample of the 2000 Census and the 2001-02 DHS comprise of women with similar characteristics.

Finally, fertility estimates in Table 3.10 suggest that, between 1990 and 2000, fertility in Zambia declined by between half and one child per woman. The DHS fertility estimates suggest the lower limit while adjusted total fertility estimates for 1990 and 2000 Censuses suggest the upper limit.

3.5 Fertility trends: 1981 to 2000

Reverse survival methods are commonly used to find out past fertility levels based on a recent age distribution of a population (United Nations 1983b). These methods are heavily dependent on the reliability of the age distribution and the mortality assumption applied to estimate earlier births. Zambian fertility estimates for the periods 1954-1969 and 1965-1980 might be derived by applying the reverse survival techniques to the 1969 and 1980 Census data. However, these two data sources are not available for analysis. Published data cannot be used because the population distributions for these data suffer from severe age-sex reporting errors (Central Statistical Office [Zambia] 1985a; Hill 1985). Further, a review of the literature indicates that there is very little information on mortality in Zambia since 1975 that can be applied to 1990 and 2000 Census data.

To this end, this section presents Zambian fertility trends from 1981 to 2000 derived from retrospective maternity histories collected in the 1992, 1996 and 2001-02 DHS. Garenne and Joseph (2002) apply this approach to the 1992 and 1996 DHS to determine the onset of the fertility transition in several developing countries including Zambia.

3.5.1 Extracting past fertility estimates from Zambian birth histories

From the maternity histories collected in the DHS, it is possible to calculate the number of births in any given calendar year (Garenne and Joseph 2002). It is also possible to derive the age of the mother (respondent) at the birth of her children from information on her date of birth and the birthdates of her children as well as the interview date (Rutstein and Rojas 2003). From this information, we can compute estimates of age-period-specific fertility rates for each calendar year up to 35 years before the survey using the conventional formula shown by Equation 3.1 (Pullum 2004: 411).

$$f(a,t) = \frac{b(a,t)}{e(a,t)} \qquad 3.1$$

where *a* refers to an age interval and *t* to a time period and therefore, *b(a,t)* is the total number of births observed at time *t* to women aged *a* at birth and *e(a,t)* is the total woman-years of exposure to risk of childbearing at age *a* during *t* period. The rates derived are increasingly censored, by age, the further back in time one goes because the DHS only interviews women under the age of 50.

Figure 3.9 shows a Lexis diagram indicating the available birth history information from each Zambian DHS. The area above the diagonal line represents the combinations of age and period outside the limit of birth histories collected by the stated survey.

Figure 3.9 Lexis diagram showing the cumulated fertility information up to age 40 available in the Zambian DHS

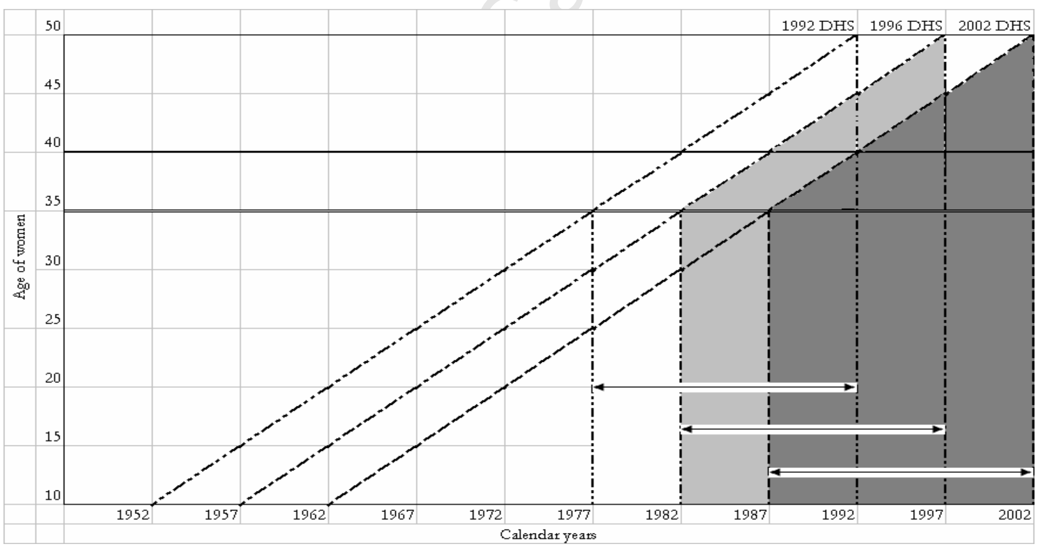


Table 3.11 presents the age-period-specific fertility rates derived from each Zambian DHS (Panel A to C). Corresponding age-period-specific fertility rates from the three surveys are consistent except for those with truncated information in a subsequent survey. Although minor, some inconsistencies suggest that the 2001-02 DHS was different from the earlier Zambian DHSs.

Summing the numerators and denominators for equivalent periods across the three surveys (panel D) allows greater precision in the estimation of period fertility trends. Apart from truncation among fertility reports of older women, *Panel D* shows that it is possible to get full sets of age-period-specific fertility rates (15-49) from 1985. However, more than 90 per cent of births occur before women are aged 40 (Garenne and Joseph 2002; Pullum 2004). Therefore, we can get acceptable fertility accounts from 1975 by considering women aged 15-39.

Periods 1975 to 1980 and 2001 to 2002 with severely truncated information are removed from the analysis. Finally, rather than single-year or five-year estimates, biennial age-period-specific fertility rates are derived. Five-year estimates mask fertility trends while single-year estimates are severely fragmented by small numbers.

Table 3.11 Age period specific fertility rates: 1992, 1996 and 2001-02 Zambia DHS

Age at	Period									
birth	1955-59	1960-64	1965-69	1970-74	1975-79	1980-84	1985-89	1990-94	1995-99	2000-02
Panel A: 1992 DHS										
15-19	0.170	0.215	0.212	0.237	0.223	0.179	0.158	0.157		
20-24		0.341	0.354	0.360	0.346	0.308	0.275	0.305		
25-29			0.305	0.341	0.323	0.308	0.282	0.266		
30-34				0.349	0.304	0.284	0.245	0.245		
35-39					0.274	0.241	0.206	0.192		
40-44						0.162	0.127	0.104		
45-49							0.041	0.028		
Panel B: 1996 DHS										
15-19		0.184	0.217	0.223	0.213	0.186	0.166	0.162	0.153	
20-24			0.342	0.361	0.340	0.302	0.290	0.290	0.280	
25-29				0.401	0.329	0.312	0.286	0.277	0.260	
30-34					0.300	0.280	0.259	0.247	0.227	
35-39						0.315	0.202	0.187	0.170	
40-44							0.179	0.088	0.079	
45-49								0.041	0.017	
Panel C: 2001-02 DHS										
15-19			0.152	0.223	0.223	0.192	0.171	0.167	0.165	0.153
20-24				0.341	0.327	0.332	0.296	0.315	0.271	0.270
25-29					0.338	0.304	0.298	0.290	0.261	0.250
30-34						0.287	0.278	0.267	0.235	0.216
35-39							0.249	0.219	0.172	0.171
40-44								0.190	0.096	0.082
45-49									0.040	0.023
Panel D: Combined DHSs										
15-19	0.170	0.208	0.210	0.229	0.220	0.185	0.164	0.163	0.161	0.153
20-24		0.341	0.352	0.359	0.339	0.312	0.285	0.302	0.273	0.270
25-29			0.305	0.354	0.327	0.308	0.288	0.279	0.261	0.250
30-34				0.349	0.303	0.283	0.258	0.253	0.232	0.216
35-39					0.274	0.257	0.207	0.199	0.171	0.171
40-44						0.162	0.138	0.101	0.092	0.082
45-49							0.041	0.034	0.024	0.023

Notes: In the period interval 1990-94, the information obtained from women aged 15-49 in the 1992 DHS only extended to 1992.
In the period interval 1955-59, the information obtained from women aged 15-49 in the 1996 DHS only extended to 1958.
In the period interval 1995-99, the information obtained from women aged 15-49 in the 1996 DHS only extended to 1996.
In the period interval 1960-64, the information obtained from women aged 15-49 in the 2001-02 DHS only extended to 1964.

3.5.2 The tempo of national fertility decline between 1981-2001

Figure 3.10 presents the Zambian fertility trend for women aged 15-39 from 1981 to 2000 derived from the 1992, 1996 and 2001-01 DHS birth histories. Table 3.12 provides the statistical description of the fertility trend computed using SPSS. Exponential parameters show the continuous rate of change of the Zambian fertility trend.

Zambia's fertility decline—measured using the continuous rate of change—has been remarkable in urban areas (-2.1 per cent per annum) but not in rural areas (-0.6 per cent per annum). The *t*-tests show that the continuous fertility declines in both rural and urban areas are significant at one per cent level.

Figure 3.10 Cumulated fertility up to age 40: 1992, 1996 and 2001-02 Zambia DHS

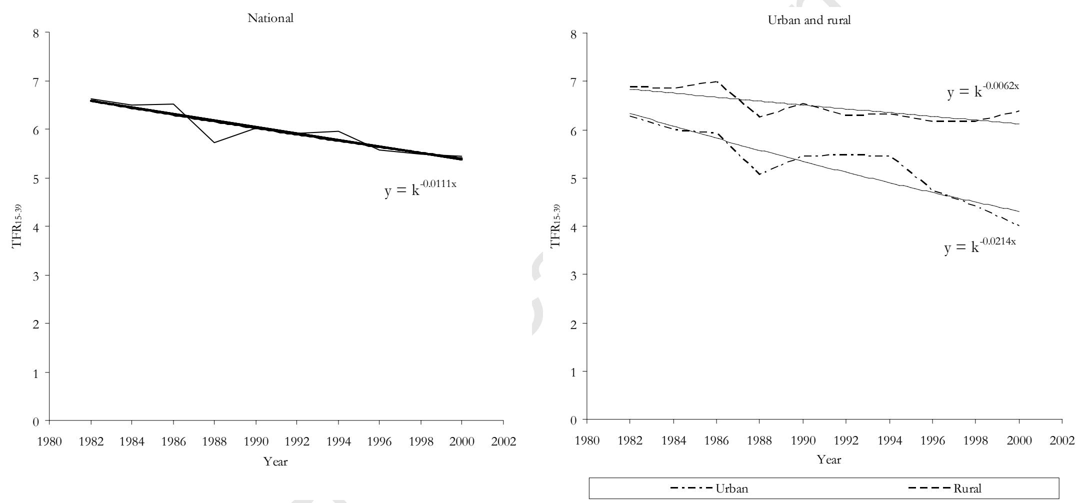


Table 3.12 Statistics describing the Zambian fertility trends of women under 40 years old

	National	Urban	Rural
Number of births	49,404	19,362	30,043
Per cent annual decline	-1.102	-2.486	-0.412
Slope (exponential)	-0.011	-0.021	-0.006
P-value	0.000	0.000	0.007
Significance	**	**	**

Notes: The national total number of births account for 71 per cent of all births reported in the histories.
** Indicates that the slope is significantly different from 0 at 0.01 level of confidence.

Garenne and Joseph (2002) report that annual fertility declines were -2.3 (urban) and -1.1 (rural) per cent. Therefore, their trends are faster in both regions especially urban areas. These differences could be because of they describe a trend that begins earlier (1977) while ours begins later (1981). Differences may also arise from inclusion of information from the 2001-02 DHS, which was not available to them.

Later, after including data from the 2001-02 DHS, Garenne (2008) reports annual fertility declines of -1.2 (urban) and -0.5 (rural) per cent showing a much slower trend in urban areas. Again, Garenne (2008) describes a trend that begins earlier (1973). Our trends do not extend beyond 1981 because in Chapter 6, we replicate this approach to evaluate subnational fertility trends. Therefore, the computations include data points that have enough cases to produce reliable subnational fertility estimates.

This method provides useful information on past fertility trends. However, it is not comparable to the conventional method of estimating total fertility because it is not ideal for detecting fertility transitions among women older than 40 years (Pullum 2004). Trends by residence classification suffer from the 'current status variable' problem. The method assumes that women have lived in their current (urban/rural) residences for the duration of the trend or their reproductive life.

3.6 Summary, limitations and conclusions

The aim of this chapter was to compute lifetime and current fertility estimates from Zambian census data after correcting fertility data for consistency and applying suitable adjustment techniques. It is not possible to compute robust fertility estimates for periods before 1990 without data from earlier censuses. Therefore, the chapter derived Zambia's fertility trend from birth histories collected in the DHS.

Evaluation of the 25 per cent sample of the 1990 Census data provides justification for the concerns expressed in the literature review that fertility data collected in Zambian censuses are marred with errors. Problems include implausible reports of children ever born and those born in the year before the enumeration as well as missing or not stated lifetime and current fertility reports. Due to prior editing by the CSO, it is difficult to determine the extent of fertility data errors in the 2000 Census data.

Comparing the computed census estimates against those derived from the DHS data suggests that the former are robust. Although the constituents of these two data sources are different, the estimates from the two sources tally. It also suggests that the corrections applied to census data are effective and the approach to adjust for under-reported fertility is appropriate.

The total fertility estimates derived by the Zambian CSO (1995b; 2003b) are almost equal to those computed in this chapter. However, their age specific fertility rates are different. It is difficult to state why because there is no documentation of corrections they applied to the data. Second, it would have helped if they had discussed in detail and justified the fertility estimation techniques they applied to adjust for underreported fertility. We hope that this detailed examination of fertility data (or indeed any other data) has set a precedent for assessing future Zambian censuses.

This chapter derived the national fertility trend for Zambia from birth histories collected in the DHS. Without data from earlier censuses, it is not possible to compute robust fertility estimates for periods before 1990. Estimates from the CSO and those derived by demographers independent of Zambian government officials such as Myburgh (1956), Coale and Lorimer (1968), Ohadike (1969), Ohadike and Tesfaghiorghis (1975), Hill (1985; 1990) and Cohen (1998) provide fertility levels in Zambia before 1990. However, some of these estimates may be unreliable because of data errors and estimation methods employed. The 1969 Zambian Census was the first to collect lifetime and current fertility data (Hill 1985). Therefore, fertility estimates before 1969 are based on inadequate measures such as the crude birth rate, child woman ratio and the general fertility rate. Second, methods applied to estimate fertility from data collected after 1969 are not reliable. Poor fertility data violate the rigid assumptions of adjustment methods such as those based on the stable population model. Corrections to reporting errors such as smoothing disguise the real fertility levels. As a result, the only source of information on past fertility for our purposes is maternity histories collected in the DHS.

Overall, apart from Malawi, fertility in Zambia is higher than any other country in Southern Africa and its transition to low fertility sluggish. Kirk and Pillet (1998) distinguish between three types of fertility transitions in sub-Saharan Africa—advanced, intermediate and delayed. They place Botswana and Zimbabwe as well as Namibia and South Africa in the advanced fertility transition. Tanzania and Zambia are in the intermediate stage and Malawi in the delayed fertility transition stage (Kirk and Pillet 1998).

Estimates derived from census data show that fertility declined by about 15 per cent between 1990 and 2000. This is more than the 10 per cent fertility decline that signals the beginning of a sustainable fertility decline (Caldwell, Caldwell and Orubuloye 1992). However, the estimates from the DHS suggest a decline of less than ten per cent (0.6 of a child, that is, from 6.5 to 5.9 children per woman). Exploring features underlying fertility differentials between Zambian ethnic groups in the next chapters will provide clues to why national fertility decline has been modest.

4 MIGRATION HISTORY, SETTLEMENT AND KINSHIP LINEAGE ARRANGEMENTS OF ETHNIC SOCIETIES IN ZAMBIA

> "…Gabriel Elison, Northern Rhodesia's foremost artist of the time…designed…the Zambian Coat of Arms, which bears the national motto 'One Zambia, One Nation'…the classically-educated British civil servants and their African acolytes protested that the motto was too simplistic and degrading. But Kenneth Kaunda knew the diversity of his people and he knew that his biggest task would be to knead them into one nation" (Sardanis 2003: 156-157).

4.1 Rationale for discussing the migration history and settlement of ethnic societies in Zambia

This chapter is a qualitative discussion of the origin, location and kinship lineage of ethnic societies found in Zambia. Congruence in origin, location in Zambia and kinship lineage forms the basis of the seven broad societal clusters of Zambian ethnic groups. This seven-cluster preliminary classification—defined qualitatively using only a few features—may be subjective. However, this qualitative discussion serves three purposes. First, history is an important ingredient of fertility analysis because institutional arrangements underlying fertility reflect histories of various societies (Greenhalgh 1995).

Second, it provides for an important hindsight on ethnic societies under study to facilitate easy interpretation of results that emerge from applying multivariate cluster analysis procedures to group societies quantitatively using a wider range of dimensions (Everitt, Landau and Leese 2001). This information will serve as independent historical and anthropological accounts to evaluate the accuracy of ethnographic data on Zambian societies in Murdock's Atlas. Lastly, the exercise provides a basis for evaluating the accuracy of ethnic groupings that other researchers and writers have used when assessing subnational fertility differentials in Zambia (Chapter 2).

From the outset, it should be stated that unlike European history, construction of sub-Saharan African history depends on the memories of individuals who contributed to oral history, and on older historians (Cunnison 1959). According to Roberts (1973: 1) "the sources for writing the history of Africa, and particularly the African interior, are multifarious, uneven and often hard of access". Some historical accounts are inconsistent because of memory failures or pressure to alter facts so that experiences in the past are perceived positively.

Another constraint is that, because of the large number of ethnic societies found in Zambia, it is beyond the scope of this thesis to discuss each one in great depth.

However, the material on Zambia presented in Section 2.1 and that on ethnic societies in this chapter provides enough detail—always subject to the veracity of the historical accounts being established—to interpret the results of the cluster analysis presented in the next chapter.

Since the discussion is a broad overview of ethnic societies found in Zambia, the material presented here depends heavily on the discussions provided by Brelsford (1956; 1965), Mitchell (1956), Roberts (1976) and some chapters in the book edited by Fagan, for example Fagan and Phillipson (1966). To support the general arguments presented by these sources, this chapter uses other materials describing specific ethnic societies or traditional features.

The next section discusses the origins of ethnic societies found in Zambia as a first step in the generation of societal clusters of Zambian ethnic groups. Section 4.3 shows the regions where ethnic societies settled in Zambia on arrival. Section 4.4 describes ethnic societies that have similar kinship lineages. This thesis uses the description of kinship lineages to determine the final cluster membership of ethnic societies that do not fit neatly into obvious categories. To assess the consistency of the qualitative grouping exercise, Section 4.5 compares the seven clusters resulting from this undertaking to other similar groupings created by other researchers and writers.

4.2 The origin of ethnic societies and their migrations to Zambia

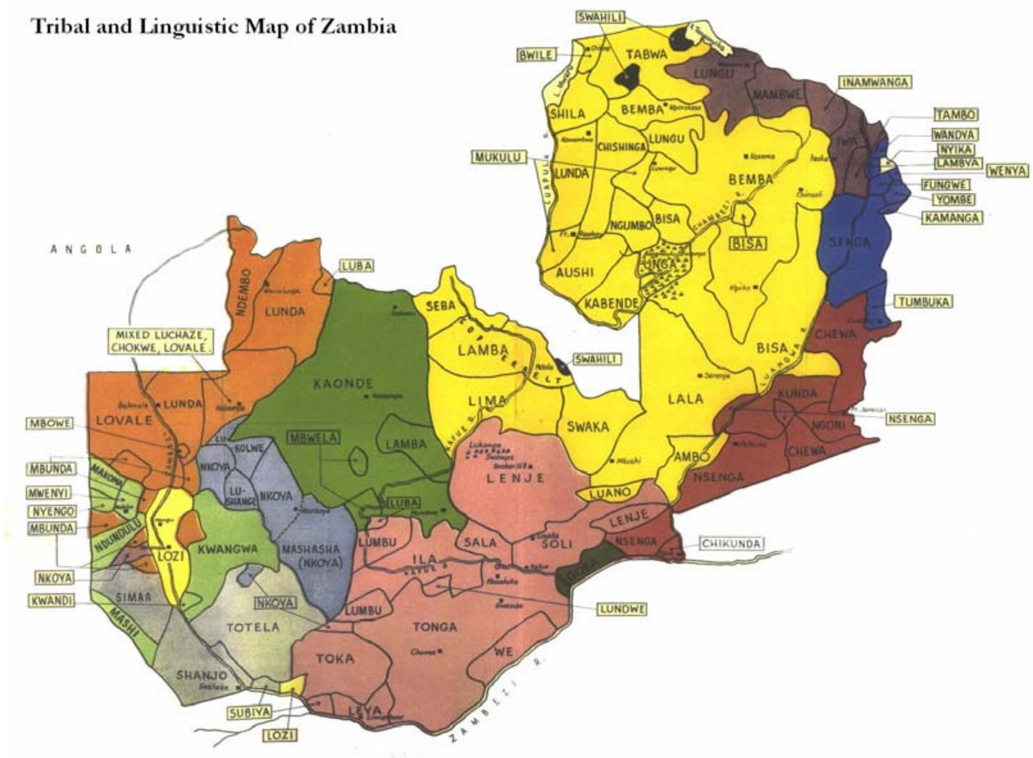
According to Brelsford (1956; 1965) there are nearly 80 ethnic societies in Zambia. Figure 4.1[1] shows the ethnic societies found in Zambia mapped according to geographical location of their ethnic villages (ethno-geographical location) in the 1950s[2]. He points out that all Zambians descend from the Bantu of the Great Lakes region in East Africa (Brelsford 1956; 1965). It is not always stated exactly when they started arriving in Zambia. However, archaeological studies suggest that humans started settling in Zambia more than 1 million years ago (Fagan and Phillipson 1966). Besides, migrations into Zambia occurred over a long period, occasioned by different reasons and involving small groups of individuals at a time (Roberts 1966). Brelsford argues that ancestors of ethnic societies transformed the cultural customs and norms (the interest of

[1] There is similar version of this map featuring pre-independence country names in Brelsford (1956). The ethnic societies and their geographic locations are the same. As Colson (1968) observes, apart from adding more information, Brelsford's 1965 (second) edition is not substantially different from his 1956 publication (first edition).

[2] The different colour shades represent Brelsford's 1965 tribal and linguistic groupings. The key was too small to include in the figure.

this research) during the migration from the Great Lakes region. The extent and nature of these transformations depend on the regions these groups passed through and societies they met before settling in Zambia. Therefore, it is important to distinguish ethnic societies according to the timing of their arrival in Zambia and the regions passed through before settling in Zambia (secondary origin).

Figure 4.1 Ethnic societies found in Zambia



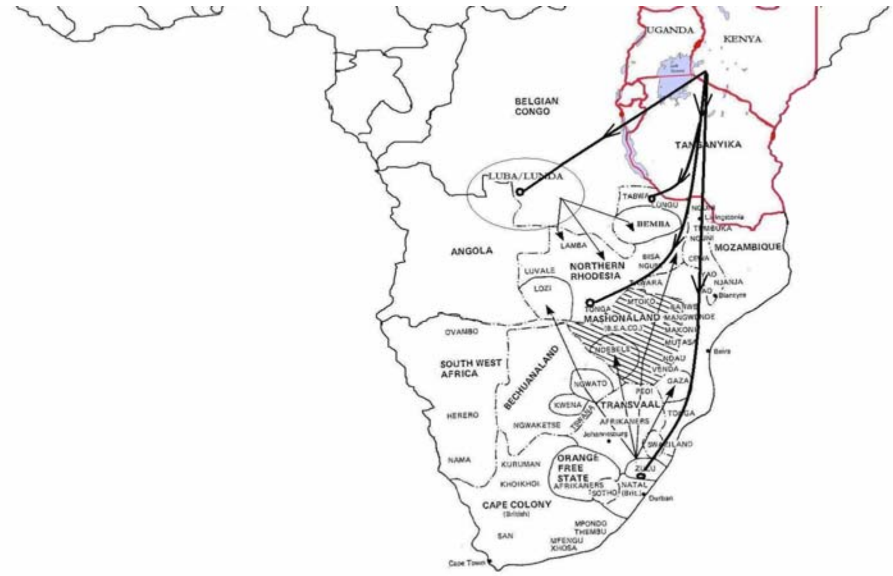
Source: Brelsford (1965)

Figure 4.2 shows migration routes of Zambian ethnic societies—that is, their region of origin and the regions they passed through before settling in Zambia. As a supplement, Table 4.1 shows various ethnic societies grouped according to period of arrival in Zambia and their secondary region of origin before migrating to Zambia—classified using information in Brelsford (1956; 1965), Mainga (1966) and Roberts (1966).

The earliest group (first cluster) migrated straight into Zambia from the Great Lakes region. The second cluster settled in the southern part of the present-day Democratic Republic of Congo (and stretching into eastern Angola) as part of the Luba or Lunda Kingdoms before migrating to Zambia. The third cluster comprises Zambian societies that migrated from South Africa (the Ngoni) and Zambian societies (the

Barotse ethnic groups: the Lozi and the surrounding tribes) whose customs and norms have been influenced by South African ethnic societies. The South African societies also initially migrated from the Great Lakes region (Poole 1949). The following sections discuss the three clusters further.

Figure 4.2 Zambian major ethnic societies according to region of origin and migration route



Modified by the author from Chanaiwa (1985)

Table 4.1 Ethnic societies according to secondary origin and period of arrival in Zambia

Great Lakes Region (up to 16th Century)		Luba/Lunda Kingdoms (17th - 18th Century)		South African influenced (19th Century)
1 Fungwe	19 Toka	1 Ambo	19 Luchazi	1 Kwandi
2 Goba/Gowa	20 Tonga	2 Aushi	20 Lunda - Lua.	2 Kwangwa
3 Ila	21 Wandya	3 Batwa*	21 Lunda - NW	3 Lozi
4 Inamwanga	22 We	4 Bemba	22 Luvale	4 Lukolwe
5 Iwa	23 Wenya	5 Bisa	23 Lwena*	5 Lushange
6 Kamanga	24 Yombe	6 Bwile	24 Mbunda	6 Makoma
7 Lambya		7 Chewa	25 Mbwela	7 Mashasha
8 Lenje		8 Chikunda	26 Mukulu	8 Mashi
9 Leya		9 Chishinga	27 Ndembu	9 Mbowe
10 Lumbu		10 Chokwe	28 Ngumbo	10 Mwenyi
11 Lungu		11 Kabende	29 Ngwela*	11 Ndundulu
12 Mambwe		12 Kaonde	30 Nsenga	12 Ngoni
13 Nyika		13 Kunda	31 Seba	13 Nkoya
14 Sala		14 Lala	32 Senga	14 Nyengo
15 Soli		15 Lamba	33 Shila	15 Shanjo
16 Sukwa*		16 Lima	34 Swaka	16 Simaa
17 Tabwa		17 Luano	35 Tumbuka	17 Subiya
18 Tambo		18 Luba	36 Unga	18 Totela

Notes: Classification based on Brelsford (1965); Mainga (1966); Roberts (1966).
Lua. Is Luapula province.
NW is North-western province.
*Not on the Tribal and Linguistic Map but discussed by Brelsford.

4.2.1 Ethnic societies that migrated directly from the Great Lakes region

There is inadequate information to identify accurately the history and origin of the societies in this cluster. This is because their migrations into Zambia took place long before the first recordings of oral or other histories. Colson (1958) notes that the Tonga (the largest group in this cluster) have no recorded history before Livingstone encountered them in 1853. Similarly, Watson (1958: 13) states that "there is no reliable historical evidence concerning the origins and previous movements of the Mambwe"—another large tribal society in this cluster. Despite this gap in history, the Tonga-Ila and Mambwe groups are presumed to have been the first to settle in Zambia and migrated through the east from the Great Lakes region (Clark 1950). Clark speculates that these people migrated between the fifteenth and sixteenth centuries. However, archaeological evidence suggests that they might have migrated much earlier—probably before the twelfth century (Colson 1958). Ethnic societies in this cluster should have been in Zambia before the 16th Century because when the Bemba (a group in the second cluster) arrived in Zambia, the Tonga-Ila and Mambwe ethnic societies had already settled (Richards 1940).

This cluster comprises two groups: the south-central group and the north-eastern group. The south-central group includes the Tonga (Plateau, Southern and Valley), Ila, Lenje, Gowa, Leya, Lumbu, Sala, Soli, Toka and We (Jaspan 1953). The north-eastern group comprises societies near Lake Tanganyika close to the Great Lakes region. The major tribes in this group include the Mambwe, Inamwanga, Iwa, Lungu, Tabwa and Tambo (Watson 1958; Brelsford 1965).

Other smaller societies in the north-eastern group include the Fungwe, Kamanga, Lambya, Nyika, Wandya, Wenya and Yombe. Brelsford (1965) describes the history of these societies as inconsistent because some historians have linked them to the DRC Kingdoms (discussed below). However, both Brelsford (1965) and Watson (1958) argue that these societies are economic allies of the major north-eastern ethnic societies. They are more similar to the north-eastern ethnic societies because their cultural customs and norms are an extension of East African ethnic societies (Brelsford 1965; Roberts 1976).

4.2.2 Ethnic societies that migrated from the Luba and Lunda Kingdoms

Descendants of this cluster comprise the largest number of the present-day ethnic societies in Zambia. They migrated from the Great Lakes region through the Congo where they first settled as part of either the Luba or Lunda Kingdoms before they finally migrated again to settle in Zambia (Clark 1950; Roberts 1966). The Luba and Lunda Kingdoms were among the greatest African empires of the 17^{th} and 18^{th} Century (Brelsford 1965). Roberts (1966) suggests that these kingdoms could have been in existence as early as 800 AD. Richards' (1940) discussion of cultural similarities between the peoples of DRC, and the Bemba as well as the Lunda (the largest groups in this cluster) suggests that these ethnic societies came from the Luba and Lunda Kingdoms. She states that although circumstantial, the literature shows that the Bemba entered Zambia from the west in the mideighteenth century. Cunnison (1959) also states that the Lunda society of Luapula Province, who regard the Bemba as their relatives, arrived from the Congo around 1740. By contrast, Roberts (1973) estimates that the Bemba started arriving in Zambia from the Luba and Lunda Kingdoms during the seventeenth century.

Historical sources have advanced various legendary explanations[3] for the migrations from the Luba and Lunda Kingdoms into Zambia (Richards 1940). Some of these are described by Moffat Thomson (1934) and Tanguy (1948), cited in Brelsford (1965) and Roberts (1973) respectively. Tanguy (1948)—cited in Kapambwe (2004)—backs up these stories suggesting that they refer to accounts of a Portuguese traveller, Lacerda (1784), who accompanied the Bemba during their migrations. Lacerda's name is prominent in most literature that discusses these societies.

The literature shows that other societies in this cluster also came from the DRC. Doke (1931) states that societies that settled in central Zambia such as the Lamba, the Lima and their allies such as the Lala, Swaka and Seba came from the Luba-Lunda Kingdoms. Apart from the Ngoni, the ethnic societies that settled in the eastern part of Zambia, migrated from the Congo Basin in the seventeenth century (Poole 1949). Similarly, the Mbunda, Lunda and the Ndembu societies who settled in the North-western part of Zambia, are claimed to have come from the Great Kingdoms of the Congo in the seventeenth century (Turner 1979; Papstein 1994).

In summary—as Brelsford (1965) states—most ethnic societies in this cluster came from the Luba or Lunda Kingdoms and migrated during the same period as the Bemba. Alternatively, they were simply annexed to the major ethnic societies, for example the Bisa to the Bemba because of the dominance of the latter over the former (Richards 1940). In a later article, Richards (1968) groups the Kaonde, Lala, Lamba, Unga and Aushi with the Bemba stating that these societies have a similar origin.

[3] The Bemba people ran away after the tower that their Luba king had asked them to build so that he could reach heaven collapsed and killed many of his subjects.

Cunnison (1959) also describes in detail the origin of other smaller ethnic groups such as the Aushi, Chishinga, Ngumbo as well as the Mukulu and their affiliation to the Lunda society.

4.2.3 Ethnic societies that migrated from South Africa and Zambian ethnic societies influenced by South African ethnic societies

This cluster comprises the smallest number of ethnic societies that are present in Zambia. There are two major societies in this cluster, the Ngoni (migrated from South Africa) and the Lozi (influenced by South African ethnic societies). Fleeing from wars in the Zulu Kingdom, the Ngoni migrated from South Africa where they were initially part of the Aba-Nguni peoples (Barnes 1968). They derive their name from Nguni, a designation of the Zulu-speaking tribes. The Aba-Nguni migrated from the Great Lakes region to South Africa in the fifteenth century (Poole 1949).

The literature on the origin of the Lozi society is conflicting. Detailed discussions of the Lozi by Mainga (1966; 1973) and Gluckman (1968) suggest that they came from the north. The possibility is that they migrated through the DRC and Angola without necessarily settling there as part of the Luba or Lunda Kingdoms. Brelsford (1965) argues that the Lozi and other societies in this group, such as the Lokolwe, had settled in Zambia before the DRC kingdoms (discussed in the previous section) were at the height of their power in the 17th Century. They are however, included in this cluster for two reasons. First, they are different from all societies in the other two clusters. Virmani (1989) supports this argument by stating that their cultural customs and norms (for example kinship lineage—discussed later) are distinctly different from the other descendants of the Luba and Lunda Kingdoms.

Second and more importantly, South African ethnic societies have infiltrated their original traditional customs and norms. The Barotse (a term that describes all societies in this cluster, apart from the Ngoni) have assumed the cultural customs and norms of the Kololo (Mainga 1973). Like the Ngoni, the Kololo are a tribal group that came from South Africa also fleeing from wars in the Zulu Kingdom. They arrived in Zambia in the mid-nineteenth Century (Poole 1949). The Ngoni settled permanently in the eastern part of Zambia among the ethnic groups they found there while the Kololo headed to the west.

Mainga (1966; 1973) states that the Kololo imposed their Sotho cultural identity on the Barotseland. They permanently altered the culture of the Barotse by introducing customs and norms that did not exist before the invasion (Brelsford 1965).

These include primogeniture succession and circumcision of young men as part of preparation for adult life. Similarly, during their reign over the Barotseland between 1840 and 1864, the Kololo also introduced the language currently spoken in this part of Zambia (Roberts 1976). The name of the major ethnic society (Lozi) was originally Aluyi or Aluyana but the Kololo changed this to suit the phonetics of their language (Gluckman 1968). According to Turner (1952: 12), "Lozi is the term now applied to Kololo, a language of which the grammar and many of the words are derived from *Sotho* of the Kololo conquerors of the Lozi, whose own language is called *Luyi* or *Luyana*".

Dominance of the Lozi society over the other societies in this cluster (apart from the Ngoni) facilitated the universal imposition of the Kololo customs and norms on all ethnic societies in this cluster. According to Mainga (1966: 121), "the Lozi Kingdom was a conquest-state which imposed its institutions on the pre-existing populations." This is why "Lozi means not only a member of the dominant tribe but any man who is subject to the king…" (Gluckman 1968: 15). As a result, it is impossible to distinguish the descendants of the true Lozi from those of other ethnic societies in this cluster. Therefore, while the origins of the ethnic societies in this cluster differ, the Lozi imposed their culture on them and in turn, the Kololo compelled the Lozi—as well as other ethnic societies in this cluster—to their Sotho culture.

Mainga (1973) divides the remaining ethnic societies in this cluster into two groups. The northern group includes the Makoma, Mbowe, Mwenyi, Nkoya, Ndundulu, Nyengo and Simaa and the southern cluster comprises of the Kwandi, Shanjo, Sibuya and Totela societies. She states that history suggests that the southern group came through the north-eastern while the former came through the north. Apart from the Ngoni, Brelsford (1965) and Gluckman (1968) describe the remaining societies in this cluster as part of the Barotse.

4.3 Ethno-geographical location of Zambian ethnic societies

This section groups ethnic societies according to ethno-geographical location of their villages—regions where descendants of ethnic societies settled when they arrived in Zambia using Brelsford's (1965) Tribal Map. The demarcations roughly match the provincial administrative boundaries presented in Chapter 2. However, although Zambia has nine provinces, the material presented in Chapter 2 shows that there are only seven ethno-geographical location boundaries, which almost match the provincial boundaries. This is because, prior to 1950, Copperbelt and Lusaka were not distinct provinces.

Table 4.2 shows ethnic societies grouped according to ethno-geographical locations of their ethnic villages in Zambia. The regions are numbered to avoid confusion between official provincial names and some geographical locations. The layout of the table broadly reflects geographical locations in Zambia—for example, Region I is North-western and Region VI is South-central.

Table 4.2 Ethnic societies grouped according to ethno-geographical location of settlement in Zambia

Region I	Region II	Region III
1 Chokwe	1 Aushi	1 Bemba
2 Kaonde	2 Batwa*	2 Fungwe
3 Luba	3 Bwile	3 Inamwanga
4 Luchazi	4 Chishinga	4 Iwa
5 Lukolwe	5 Kabende	5 Kamanga
6 Lunda	6 Lunda	6 Lambya
7 Luvale	7 Mukulu	7 Lungu
8 Lwena*	8 Ngumbo	8 Mambwe
9 Mbowe	9 Ngwela*	9 Nyika
10 Mbwela	10 Shila	10 Sukwa*
11 Ndembu	11 Tabwa	11 Tambo
	12 Unga	12 Wandya
		13 Wenya
		14 Yombe

Region IV	Region V	Region VII
1 Kwandi	1 Goba/Gowa	1 Ambo
2 Kwangwa	2 Lala	2 Bisa
3 Lozi	3 Lamba	3 Chewa
4 Lushange	4 Lenje	4 Chikunda
5 Makoma	5 Lima	5 Kunda
6 Mashasha	6 Luano	6 Ngoni
7 Mashi	7 Seba	7 Nsenga
8 Mbunda	8 Soli	8 Senga
9 Mwenyi	9 Swaka	9 Tumbuka
10 Ndundulu		
11 Nkoya	**Region VI**	
12 Nyengo	1 Ila	
13 Shanjo	2 Leya	
14 Simaa	3 Lumbu	
15 Subiya	4 Sala	
16 Totela	5 Toka	
	6 Tonga	
	7 We	

Notes: Grouping based on Brelsford's (1965) Tribal and Linguistic map.
The layout of the table broadly reflects geographical location in Zambia - for example Region I is North-western and Region VI is South-central.
*Not in the Tribal and Linguistic Map but discussed by Brelsford.

According to the discussion in the previous section, most ethnic societies that migrated from the Luba-Lunda Kingdoms (second cluster) settled in Regions I, II, V and VII. Most ethnic societies in Regions III and VI are those that migrated from the Great Lakes Region (first cluster) except for the Bemba (Region III) who migrated from the Luba-Lunda Kingdoms. Section 4.2 classifies all the societies in Region IV as those influenced by South African ethnic societies (third cluster).

There are several societies that do not fit neatly into the obvious demarcations. The Lukolwe and Mbowe (Region I) as well as the Ngoni (Region VII) are South African-influenced ethnic societies (third cluster) that settled close to or among societies from the former Luba-Lunda Kingdoms. The Tabwa (Region II) as well as the Goba, Lenje and Soli (Region V) are from the Great Lakes Region (first cluster) but settled near the former DRC societies. The Mbunda ethnic society migrated from the Luba-Lunda Kingdoms but most of them settled in Region IV (third cluster). Considering that the ethno-geographical location borders are determined mechanically to match the provincial boundaries, it is also possible to group the Lushange and Nkoya societies under Region I.

Two examples can show that ethnic societies whose descendants originated from the same region but settled in different regions can develop cultural customs and norms of societies in the region where they settle. First, one group of the earliest clusters of ethnic societies to arrive in Zambia settled in Region III and the other settled in Region VI. Despite coming from the same region and migrating during the same period, these societies are different. The main preoccupation for ethnic societies in Region VI is cattle rearing while those that settled in Region III are mostly crop-cultivators (Brelsford 1965; Roberts 1966). Watson (1958: 30) observes that unlike the Tonga or Ila, the Mambwe—a large society in Region III—"…do not give the attentive care to cattle which marks the true pastoralist". Further, Roberts (1966) states that unlike major ethnic societies in Region III, those in Region VI had used the skins of a sacrificed herd of as many as 60 cattle for ritual ceremonies such as installing a new leader. This is because they felt that this was an important ritual for their well-being, reproduction and production—but, obviously, a norm not followed by their northern counterparts.

The second example refers to the Lunda. They are descendants of the Lunda Kingdom and were among the second cluster to settle in Zambia. One group settled in Region I (North-western) while the other settled in Region II (Luapula). Traditional customs and norms, including the language of the Luapula-Lunda, are close to those of the Aushi and Bemba societies of Regions II and III, respectively (Brelsford 1965). By contrast, the North-western Lunda are closely identified with ethnic societies in Region I such as the Ndembu and to a certain extent their close neighbour—the Lozi of Region IV.

Corinaldi (1966) provides some reasons that may account for regional cultural differentials in Zambia. He states that climatic and environmental conditions in a particular region could have had an impact on determining the means of subsistence—the main preoccupation of ethnic societies. In turn, means of subsistence and technological knowledge and skills tailor decision making, overall traditional customs and norms including reproduction choices (Brelsford 1965; Lesthaeghe 1989b).

The differences between two societies—the Ngoni and the Kololo—both originally cattle-herding societies from South Africa, support Corinaldi's suggestion. The Ngoni settled in the south-eastern part of Zambia (Region VII). During the period of migrations into Zambia, this region was not suitable for cattle-rearing because it lies in a valley (the Luangwa) with limited grazing land and infested with tsetse fly as well as harbouring a large population of wild animals (Corinaldi 1966; Roberts 1976). However, the soils were suitable and rainfall sufficient for crop cultivation (Barnes 1968). It is most probable that crop farming was the main means of subsistence for ethnic societies in this region before the arrival of the Ngoni society. Therefore, the cultural customs and norms of the indigenous ethnic groups took precedence over those for the Ngoni society. Brelsford (1965) argues that the Ngoni defeated the Chewa in the battlefield but, culturally, the Ngoni were defeated. Apart from the language, which according to Barnes (1968) is only heard in songs and royal praises, the Ngoni have adopted the marriage customs of the Chewa and Nsenga. By contrast, the societal customs and norms of another migrant group, the Kololo, took precedence in the south-western region (Region IV). Like their counterparts, they were a cattle-herding society but they settled on the flood plains. These areas are usually sparsely populated and allow grass to grow freely, therefore, providing a good environment for cattle rearing (Corinaldi 1966; Roberts 1976).

The preceding paragraphs show that besides the region of origin, the environmental conditions prevailing in an area help to determine societal customs and norms. This justifies delineation of ethnic societies according to ethno-geographical locations of their villages. The regional demarcation presented in this section is mechanistic. It is meant to match the existing provincial administrative boundaries to ethno-geographical borders as an attempt to assess Mitchell's (1965) hypothesis that provincial fertility differentials are ethnic. The next section considers other attributes that this exercise uses to finally group societies whose current category is not obvious (borderline cases).

4.4 Affiliations based on kinship lineage

The social and community arrangements underlying reproduction in Zambian ethnic societies include social organisation, patterns of marriage, religious beliefs and kinship lineage (Roberts 1976). This section uses one feature only—kinship lineage—to identify societies with similar traditions. Kinship lineage is selected for our purpose because, as discussed in Chapter 2, it provides an important basis for understanding African societies (Hull 1980). Ohadike (1990) states that kinship organisation is an important determinant of marriage and family formation as well as fertility levels, patterns and variation in pre-industrial Zambia. Past research on fertility differentials in Zambia—for example Mitchell (1965)—has used this variable to group ethnic societies. Therefore, to assess Mitchell's hypothesis that fertility differentials exist between ethnic societies in Zambia, this research first replicates and then improves on his method.

Brelsford (1965) and to a lesser extent Roberts (1976) describe the kinship lineages of ethnic societies found in Zambia. The following paragraphs describe these lineages to aid regional regrouping of societies whose membership in Table 4.2 is not obvious.

4.4.1 Zambian ethnic societies tracing relations through cognatic kinship lineage

Societies in Region IV (as presented in Table 4.2) trace relations through cognatic kinship lineage. Mitchell (1965) describes the kinship lineage of these societies as 'western composite'. Gluckman (1950: 171) states that "there is no dominant unilineal kin-group, either in the father's patrilineal or the mother's matrilineal lines…every child, legitimate, illegitimate and adulterine has the right to make its home in a village of either its mother's parents and to inherit there…it also has these rights with the kin of its father…". Initially these societies used to trace relations through matrilineal kinship only before taking on patrilineal kinship (Roberts 1976). The Kololo—who are patrilineal—must have introduced their patrilineal kinship lineage among these societies in the mid 19^{th} Century (Mainga 1973).

All borderline societies—the Mbunda, Totela and Subiya—in Region IV (Table 4.2) are retained in this region. Brelsford (1965) identifies the Mbunda, Totela and Subiya societies with this region based on their kinship lineage. Like most ethnic groups in Region I, the Mbunda society came from the Lunda Kingdom of the DRC. However, geographically, most Mbundas are in Region IV and their descendants have lived among societies in this region for a long time and thus they have adopted the cultural customs and norms of the Lozi (Papstein 1994). Similarly, Mainga (1973) argues that the kinship lineage and other traditional customs and norms of the Totela and Subiya are typical of other societies found in Region IV.

In addition, the Lukolwe society is reclassified from Region I to Region IV. According to Brelsford (1965), the kinship lineage as well as other traditional customs and norms of this society are similar to ethnic societies in Region IV.

4.4.2 Zambian ethnic societies tracing relations through dual kinship lineage: matrilineal kinship with a strong emphasis of patrilineal inheritance

Although societies in Region VI (Table 4.2) trace relations through matrilineal kinship, patriline wealth inheritance is an important component because of their dependence on cattle. Jaspan (1953) states that the Ila—a large society in Region VI—are matrilineal but they reckon inheritance through the male line. Roberts (1976) suggests that this is because they depended heavily on cattle rearing which they perceived to be a male-oriented task. Colson (1958; 1960; 1968a) observes that the matrilineal kinship of the Tonga society of Region VI is "…not linked together in any fashion…ties not stable and impervious to time" (Colson 1958: 16-17). This suggests that the Tonga also place emphasis on patrilineal inheritance since they too are also heavily dependent on cattle rearing.

Holden and Mace (2003) show that matrilineal Bantu-speaking cultures abandon their matriliny when they start keeping cattle. They argue that this is because matrilineal societies survive on extensive agriculture—that is, they do not use ploughs when farming nor do they domesticate large animals. Therefore, their social organisation is flexible and adaptive to the environment because their survival is not always certain. This is why compared with other kinship lineages, matrilineal societies who acquire cattle (or any other large animals) tend to adopt patrilineal or mixed descent (Holden and Mace 2003).

Based on kinship lineage, three societies are regrouped from Region V to Region VI. Brelsford (1956: 62) links the Lenje to societies in Region VI—stating that in terms of economic and social organisation, "the Lenje…are more closely allied to the Ila-Tonga group than they are to their neighbours in the north and east." Jaspan (1953: 10) also states that "the Tonga are closely related in both culture and language to the Ila, the Sala and the Lenje...". In this group, he also includes the Soli and the Goba. The other societies include the Subiya and the Totela, however, he states that these societies bear the strongest resemblance to ethnic societies in the western part of Zambia grouped in Region IV although their languages resemble societies in Region VI.

4.4.3 Zambian ethnic societies tracing relations through patrilineal kinship

The Lunda (Region I), and all ethnic societies that settled in Region III apart from the Bemba, trace their relations through patrilineal kinship. Roberts (1976: 73) states that in "…their custom of patrilineal descent, as in their languages, they represent a southward extension of East African cultural traditions". Watson (1958) observes that the Mambwe and Lungu (major ethnic societies in Region III) are patrilineal Bantu peoples who were once part of the societies drifting southwards away from the Great Lakes Region. They "…differ greatly from the matrilineal peoples on the plateau to the south such as the Bemba…but are more akin to those of the Tanganyikan tribes…" (Watson 1958: 14). Therefore, we allocate the Bemba to Region II. However, it is not possible to move the Lunda (Region I) to Region III because neither is it a borderline case nor is it near Region III.

Both the Senga and Kamanga societies are reclassified under Region III because—according to Brelsford (1965)—these societies are patrilineal. He states that the former society adopted its patrilineal kinship from the latter. The Tumbuka (Region VII) is also reclassified because it is another society whose patrilineal kinship is linked to the Senga by Roberts (1976) and to the Kamanga by Brelsford (1965). Likewise, the Ngoni society is regrouped from Region VII to Region III because despite settling among matrilineal societies they have maintained their patrilineal kinship norm. Barnes (1968) argues that the Ngoni have created an integrated culture by keeping the patrilineal kinship of their Zulu ancestors and their Shona captives while adopting the matrilineal marriage norms and customs of their Chewa and Nsenga captives. Therefore, their "lineage systems belongs to one variety and the Ngoni residential systems to another" (Barnes 1968: 56).

4.4.4 Zambian ethnic societies tracing relations through matrilineal kinship

Except for the Lunda, the literature suggests that ethnic societies in the remaining regions (I, II, V and VII of Table 4.2) are full corporate matrilineal kinship societies. In these societies, customs such as adult life initiation ceremonies to prepare adolescent young women are similar (Roberts 1976). However, Roberts (1976: 74) states that "within this common pattern of custom and belief, we can discern regional variations which probably developed by the 16th Century". For example, societies in Region I perform initiation ceremonies for young men as well. These ceremonies are similar to those performed for young women except they include circumcision and spiritual dances meant to earn the support of ancestors (Turner 1979).

After making changes to the other three kinship lineages groups discussed above, Regions I, II, V and VII (matrilineal kinship) remain unchanged. The Bemba and the Bisa are reallocated from Regions III and VI, respectively to Region II. Watson (1958) and Richards (1968) define the Bemba as a matrilineal society while Roberts (1973) affiliates the Bisa to societies in Regions II and V particularly the Bemba society.

There are three groups of retentions as well. First, apart from their descendants settling in Region VII, Brelsford (1965) points out that the social organisation of the Ambo is similar to the Nsenga and Chikunda of Region VII rather than the Lala or Lamba societies. Poole (1949) describes how the Ambo have assumed the customs and norms of societies in Region VII. He therefore groups them with the native ethnic groups of the East Luangwa Province of Northern Rhodesia (the equivalent of Region VII). Second, the language and social organisation of the Lala, Lamba and Swaka societies are similar to those in Region II (Brelsford 1965). However, these societies form an autonomous group (Region V) because of geographic separation due to the protruding DRC border.

Third, despite being patrilineal, the Lunda are retained in Region I. Although Roberts (1976) suggests that the Lunda are a patrilineal society, he does not provide enough information to support this. Turner (1979), who provides details concerning the kinship lineage of the Ndembu-Lunda, states that they are matrilineal although they seem "…to have lost central authority and military organisation they may have possessed at first…" (Turner 1979: 2). During this disintegration, they might have changed their social arrangements as well. Therefore, at this point, it is difficult to move them without more information on their kinship lineage especially that they are neither a borderline case nor geographically near the patrilineal societies.

Table 4.3 re-presents Table 4.2 after the reallocations discussed above—that is after considering similarities in kinship lineage. To identify the largest Zambian societies, the table shows the 1953 population estimates provided by the Zambian colonial government (Brelsford 1956: 124-125). We use 1953 figures rather than the 1962 figures presented in Brelsford (1965) for two reasons. First, tribal population figures collected in later enumerations did not capture tribesmen who had migrated to other areas (Brelsford 1965). This is because information collection was restricted to people living under their respective chiefs. Second, the 1953 figures coincide with the reference period of most of the materials discussing these societies. To assess changes on ethnic composition in Zambia, Chapter 6 presents more recent population figures for these societies.

Table 4.3 Ethnic societies according to region of settlement and kinship lineage system

Region I

Society	Population in 1953 Number	Population in 1953 Per cent
1 Luvale	49,097	24.4
2 Kaonde	42,354	21.1
3 Lunda	40,131	20.0
4 Ndembu	33,216	16.5
5 Luchazi	21,442	10.7
6 Chokwe	11,355	5.7
7 Mbowe	2,941	1.5
8 Mbwela	280	0.1
9 Luba	N/S	
10 Lwena*		
Total	200,816	100.0

Region II

Society	Population in 1953 Number	Population in 1953 Per cent
1 Bemba	144,511	32.5
2 Lunda	82,050	18.4
3 Bisa	50,804	11.4
4 Aushi	43,163	9.7
5 Chishinga	28,735	6.5
6 Ngumbo	28,047	6.3
7 Mukulu	20,882	4.7
8 Tabwa	15,320	3.4
9 Kabende	9,355	2.1
10 Unga	9,204	2.1
11 Shila	7,300	1.6
12 Bwile	5,899	1.3
13 Batwa*		
14 Ngwela*		
Total	445,270	100.0

Region III

Society	Population in 1953 Number	Population in 1953 Per cent
1 Ngoni	66,589	30.1
2 Lungu	38,073	17.2
3 Senga	25,811	11.7
4 Tumbuka	25,300	11.4
5 Mambwe	21,388	9.7
6 Inamwanga	12,400	5.6
7 Iwa	12,249	5.5
8 Tambo	5,340	2.4
9 Yombe	4,234	1.9
10 Fungwe	2,849	1.3
11 Nyika	2,630	1.2
12 Lambya	1,953	0.9
13 Wenya	900	0.4
14 Wandya	800	0.4
15 Kamanga	500	0.2
16 Sukwa*		
Total	221,016	100.0

Region IV

Society	Population in 1953 Number	Population in 1953 Per cent
1 Lozi	54,605	22.9
2 Kwangwa	34,866	14.6
3 Mbunda	32,111	13.5
4 Nkoya	28,785	12.1
5 Kwandi	13,841	5.8
6 Totela	13,765	5.8
7 Subiya	9,705	4.1
8 Ndundulu	7,649	3.2
9 Lushange	7,000	2.9
10 Makoma	6,557	2.7
11 Mashasha	5,876	2.5
12 Nyengo	5,833	2.4
13 Simaa	5,440	2.3
14 Mwenyi	4,804	2.0
15 Shanjo	3,385	1.4
16 Mashi	3,377	1.4
17 Lukolwe	892	0.4
Total	238,491	100.0

Region V

Society	Population in 1953 Number	Population in 1953 Per cent
1 Lala	55,936	41.5
2 Lamba	35,175	26.1
3 Swaka	17,647	13.1
4 Lima	15,210	11.3
5 Seba	6,000	4.5
6 Luano	4,808	3.6
Total	134,776	100.0

Region VI

Society	Population in 1953 Number	Population in 1953 Per cent
1 Tonga	164,829	58.8
2 Lenje	42,723	15.2
3 Soli	19,208	6.8
4 Ila	17,737	6.3
5 Toka	16,257	5.8
6 Goba/Gowa	7,436	2.7
7 Leya	6,256	2.2
8 Sala	4,034	1.4
9 Lumbu	2,063	0.7
10 We	N/S	
Total	280,543	100.0

Region VII

Society	Population in 1953 Number	Population in 1953 Per cent
1 Chewa	127,824	54.0
2 Nsenga	73,568	31.1
3 Kunda	19,447	8.2
4 Ambo	11,657	4.9
5 Chikunda	4,383	1.9
Total	236,879	100

Notes: Grouping based on Brelsford's (1965) Tribal and Linguistic map.
The layout of the table broadly reflects geographical location in Zambia - for example Region I is North-western and Region VI is South-central.
*Not in the Tribal and Linguistic Map but discussed by Brelsford.
NS means the population figure of the specific society is not stated probably because it is included in a larger society which is however not specified by Brelsford.

Region IV has the largest number of ethnic societies followed by Regions III and II respectively, while Regions V and VII have the fewest. Of the nearly 1.7 million inhabitants in 1953, Region II had the largest population (about 25 per cent of the national total) while Region V had the smallest (less than 10 per cent of the national total).

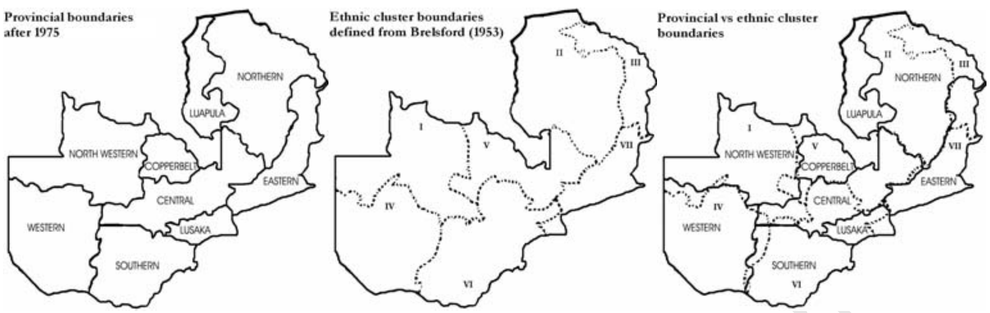
The 1953 population distribution also shows intracluster ethnic variations within each grouping. Three of the eight enumerated societies in Region I account for 65 per cent of the total population in this cluster—about 20 per cent each. The other regions had only one society with a large population in 1953. These data provide insight into the larger ethnic societies in each cluster as well as the country as a whole. This information is useful in Chapter 6 when we present more recent population figures for these societies. This knowledge also explains why Region I is represented by three (Kaonde, Lunda and Luvale) out of the seven Zambian official languages—the others are Bemba, Lozi, Nyanja and Tonga (Central Statistical Office [Zambia] 2003b). Nyanja is a language spoken by some ethnic societies found in Region VII (Barnes 1968). Regions II, IV, VI and VII are represented by one language each, that is Bemba, Lozi, Tonga and Nyanja, respectively. None of the current official languages represents societies in Regions III and V.

Different population sizes of ethnic societies and the number of societies in each region may have implications for the homogeneity of these regional clusters. Regions II, IV, VI and VII may be more homogenous because they are dominated by one society each. By contrast, Region I may not be as homogenous because it is not dominated by one society. Similarly, holding other factors constant, regions with many societies (Regions II, III and IV) may not be as homogenous compared with those with fewer societies.

Figure 4.3 compares the ethno-geographical location of the seven clusters presented in Table 4.3 with Zambia's administrative boundaries. The dotted lines show the ethno-geographic regional boundaries as defined from Brelsford's map while the solid line represents the provincial administrative boundaries. The disparity in the two boundaries is minor for Regions I and IV versus the North-western and Western Provinces respectively. However, major disparities exist for the remaining ethno-geographical clusters versus provincial boundaries. Region VI covers three provinces—the Central, Lusaka and the Southern Provinces while Region V covers the Central and Copperbelt Provinces. Societies in Regions III and VI as well as Regions II and III share the

Eastern and Northern Provinces respectively. Lastly, Luapula and Northern Provinces share ethnic societies in Region II.

Figure 4.3 Regional clusters of ethnic societies according to location of ethnic settlement and kinship systems relative to provincial boundaries



Provincial map scanned from CSO (2003b).

This suggests that the conclusion drawn by the CSO (1975) that provincial fertility differentials are ethnic is most probably inaccurate and oversimplified. Chapter 6 presents and compares fertility indices for groups of ethnic societies derived in the next chapter in order to evaluate whether regional fertility differentials are indeed a reflection of ethnic fertility.

4.5 Comparability of the ethno-geographical regional clusters

This section compares the clusters presented in Table 4.3 with those obtained for similar purposes by other researchers.

4.5.1 Kinship lineage clusters of Zambian ethnic societies

Apart from five differences, the clusters (Table 4.4) reported by Mitchell (1965) arising from his 1961 study are identical to those presented in Table 4.3. The first three differences are minor but the last two are more significant. First, Mitchell has 14 clusters because he subdivides most groups into smaller units. Second, Mitchell does not address all societies presented in Table 4.3. Only three of the 17 societies in Region IV appear in his groupings and in each of the other regional groupings, at least one society is missing in his classifications.

Third, the Henga, Kawendi, Lakeshore Tonga, Malila, Ngoni (Gomani and Mbelwa), Nguru, Sena, and Yao societies are not found in Zambia but in its neighbouring countries. Further, Mitchell (1965) presents the Nyanja as a society but as Barnes (1968) argues, Nyanja is not a distinct ethnic society but a language spoken by some ethnic societies found in the eastern part of Zambia. That is why it does not appear on Brelsford's (1965) Tribal Map of Zambia. Contemporary classifications perpetuate this misconception. Gordon's (2005) Ethnologue Maps present Nyanja as an ethnic society in the ethno-geographical regional residence of the Chewa and Ngoni. The census as well as the Demographic and Health Survey also recognise Nyanja as an ethnic society. Therefore, in this thesis, we also regard Nyanja as part of ethnic societies found in eastern Zambia. This should not be a problem because considering population size of ethnic societies found in this region, the proportion of the Nyanja group is not significant.

Table 4.4 Ethnic societies in Zambia grouped by Mitchell according to region and lineage type

Region	Societies by lineage type					
North-western	Matrilineal - Ndembu type		Matrilineal - Lwena type			
(Region I)	Ndembu	Kaonde	Lwena	Chokwe		
	Lunda		Luvale	Mbunda		
			Luchazi			
South-western	Composite - Lozi type					
(Region IV)	Nkoya	Lozi				
	Mbwela	Mbowe				
North-eastern	Patrilineal - Mambwe type		Patrilineal - Tumbuka type		Undefined - Ngoni type	
(Region III)	Mambwe	Iwa	Henga	Nyika	Mpenzeni Ngoni	Gomani Ngoni
	Lungu	Sukwa	Tumbuka	Malila	Mbelwa Ngoni	
	Inamwanga	Tambo	Fungwe	Lambya		
			Kamanga			
South-eastern	Matrilineal - Nyanja type		Matrilineal - Nsenga type			
(Region VII)	Chewa	Nguru	Nsenga			
	Nyanja	Sena				
	Lakeside Tonga	Chikunda				
	Yao					
North-central	Matrilineal - Bemba type		Matrilineal - Luapula type		Matrilineal - Aushi type	
(Region II)	Bemba	Tabwa	Lunda	Chishinga	Aushi	Unga
	Bisa	Senga	Bwile	Shila	Mukulu	Ngwela
					Ngumbo	
Central	Matrilineal - Lamba type					
(Region V)	Lamba	Ambo				
	Lala	Swaka				
	Lima	Kawendi				
	Luano					
South-central	Matrilineal - Lenje type		Matrilineal - Tonga/Ila type			
(Region VI)	Lenje	Sala	Tonga	Subiya		
	Soli		Ila	Toka		

Source: Mitchell (1965: 10).

Fourth, it is difficult to understand the basis for some of Mitchell's (1965) classifications without further information on the procedures he used to classify the societies, as he does not present or reference it. Mitchell places the Mbunda and Subiya (Region IV in Table 4.3) in Regions I and VI respectively. Meanwhile, the Mbowe and Mbwela (Region I in Table 4.3) appear in Region IV. Lastly, Mitchell groups the Senga (Region III in Table 4.3) and Ambo (Region IV in Table 4.3) with societies found in Regions II and V respectively. However, when we consider the population size of these groups, the differences in the classifications are not significant.

4.5.2 Murdock's ethnic clusters of Zambian ethnic societies

When compiling and coding cultural and social information on ethnic societies of the world, Murdock (1967a) classified the societies according to region and broad ethnic clusters. Murdock does not provide details of the classification procedure he employed. However, it is most likely that the grouping was qualitative—similar to the one discussed in the preceding paragraphs.

Table 4.5 presents Zambian ethnic societies grouped according to Murdock's regional and ethnic classifications. To aid the discussion that follows, the table presents population figures from Brelsford (1965). The table does not present figures provided by Murdock (1967a) because they are scanty and inaccurate, and therefore incomparable. Some figures, especially for ethnic societies near the border, are implausibly high. It is most likely that he did not limit them to Zambian societies, but to the entire ethnic group irrespective of their country of residence.

Table 4.5 Ethnic societies grouped according to Murdock's classification of Zambian ethnic societies

Region	Ethnic cluster	Society name	*Ethno-geographic region in Zambia	**Number in 1953
Equatorial Bantu	Luba	Luba	*Region I*	.
NEastern Bantu	Rukwa	Iwa	*Region III*	12,249
		Mambwe[1]	*Region III*	21,388
Central Bantu	Nguni	Ngoni	*Region III*	66,589
	Lunda	Luvale	*Region I*	49,097
		Ndembu	*Region I*	33,216
		Luchazi	*Region I*	21,442
		Chokwe	*Region I*	11,355
	Bemba-Lamba	Kaonde	*Region I*	42,354
		Bemba	*Region II*	144,511
		Lunda-Luapula	*Region II*	82,050
		Shila	*Region II*	7,300
		Tumbuka	*Region III*	25,300
		Lala	*Region V*	55,936
		Lamba	*Region V*	35,175
	Ila-Tonga	Tonga	*Region VI*	164,829
		Ila	*Region VI*	17,737
	Maravi	Chewa	*Region VII*	127,824
		Kunda	*Region VII*	19,447
		Nyanja	*Region VII*	.
Southern Bantu	Barotseland	Lozi	*Region IV*	54,605

Sources: Murdock (1967).

Notes: 1. Misclassified as central Bantu in Murdock's Ethnographic Atlas. The Mambwes are part of the Rukwa ethnic cluster of North-eastern Bantu (Walsh and Swilla 2001). This is therefore corrected here.

*The ethno-geographic location in Zambia is based on origin, region of traditional settlement and lineage group according to the data in Table 4.3.

**Population figures for 1953 obtained from Brelsford (1956).

Murdock divided ethnic groups in the sub-Saharan region into four groups—Central Bantu, Equatorial Bantu, North-eastern Bantu and Southern Bantu. The first column of Table 4.5 shows that at least one Zambian ethnic society falls into each of the four groups, with the majority falling under the Central Bantu. Murdock's grouping closely reflects the clusters based on origin and arrival in Zambia discussed in Section 4.2 and presented in Table 4.1. Where there are differences in classifications, it is most likely because Murdock (1967a) considered other features besides origin and when they migrated into Zambia.

Murdock (1967a) further split the broad ethnic groups into smaller clusters[4]. These ethnic clusters are similar to the clusters presented in Table 4.3 that consider region of settlement and kinship lineage apart from origin and period of arrival in Zambia. The second column of Table 4.5 shows that apart from the Central Bantu, each broad group has one ethnic cluster—the Luba, Rukwa and Barotseland. The Central Bantu has five ethnic clusters of Zambian societies. The Bemba-Lamba cluster has the most societies (seven) followed by the Lunda (four societies) and the Maravi cluster with three societies.

Murdock's ethnic cluster compositions are also similar to those presented in Table 4.3 (shown in column four of Table 4.5). However, there are four differences between these two classifications (the second column versus the fourth column of Table 4.5). First, in column four, the Ngoni are in the Rukwa ethnic cluster with the Iwa and Mambwe (Region III). Section 4.4 has offered reasons for this grouping—that is, despite picking up customs and norms of other Zambian ethnic societies, the Ngoni's have kept their patrilineal kinship (Barnes 1968). It could be that Murdock (1967b: 116) did not consider regrouping the Ngoni because their patrilineal kinship is supposedly rudimentary as he simply notes that they "…are vestigial patrisibs".

Second, in column four (Table 4.5), the Kaonde are in the Lunda ethnic cluster (Region I) while in Murdock's grouping they are in the Bemba-Lamba group. The preceding paragraphs justify our grouping based on region of settlement. Rather than the Bemba-Lamba group, the villages of the Kaonde fall in the Lunda ethno-geographic region. Third, in column four, the Tumbuka are in the Rukwa ethnic cluster (Region III). It may be that Murdock did not consider their transformation from a matrilineal society to a patrilineal kinship society. Nonetheless, Murdock (1967a: 9) recognises that "the Tumbuka were formerly a matrilineal or a non-patrilineal society"

[4] In total, Murdock has 85 ethnic clusters of sub-Saharan traditional societies.

Lastly and of least importance, Murdock combines Regions II and V into one cluster (Bemba-Lamba). In our case, the main reason for splitting these groups is the geographical separation because of the DRC boundary protruding into Zambia.

Murdock addresses only the most prominent (those with large population size) ethnic societies of Zambia—a fraction of the societies presented in Table 4.3. Most societies covered (six and four respectively) represent Regions I and III and only one society represents Region IV. This unequal distribution may suggest cultural diversity within these regions or possibly other reasons such as interest by anthropologists who collected information on these societies. Apart from Region IV, the societies in Murdock (1967b) represent all regions by more than 50 per cent of the total ethno-geographical regional populations in 1953. The Lozi society accounts for only 23 per cent of the 1953 total population size in Region IV. However, they adequately represent all societies in this region because of the acculturation feature of the Barotse (Region IV) societies (Mainga 1973).

Inclusion of the Lunda, Bisa, Aushi, Lungu, Senga, Swaka and Lima would have improved sample representation because the 1953 count suggests that the population sizes of these societies was large (about 10 per cent between them). However, there is also evidence to suggest that these societies are similar to those included in Murdock's Ethnography Atlas. Turner (1979: 2) states that Lundas are similar to the Ndembu and refers to them as the "Ndembu Lunda". Cunnison (1959) and Roberts (1973) observe that the Bembas and Bisas as well as the Luapula-Lunda and Aushi are similar to one another and all ethnic societies in Region II. Brelsford (1965) extends these similarities to societies in Regions V that include the Swaka and the Lima. Lastly, the Mambwes and the Iwa are similar to the Lungus and Inamwangas, respectively (Watson 1958; Brelsford 1965; Walsh and Swilla 2001) while the Tumbuka are similar to the Senga and the remaining smaller ethnic societies in Region III (Brelsford 1965).

4.5.3 Linguistic clusters of Zambian ethnic societies

Societies with a similar language are more likely to share similar cultural customs and norms than those with different languages. Roberts (1976) observes that the linguistic and archaeological evidence shows that some languages have been spoken in Zambia for a long time while others have evolved and transformed during migrations and conquests—probably in line with the history and migration movements of Zambian ethnic societies discussed in the preceding sections.

Kashoki and Mann (1978) asked twenty-five Zambians, each with a different language, to translate one hundred words from English into their own language. They analysed the translations for similarities and differences. Table 4.6 shows ethnic societies grouped according to similarities in language. Information in the last column refers to the ethno-geographical groupings presented in Table 4.3.

Table 4.6 Ethnic societies in Zambia grouped according to language groups

Region	Language group	Principal modern languages	Other related languages	*Ethno-geographic region in Zambia
Western	Lunda - NWestern	Lunda		Region I
	Kaonde	Kaonde		Region I
	Wiko	Luvale		Region I
		Luchazi		Region I
		Chokwe		Region I
		Mbunda		Region IV
	Nkoya	Nkoya	Lukolwe	Region IV
			Mbwela	Region I
	Luyana/Lozi	Kwangwa		Region IV
		Kwandi		Region IV
		Makoma		Region IV
		Mashi		Region IV
Eastern	Chewa	Nyanja		Region VII
	Central		Kunda	Region VII
			Nsenga	Region VII
	Tumbuka	Tumbuka	Senga	Region VII
Southern	Central	Tonga	Toka	Region VI
			Leya	Region VI
			Ila	Region VI
			Sala	Region VI
			Lenje	Region VI
			Soli	Region VI
			Subiya	Region IV
			Totela	Region IV
Northern/Central	Corridor	Mambwe	Lungu	Region III
		Inamwanga	Iwa	Region III
		Lambya	Tambo	Region III
		Nyika		Region III
	Central	Bemba	Aushi	Region II
			Chishinga	Region II
			Shila	Region II
			Tabwa	Region II
			Unga	Region II
			Twa/Batwa	Region II
			Bisa	Region II
			Lamba	Region V
			Swaka	Region V
			Lala	Region V
			Ambo	RegionVII

Source: Roberts (1976: 69).
Note: This table is based on Kashoki and Mann's work but was presented by Roberts before they published their work.
*The ethno-geographic location in Zambia is based on origin, region of traditional settlement and lineage group according to the data in Table 4.3.

According to their classifications, there are 19 principal languages (third column) grouped into nine major tongues (second column) or eleven if broken down according to geographical regions (Kashoki and Mann 1978). The principal languages have 27 dialects (fourth column). As expected, some regions have more than one major language grouping and sometimes several principal languages as well as dialects. There are three major languages spoken in Region I (North-western Lunda, Kaonde and Wiko) and Region VII (Chewa, Eastern and Tumbuka). There are two major languages spoken in Region IV (Nkoya and Lozi) while the remaining regions speak one major language each. All the regions are multilingual because Regions I, III and IV have more than three principal modern languages while Regions II, V, VI and VII have more than three dialects.

Most importantly, apart from seven exceptions, Kashoki and Mann's (1978) classification—which is also similar to Maho's (2007) linguistic classification of the Bantu—is not different from that in Table 4.3. Mbunda (Region IV) is a principal language spoken in Region I. Although the Mbwela are in Region I, Table 4.6 shows that they speak languages similar to those spoken by societies in Region IV. The Totela and Subiya languages (Region IV) are similar to those spoken by societies in the Region VI. The Lala, Lamba and Swaka languages (Region V) are akin to those spoken in Region II. The preceding sections have justified these differences. Besides, language is not suitable for grouping ethnic societies without considering other attributes (Lesthaeghe 1989a; Kaufman and James 2003).

4.5.4 Political clusters of Zambian ethnic societies

This section evaluates if seven is the most appropriate number for grouping the 80 ethnic societies found in Zambia. To compute the possible number of clusters of ethnic societies in Zambia, we adopt a method used by Mozaffar and Scarritt (2002) to measure ethno-political cleaverages in Zambia. They apply the Ethno-political Group Fragmentation Index (EPGFI) to the proportion of the total population shared by ethnic societies or groups of ethnic societies. The EPGFI is a measure used in political studies to compute the number of political groups in a country that are based on ethnic affiliation. It is derived from the inverse of the Herfindahl-Hirschman concentration index—an index used in economics to measure market concentration based on the proportions of the market that are shared by each firm (Equation 5.1).

$$EPGFI = \frac{1}{\sum g_i^2} \qquad 5.1$$

where g_i is the proportion of the total population shared by each ethnic group. Mozaffar and Scarritt (2002) do not state how they determined the ethnic groupings from the ethnic societies in Zambia on the data that they applied to this end. They mention that the data refers to the 1990-91 period (it is most likely the 1990 Census). Table 4.7 presents the proportion of the total population shared by each group of ethnic societies in Zambia.

Table 4.7 Proportion of the total population shared by each ethno-political group

Bemba/Mambwe		Tonga/Ila/Lenje[2]		Chewa/Tumbuka		Lunda/Kaonde		Barotse	
Bemba/Bisa	22	Tonga		Chewa/Ngoni	13	Lunda	5	Lozi	7
Luapula[1]	8	Ila		Tumbuka	3	Luvale	4	Nkoya	1
Lamba/Lala	8	Lenje		Kunda	2	Kaonde	3		
Mambwe	5								
Total proportion	**43**		**19**		**18**		**12**		**8**

Source: Mozaffar and Scarritt (2002: 26).
Notes: 1. Traditional societies in Luapula province of Zambia.
2. The proportion of each tribe in this group is not specified.

The Bemba/Mambwe group is the largest and the Barotse is the smallest. This is consistent with the information in Table 4.3. Mozaffar and Scarritt (2002) report applying the information presented in Table 4.7 to Equation 5.1. They get an EPGFI of 3.65 nationally (using proportions of the five broad groupings) and 7.14[5] when societal proportions are applied. These values suggest that there are between three and seven groups of ethnic societies (or political groups based on ethnic affiliation) in Zambia. Mozaffar and Scarritt (2002) state that the latter EPGFI is more appropriate because Zambia is a fragmented country due to obvious intrasocietal differences.

However, Mozaffar and Scarritt (2002) oversimplify their groupings. They do not consider all the ethnic societies found in Zambia or explain the basis of their broad groupings. Grouping the Bemba and Mambwe as well as the Tumbuka and Chewa in the same clusters casts doubt on the procedures they applied to arrive at the five broad groupings. The preceding sections have shown that these societies belong to different groups. Consequently, this affects their computed EPGFI. As a check, we recompute the EPGFI using the 1953 proportions as presented in Table 4.3—we get an EPGFI figure of 6.2. This means that, as at 1953, there should have been six groups of ethnic societies (or political groups based on ethnic affiliation) in Zambia. Therefore, the results from the EPGFI method does not contradict the number of clusters (seven) proposed in Table 4.3.

[5] Applying Equation 5.1 to the information in Table 4.7 gives an EPGFI of 7.8. The difference could be due to rounding of figures presented by Mozaffar and Scarritt.

4.6 Conclusion

The aim of this chapter was to derive ethnic clusters in Zambia using qualitative information. This derivation considered homogeneity within, and diversity between, region of origin, location of ethnic villages, and kinship lineage while trying as much as possible to align these ethno-geographical demarcations to provincial administrative boundaries. Up to this point, the derived clusters are no different from those proposed by other authors, regardless of differences in objectives. This suggests that the seven clusters derived in this chapter, as presented in Table 4.3, are a good representation of the ethnic clusters found in Zambia.

This exercise also shows that Zambian ethnic societies have diverse migration histories. In turn, these coupled with different regions of settlement have shaped cultural customs and norms of Zambian ethnic societies. These cultural differences underpin regional or ethnic fertility differentials. Clusters of ethnic societies derived in this chapter serve as a first step towards avoiding confounding regional and ethnic fertility differentials which as discussed in Section 2.4.2.2 past studies examining subnational fertility have suffered. The chapter also equips us with information for interpreting multivariate cluster analysis results in the next chapter. The next chapter applies multivariate cluster analysis to several features that influence reproduction in pre-industrial societies to derive clusters of ethnic societies in Zambia that have similar traditional reproductive features.

5 EXPLAINING PAST FERTILITY DIFFERENTIALS: DERIVING TRADITIONAL REPRODUCTIVE REGIMES IN ZAMBIA

> "Admittedly, nothing is more difficult than forming ethnic clusters, and choices are always to some extent arbitrary…With these caveats in mind, we shall now turn to some statistical work" (Lesthaeghe and Eelens 1989: 95, 98).

5.1 The use of cluster analysis to derive traditional reproductive regimes

This chapter applies multivariate cluster analysis to derive ethnic clusters (traditional reproductive regimes). Deriving traditional reproductive regimes from several societies requires a quantitative method that simultaneously integrates complementary or co-varying attributes. Chapter 2 highlighted several attributes that govern reproduction in traditional societies while Chapter 4 documented many tribal societies in Zambia. Reducing these traditional societies to a manageable number allows for easier comparative analysis. However, it is preferable to base classifications of traditional societies on multiple attributes that influence reproduction in traditional societies. Such an approach avoids the subjectivity that may arise if fewer attributes are used as they may not expose overall and important differences (Maxwell, Pryor and Smith 2002). Use of multivariate cluster analysis avoids the limitations associated with defining ethnicity (in the context of reproduction) normatively or based on a few features only.

Multivariate cluster analysis computes the average of all attributes and then groups similar objects—in this case traditional societies—based on average properties. The procedure also exposes the overall pattern of the various attributes defining the groups. Defining and identifying traditional reproductive regimes in Zambia using multivariate cluster analysis attains two ancillary objectives. First, based on anthropological evidence, the method identifies ethnic societies with similar features governing traditional reproduction. Second, the method spells out the overall similarities and differences of features influencing reproduction and, therefore, highlights those that underlie fertility differentials between ethnic societies.

The next section describes multivariate cluster analysis as a statistical tool. Section 5.3 derives clusters of societies with similar traditional reproductive behaviours in Zambia using societies for which data are available in Murdock's (1967a) Ethnographic Atlas. Section 5.4 discusses the possible limitations of the methods applied and evaluates the approach adopted to define traditional reproductive clusters in Zambia.

5.2 Multivariate cluster analysis: procedure and techniques

Predictive discriminant analysis, logistic regression and cluster analysis are statistical procedures that classify multivariate observations into groups based on similar averages or overall patterns of attributes defining a particular phenomenon (Sall, Creighton and Lehman 2005). The first two procedures reassign observations to known groups before computing similarities between elements in each category using continuous variables such as age and income (Hand, Mannila and Smyth 2001). Unlike the other two procedures, cluster analysis does not require predetermined classifications and none of the variables need be continuous (Everitt, Landau and Leese 2001).

Therefore, since no obvious classifications exist, multivariate cluster analysis is the most suitable procedure for grouping ethnic societies in Zambia rather than predictive discriminant analysis or logistic regression. In addition, almost all anthropological attributes underlying reproduction in traditional societies are categorical variables. The following paragraph and sections discuss techniques for performing multivariate cluster analysis procedures.[1]

Cluster analysis forms classes based on multivariate descriptions—in this case similar traditional patterns of reproduction—by grouping observations that are similar, thereby minimising within-cluster variation and maximising between-cluster variation (Everitt, Landau and Leese 2001). A single point, the multivariate mean, can then be used as a replacement for the grouped observations. The focus of multivariate cluster analysis is to determine characteristics that define the clusters, the number of clusters and the observations that belong to each cluster (Smith 2002). To achieve this, multivariate cluster analysis should first measure multivariate distances (also known as proximity measures). The procedure then applies these distances to divide a set of observations into groups. Therefore, to appreciate cluster analysis, an understanding of measures of proximity and their operation is essential (Everitt, Landau and Leese 2001; Maxwell, Pryor and Smith 2002).

[1] The discussion of cluster analysis procedures relies heavily on the material presented in Everitt, Landau and Leese (2001). This work provides a detailed review of the subject and it is cited in most software manuals that have multivariate cluster analysis modules.

5.2.1 Measures of proximity in cluster analysis

Proximity is a general term used to denote similarity or dissimilarity between multivariate observations (Hand, Mannila and Smyth 2001). In cluster analysis, proximity measurement is the mathematical technique for measuring the distance between multivariate observations to determine group membership (Everitt, Landau and Leese 2001). The procedure computes and then compares the average multidimensional distances of all variables for each observation to identify those that are multidimensionally close, and those that are far apart. If the average distance between observations is small then the observations are deemed to be similar and therefore belong to the same group. Proximity is measured using one of two complementary indices—the coefficients of dissimilarity and similarity (Everitt, Landau and Leese 2001). The coefficient of dissimilarity indicates the distances between observations while the coefficient of similarity shows the closeness of observations. If the coefficient of dissimilarity is small then that for similarity is large, and vice versa.

Specific measures of proximity have been defined for each variable type—ratio, interval, ordinal, and nominal. There are also proximity measures that are suitable for data sets containing both continuous and categorical variables as well as those that are appropriate for binary data. Everitt, Landau and Leese (2001) state that there is no particular criterion that can guide the selection of a measure of proximity. Instead, to determine the measure of proximity to adopt, one should jointly consider the reasons for undertaking a multivariate cluster analysis, the nature of the data, the scale of measurement and the clustering techniques.

This study adopts the Euclidean distance as its measure of proximity. The data used to cluster traditional reproductive societies in Zambia—obtained from the Murdock's Ethnographic Atlas—are similar to those used by Maxwell, Pryor and Smith (2002) in their application of cluster analysis in cross-cultural research. The Euclidean distance is a measure of proximity that is applicable to interval scaled variables. However, researchers have also used it to classify anthropological data—which is mostly categorical. Pryor (2003; 2005b) uses anthropological data also obtained from Murdock's Ethnographic Atlas in addition to that coded by himself to derive traditional economic systems. The Euclidean measure of proximity is applicable to ordinal data as well as categorical data if they are treated as interval scaled—this is achieved by transforming them into binary format or by manually assigning ordinal distances between states (Smith 2002).

The Euclidean distance technique is described below as presented by Everitt, Landau and Leese (2001) and Hand, Mannila and Smyth (2001). To begin with, we assume a representation of a multivariate data set matrix **X** containing $\boldsymbol{p}$ attributes (descriptions) describing $\boldsymbol{n}$ observations (societies).

$$\mathbf{X} = \boldsymbol{n} \text{ x } \boldsymbol{p} = \begin{bmatrix} x_{11} \ x_{12} \ \ldots \ x_{1p} \\ x_{21} \ x_{22} \ \ldots \ x_{2p} \\ . \\ . \\ . \\ x_{n1} \ x_{n2} \ \ldots \ x_{np} \end{bmatrix} \qquad 5.1$$

The distances (d_{ij}) between the $\boldsymbol{i}^{th}$ and $\boldsymbol{j}^{th}$ observation in this matrix are determined using the Euclidean distances defined by Equation 5.2 (Everitt, Landau and Leese 2001: 40):

$$d_e = \left(\sum_{k=1}^{p} \left(x_{ik} - x_{jk} \right)^2 \right)^{\frac{1}{2}} \qquad 5.2$$

where $\boldsymbol{x}_{ik}$ and $\boldsymbol{x}_{jk}$ are the $\boldsymbol{k}^{th}$ variable value of the $\boldsymbol{p}$-dimensional observation for objects $\boldsymbol{i}$ and $\boldsymbol{j}$. This is the distance between two $\boldsymbol{p}$-dimensional points in Euclidean space. The formula is applicable if the data are in a homogeneous multivariable space—i.e. variables are measuring attributes of similar units (Maxwell, Pryor and Smith 2002).

Usually, the data are diverse, i.e. they do not have similar variances because the variables measure different attributes of an object using different units (for example age, income). Dividing each variable by its sample standard deviation standardises the data so that the distances of each dimension are statistically similar (Hand, Mannila and Smyth 2001). Equation 5.3 estimates the standard deviation for the $\boldsymbol{k}^{th}$ attribute.

$$\hat{\sigma}_k = \left(\frac{1}{n} \sum_{i=1}^{n} \left(x_{ik} - \mu_k \right)^2 \right)^{\frac{1}{2}} \qquad 5.3$$

Standardisation converts all variables to the same scale resulting in variables that have a mean of zero and a standard deviation of one. This means that the measure of proximity—in this case, the Euclidean distance—should be scaled as well. The scaled measure is referred to as the squared Euclidean distance (Equation 5.4). It is a summation of the squared distances over all variables obtained by dividing the squared difference of each dimension by its standard deviation. It is therefore a form of standardisation or a special case of variable weighting (Everitt, Landau and Leese 2001; Maxwell, Pryor and Smith 2002).

$$d_s = \left(\sum_{k=1}^{p} \left(\frac{(x_{ik} - x_{jk})^2}{\hat{\sigma}_k} \right) \right)^{\frac{1}{2}} \tag{5.4}$$

In cases where some observations have missing data such as the ethnographic data used in this study, the measure of proximity to be applied should be adjusted so that only valid responses are considered (Maxwell, Pryor and Smith 2002). To achieve this, Backer (1995) suggests the use of an average scaled Euclidean distance. Maxwell and Buddemeier (2002: 79) present the modified squared Euclidean distance measure that accommodates missing data (Equation 5.5).

$$d_a = \left[\frac{\sum_{i \in valid} \left(\frac{(x_{ik} - x_{jk})^2}{\sigma^2} \right)}{card(valid)} \right] \tag{5.5}$$

where *valid* is the set of dimensions that have valid data in both x_{ik} and x_{jk}, and *card (valid)* is the number of valid dimensions.

5.2.2 Clustering algorithms

After measuring distance, clustering requires a suitable algorithm to group similar observations together and separate those that are different. The objective of a clustering algorithm is to minimise intracluster variance and maximise intercluster variance (Everitt, Landau and Leese 2001). There are two types of clustering algorithms—hierarchical and non-hierarchical.

5.2.2.1 Hierarchical clustering algorithms

Hierarchical clustering algorithms merge (divide) the closest (furthest) observations at each step and stop only upon attaining the specified number of groups or when there are no more objects to merge or divide (Maxwell, Pryor and Smith 2002). At each step of fusing or partitioning, the technique aims to find an optimal combination of observations and then groups observations whose proximity distances are similar.

There are two variants of hierarchical clustering algorithms—divisive and agglomerative (Everitt, Landau and Leese 2001). They can be conceptualised respectively as bottom-up and top-down hierarchical clustering approaches. At each step, divisive methods partition a single cluster composed of all observations (1 group of size *n*) into clusters that have one observation only (*N* groups each of size 1). Similarly, agglomerative methods fuse together several clusters containing one observation each (*N* groups each of size 1) to one cluster containing all observations (1 group of size n). Divisive hierarchical clustering algorithms are not available in most commonly used statistical software—for example, STATA v10 and SPSS v10—because they are rarely used (Everitt, Landau and Leese 2001). According to StataCorp (2003), the STATA software does not include divisive hierarchical clustering commands because these procedures are not only rarely used but their computational time is unreasonable or time-consuming.

To evaluate if two groups should be joined, agglomerative clustering algorithms compute average proximities (also known as linkages) to compare the proximity dimensions of groups of observations (not those of individual observations). There are several methods of computing linkages depending on the method used to measure proximity (Everitt, Landau and Leese 2001). However, only two of these methods are presented here—the single linkage (or *k*-nearest neighbour) and the centroid linkage (or the archetype averaging). These are the most commonly used if proximity is measured using the Euclidean distance technique (Maxwell, Pryor and Smith 2002).

The *k*-nearest neighbour technique (using the proximity matrix for its operation) merges clusters based on the closest distance between any two pairs of observations from each group (StataCorp 2003). By contrast, the archetype averaging technique uses the mean value of the grouped points (Everitt, Landau and Leese 2001). The *k*-nearest neighbour and the archetype averaging hierarchical algorithms cluster groups of observations by setting the conditions described in the following formulae, respectively:

$$d_{\min}\left(C_i, C_j\right) = \min_{C_i, C_j} \left\| x - x^{'} \right\| \qquad 5.6$$

$$d_{mean}(C_i, C_j) = \|\mu_i - \mu_j\| \quad 5.7$$

where $\boldsymbol{x}$ is an object in C_i, $\boldsymbol{x'}$ is an object in C_j while μ_i and μ_j are the mean vectors of classes C_i and C_j, respectively.

5.2.2.2 Non-hierarchical clustering algorithms

The second group of clustering methods consist of non-hierarchical (also known as optimisation) techniques. These methods do not form any hierarchical structures; instead, they classify observations into a specified number of groups by minimising or maximising some numerical selection criterion. Selection of an optimisation criterion and the algorithm to perform the optimisation are the two most important aspects of non-hierarchical clustering techniques (Everitt, Landau and Leese 2001). The following paragraphs discuss these further.

Optimisation criteria

A selection criterion classifies observations into a specified number of groups (Everitt, Landau and Leese 2001). Each criterion of partitioning $\boldsymbol{n}$ observations into $\boldsymbol{g}$ clusters has an index, $\boldsymbol{c}(\boldsymbol{n}, \boldsymbol{g})$, that measures the efficiency (known as the index of adequacy) of the partitioning procedure. The procedure evaluates the variances of observations to appraise the tightness of clusters as well as the distance within and between clusters (Hand, Mannila and Smyth 2001). The adequacy index uses dimensions from either proximity measures or the original data matrix. Measures that use the dissimilarity matrix (dimensions obtained from the measures of proximity) aim to either minimise the lack of homogeneity or maximise separation of groups.[2]

Everitt, Landau and Leese (2001) point out that for various computations, multivariate cluster analysis measures apply the original data matrix described by $\boldsymbol{n}$ x $\boldsymbol{p}$ (where $\boldsymbol{n}$ is the number of observations and $\boldsymbol{p}$ is the number of variables). These measures decompose the dispersion matrix $\boldsymbol{T}$ as follows:

$$T = \sum_{m=1}^{g} \sum_{l=1}^{n_m} (x_{ml} - \bar{x})(x_{ml} - \bar{x})' \quad 5.8$$

where $\boldsymbol{m}$ is the number of clusters from 1 to $\boldsymbol{g}$, $\boldsymbol{n_m}$ is the number of observations in the $\boldsymbol{m}^{th}$ group from 1 to $\boldsymbol{l}$, $\boldsymbol{x_{ml}}$ is the $\boldsymbol{p}$-dimensional vector of

---

[2] However, cluster analysis rarely uses these indices because they are applicable to one-mode dissimilarity matrices and not useful to multivariate data sets. They are included in this discussion for completeness only.

observations of the l^{th} object in group $\boldsymbol{m}$ and $\bar{x}$ the $\boldsymbol{p}$-dimensional vector of overall sample means for each variable. Equations 5.9 and 5.10 break up the right-hand side of Equation 5.8 into within-group ($\boldsymbol{W}$) and between-group ($\boldsymbol{B}$) dispersion matrices so $\boldsymbol{T} = \boldsymbol{W} + \boldsymbol{B}$.

$$W = \sum_{m=1}^{g} \sum_{l=1}^{n_m} (x_{ml} - \bar{x}_m)(x_{ml} - \bar{x}_m)' \qquad 5.9$$

$$B = \sum_{m=1}^{g} n_m (\bar{x}_m - \bar{x})(\bar{x}_m - \bar{x})' \qquad 5.10$$

where $\bar{x}_{\mathrm{m}}$ is the $\boldsymbol{p}$-dimensional vector of sample means within-group $\boldsymbol{m}$ and between-group dispersion matrices.

For multivariate data sets ($\boldsymbol{p}$>1), Everitt, Landau and Leese (2001) state that the selection criterion—that is minimising trace($\boldsymbol{W}$) or maximising trace($\boldsymbol{B}$)—covers all the variables in the data set simultaneously. Minimising the sum of the squared Euclidean distances between observations and their group mean (Equation 5.11) minimises trace($\boldsymbol{W}$).

$$E = \sum_{m=1}^{g} \sum_{l=1}^{n_m} (x_{ml} - \bar{x}_m)' (x_{ml} - \bar{x}_m) = \sum_{m=1}^{g} \sum_{l=1}^{n_m} d_{ml,m}^2 \qquad 5.11$$

Alternatively, Equation 5.12 is applied if information from the distance matrix is used.

$$E = \sum_{m=1}^{g} \frac{1}{2n_m} \sum_{l=1}^{n_m} \sum_{v=1, v \neq l}^{n_m} d_{ml,mv}^2 \qquad 5.12$$

where $\boldsymbol{d_{ml,m}}$ is the Euclidean distance between the l^{th} observation in the m^{th} group and the mean of the m^{th} group whereas $\boldsymbol{d_{ml,mv}}$ is the Euclidean distance between l^{th} and v^{th} observation in the m^{th} group.

Everitt, Landau and Leese (2001) discuss two more criteria—minimisation of det($\boldsymbol{W}$) and maximisation of the trace($\boldsymbol{BW}^{-1}$). However, multivariate cluster analysis rarely uses these criteria and therefore these are not pursued here.

Optimisation algorithms

Multivariate cluster analysis uses optimisation algorithms to execute one of the optimisation criteria discussed above (Everitt, Landau and Leese 2001). It is not possible to compute the index of adequacy for all available criteria before selecting the one that provides an optimal value because each dataset has an infinite number of possible partitions. Therefore, algorithms for identifying the best criterion through searching all possible criteria and keeping one that shows an improvement relative to one that has been previously selected have been devised. The *k*-means algorithm is the oldest and most commonly used technique. Other similar algorithms (for example the Mahalanobis measure of distance), are infrequently applied because their results are sensitive to and severely affected by the choice of input parameters (Everitt, Landau and Leese 2001).

The *k*-means algorithm classifies all observations in the data set into a predetermined number of groups by minimising or maximising a numerical decisive criterion. For measurements in the Euclidean space, it uses the mean of each group (cluster centres) and the Euclidean distance between observations in each group to come up with clusters that minimise within cluster variation (Equation 5.11). Hand, Mannila and Smyth (2001: 303) describe the basic version of *k*-means algorithm. Iteration begins with a fixed number of clusters, $\boldsymbol{K}$, and then each cluster is updated by simultaneously reallocating observations with means in an Euclidean distance that are closest before recomputing the group means (centroids). The procedure then uses the new centroids in the next iteration for further evaluation and reallocation of cluster membership. Everitt, Landau and Leese (2001: 100) state that "although not explicitly stated, it can be shown that under some regularity conditions this is equivalent to minimising trace($\boldsymbol{W}$)." Iteration continues until the observations stop changing cluster membership or a prescribed number of iterations have been completed. Because the resultant clusters are dependent on the critical conditions (i.e. the procedure searches for local, not global, minima), cluster analysis needs to apply the *k*-means algorithm several times and preferably with different configurations. Lastly, to standardise the distances between the observations in a group and between clusters means that for every classification, the *k*-mean algorithm needs scaling as previously described (Everitt, Landau and Leese 2001).

5.2.3 Determining the number of clusters

As input, a non-hierarchical clustering algorithm requires a predetermined number of clusters. Obviously, the number of groups can range from one to $\boldsymbol{n}$ (where $\boldsymbol{n}$ is the number of observations in the sample). Observations in a multivariate data set are more likely to be unique in one aspect or another but some observations will fall within the same average range. In general, a smaller number of clusters will represent many observations and conversely. Therefore, a need arises to determine the ideal number of clusters, c, such that $1 < c < n$.

For any given data set, many clusters ($c \approx n$) are likely to reduce the error of clustering observations—that is the total distance between each observation and the cluster mean. However, it is most probable that no new information would be achieved by having many clusters (Maxwell and Buddemeier 2002). This means that for a given data set, there is a point beyond which the cost of having another cluster is not worth the benefit of the extra information it will provide (Pryor 2005a). Therefore, the aim is to determine the number of clusters such that the classification error—the noise—will not decrease if increased by an extra cluster.

Theory, exploration or preference guides the determination of the number of clusters. However, considering that cluster analysis is a tool for discovering structures, these methods can be subjective especially if imposed without justified prior expectations. Therefore, to obtain an optimal number of clusters objectively, mathematical methods should be considered.

There are several methods for determining the number of clusters mathematically. Some are specific to either hierarchical or optimisation clustering (and particular to either continuous or categorical data), others are applicable to both methods of clustering. Everitt, Landau and Leese (2001: 77) state that no particular method is suitable for every situation and "there is no consensus about which rule to apply". Unless there is information that suggests otherwise, they propose adoption of a method that yields the highest number of clusters or, if nothing else, considering the alternative of "no clusters exist". However, this study adopts a method—the minimum description length (MDL)—that Maxwell, Pryor and Smith (2002) propose for use in cross-cultural research to determine the optimal number of clusters.

The MDL (also known as data compression) method is a mathematical optimisation technique that can determine the number of clusters in a data set with n observations and p variables (Maxwell, Pryor and Smith 2002). Rissanen (2001) notes that the basis of the MDL lies in parametric probability models. The number of parameters in a probability model and the representational error make up the description length. For any number of clusters in a data set, the description length is computed as follows (Equation 5.13):

$$DL = -\log P\left(x^n \middle| \theta\right) + \frac{k}{2}\log n \qquad 5.13$$

where $P\left(x^n|\theta\right)$ is the probability of the data x^n given the model θ and k is the number of model parameters (Maxwell and Buddemeier 2002). The aim of the MDL principle is to find an index [$\hat{\gamma}\left(x^n\right)$] that minimises the stochastic complexity in parametric probability models. Rissanen (2001) describes this in Equation 5.14:

$$\min_{\gamma} \left\{\log C_n(\gamma) - \log f\left(x^n; \hat{\theta}(x^n), \gamma\right)\right\} \qquad 5.14$$

The point at which Equation 5.14 (the stochastic complexity) is at its minimum is also the point at which the number of clusters is optimal. At this point, increasing ***n*** does not translate into an optimal parametric probability model. This implies that increasing the number of clusters does not reduce the error of representation while reducing clusters increases the error.

Maxwell, Pryor and Smith (2002) recommend that the minimal number of suggested clusters is usually more useful. This entails the possibility of increased within-cluster-variance for the benefit of reduced between-cluster-variance. However, they caution that although the MDL method determines the number of clusters mathematically, the technique should be used as a guide only.

5.2.4 Examining dimensions that define clusters

Pryor (2003; 2005b) suggests that interpreting cluster analysis results requires prior knowledge of the observations to be classified and the data set to be used. The former is a qualitative understanding of the observations involved (similar to the material presented in Chapter 4); the latter involves preliminary statistical explorations of the data set to identify the most important dimensions.

Statistical explorations provide an insight into the data structure and help to identify variables that explain the most variance. This also simplifies selection and restriction of the data set to important variables—also known as data reduction (Sabater, Esteban, Iscar *et al.* 2004). Everitt, Landau and Leese (2001) discuss several methods that are useful for exploring data sets of various dimensions. If the variables are few, Cartesian plots are useful, but data with several variables require much more advanced data visualisation techniques (Smith 2002). The data used in this study are multivariate; therefore, the remaining paragraphs of this section discuss techniques that are applicable to such data.

All multivariate data visualisation techniques are indirect because it is not possible to visualise directly data that have more than three dimensions. Everitt, Landau and Leese (2001) identify three methods that are useful for visualisation of multidimensional data sets; namely, scatter-plot matrices, exploration projection pursuit and principal component analysis. Principal component analysis (PCA) is the most commonly used method of probing multidimensional data sets because of the shortfalls of the first two methods. Hand, Mannila and Smyth (2001) observe that scatter-plot matrices are unable to reveal the true or complete structures present in a multidimensional data set because they use two-dimensional marginal views to examine pair-wise relationships between variables. The exploration projection pursuit is a random search of "interesting directions" in the data set based on few variables. This technique does not always produce reliable results because it is sensitive to small changes in data configurations and it is only ideal if the observations are highly distinct (Everitt, Landau and Leese 2001). In addition, it is computationally demanding (Hand, Mannila and Smyth 2001).

Principal component analysis is a method of transforming variables in a data set into new and fewer uncorrelated variables—called principal components—that are linear combinations of the original variables (Afifi and Clark 1984). Principal component analysis is suitable for identifying the most important variables because, as Sabater, Esteban, Iscar et al. (2004: 78) observe, the procedure ensures "…minimum loss of information and with an added advantage of having an objective procedure, in that the data (not the researcher) decide which part is informative and which part can be eliminated." Therefore, it is a useful tool for condensing information in the data set into fewer variables without losing much information. Principal component analysis identifies interrelated variables and their common underlying dimensions (Hair, Black, Babin *et al.* 2006a). Technically, principal component analysis is a special case of the exploration projection pursuit method but in this case, the only "interesting directions" consist of seeking the linear combination of variables that explain maximum variability in the data (Hand, Mannila and Smyth 2001). This way it reveals the number of linear combination of variables (principal components) in the data set that capture maximum sample variance in sequentially reducing amounts (Kennedy 2003).

The matrix in Equation 5.15 illustrates the principal components as follows:

$$\begin{bmatrix} y_1 \\ y_2 \\ . \\ . \\ . \\ y_p \end{bmatrix} = \begin{bmatrix} a_{11}x_1 + a_{12}x_2 + ... + a_{1p}x_p \\ a_{21}x_1 + a_{22}x_2 + ... + a_{2p}x_p \\ \\ \\ \\ a_{p1}x_1 + a_{p2}x_2 + ... + a_{pp}x_p \end{bmatrix} \qquad 5.15$$

where $\boldsymbol{y}$ represents a vector of principal component $\boldsymbol{p}$ (accounting for decreasing proportion of total variance of the original variables in this order). $\boldsymbol{x_n}$ represents the original variables and the coefficients (***a***-values) define the components. The coefficients are derived from the eigenvectors of the sample covariance matrix or the sample correlations matrix if the variables are measuring different units. The variances of eigenvalues of either the sample covariance matrix or the sample correlations matrix provide the principal components. To ensure that the total variance of the original variables is equal to that of the principal components; the coefficients are scaled to make their sum of squares equal to one. Hand, Mannila and Smyth (2001: 77-80) present mathematical deviations of principal component analysis parameters such as variances, eigenvalues and eigenvectors but the remaining paragraphs discuss only the essential aspects relevant to this study.

The principal components do not correlate with one another and account for decreasing proportions of total variance of the original variables (Afifi and Clark 1984). The first principal component is a linear combination of original variables in the data set that account for the maximum variance. Subsequent principal components, which are orthogonal (or uncorrelated) to preceding principal components, capture the remaining maximum variation in the data set and the incremental variation captured decreases monotonically with each additional principal component. If there is no correlation between variables in the data, then all principal components will have the same variance (Hand, Mannila and Smyth 2001). Further, the original variables are parsimonious if the first few principal components account for most variance in the data set.

Principal component analysis projects the multivariate data into a set of vectors that exist in a lower dimensional data space to make visual inspection complete and informative (Hand, Mannila and Smyth 2001). This property allows for visualisation and manipulation of high dimension data sets for purposes of assessing the data set structure. Further, principal component analysis allows for objective selection of variables by revealing those explaining large variations in the data set. It is also more likely that the remaining variables are independent i.e. not correlated—a property that is ideal for model fitting techniques such as cluster analysis.

StatSoft (2003) presents two methods that aid selection of the most important principal components. First, the Kaiser Criterion, an approach that recommends retention of principal components with eigenvalues that are greater than one because they provide a comprehensive description of the data set. Second, the scree test which is a graphical method that plots the eigenvalues against the number of eigenvalues. This method recommends selecting eigenvalues to the left of the point where the values level off.

5.3 Deriving traditional reproductive regimes in Zambia using multivariate cluster analysis

This section applies multivariate cluster analysis procedures to several attributes that influence reproduction in pre-industrial societies to derive Zambian traditional reproductive regimes. Section 5.3.1 presents the ethnographic data on Zambian societies used to derive these reproductive regimes while Section 5.3.2 presents the results of multivariate cluster analysis. Section 5.3.3 describes the emerging Zambian traditional reproductive regimes with a focus on expected fertility differentials between them. This section also highlights the features that may account for the expected ethnic fertility variations.

5.3.1 Anthropological data on Zambian traditional societies in Murdock's Ethnographic Atlas

This section addresses two components. First, it identifies the Zambian societies in Murdock's Ethnographic Atlas. Second, it describes the anthropological attributes (variables) underlying reproduction in these traditional societies—that is, the dimensions applied to derive Zambian traditional reproductive regimes.

5.3.1.1 Zambian traditional societies in Murdock's Ethnographic Atlas

Murdock's Ethnographic Atlas has data on 21 traditional societies found in Zambia, accounting for 57 per cent of the 1953 Zambian population presented in Table 4.3. Zambian traditional societies in Murdock's Ethnographic Atlas were identified using information on societal names and their recorded geographical location (latitude and longitude). Societies within the geographical latitude and longitude confines of Zambia (8-18°S and 22-34°E) which are however not Zambian were eliminated—for example the Boers (16°S, 28°E) and the Yeke (11°S, 28°E). These societies are located in other countries with similar geographical coordinates.

Societies with the names similar to Zambian traditional societies and yet whose latitude and longitude readings show that they lie outside Zambia were examined to ensure that these societies are not in Zambia. The Ambo (17°S, 16°E), Lenge (25°S, 34°E) and Mbundu (12°S, 16°E) are excluded because Gordon's (2005) Ethnologue Maps show that the Ambo and Mbundu reside in Angola while the Lenge is a dialect of the Chopi society of Mozambique.

Further examination of the Ethnologue Maps reveals two inconsistencies in Murdock's Ethnographic Atlas. First, Murdock's Ethnographic Atlas has wrongly recorded the latitude coordinate (9°N) of the Mambwe (9°S, 32°E) traditional society. Second, the Tonga society is a case where two societies sharing a similar name are represented in Murdock's Ethnographic Atlas in two different regions. It is possible to confuse the Lake Tonga for the Tonga traditional society near the Lake Kariba. However, this society is excluded after noting from Jaspan (1953) that the Lake Tonga traditional society is distinct from the Plateau Tonga and refers to a particular traditional society in Malawi.

Table 5.1 presents Zambian societies whose traditional attributes are available in Murdock's Ethnographic Atlas. The second and third columns present the geographical location in degrees of latitude and longitude used for purposes of identifying ethnic societies that are Zambian. Column four of Table 5.1 presents the estimated publication date[3] of some materials used to derive the Murdock's Ethnographic Atlas codes on each society. The earliest record (for the Lozi) was published in 1890 while the latest (for the Kunda traditional society) in 1950. This means that information on Zambian traditional societies in Murdock's Ethnographic Atlas refers to ethnologies collected or published over 60 years. However, ethnographies of 14 of the 21 Zambian traditional societies in Murdock's Atlas were first published between 1920 and 1940. Further, the Zambian information is better than the Standard Cross-Cultural Sample because 17 of the 21 reference materials on Zambia in Murdock's Atlas were published between 1901 and 1950. Regardless, there is a possibility that comparisons of information between Zambian societies are likely to be imprecise because of the differences in the time-period of collecting or publishing this information. To address this problem, Coast (2003) recommends evaluating ethnographies with other accounts preferably independent of this source, and more recent. Before doing so, she recommends understanding the broader historical context

[3] This is usually the year of publishing the first detailed observational report on a traditional society (Goodenough 1964).

of the societies under investigation as a step towards assessing the available ethnographic information (Chapter 4). Sections 5.3.2 and 5.3.3 also address these concerns during application of clusters analysis procedures.

Table 5.1 Zambian societies whose pre-industrial information is included in Murdock's Ethnographic Atlas

Society name	Geographical location		Year of information collection	*Ethno-geo. region in Zambia
	Latitude	Longitude		
Luvale	12°S	22°E	1930	Region I
Kaonde	13°S	26°E	1920	Region I
Ndembu	11°S	26°E	1930	Region I
Luchazi	13°S	23°E	1930	Region I
Chokwe	10°S	21°E	1920	Region I
Luba	08°S	26°E	1930	Region I
Bemba	11°S	31°E	1900	Region II
Lunda-Luapula (Luapula)	10°S	29°E	1940	Region II
Shila	10°S	28°E	1900	Region II
Ngoni (Mpezeni Ngoni)	12°S	33°E	1940	Region III
Tumbuka	12°S	34°E	1920	Region III
Mambwe	09°S	32°E	1910	Region III
Iwa	10°S	32°E	1900	Region III
Lozi	15°S	23°E	1890	Region IV
Lala	15°S	31°E	1940	Region V
Lamba	13°S	28°E	1920	Region V
Tonga (Plateau Tonga)	18°S	28°E	1940	Region VI
Ila	16°S	27°E	1920	Region VI
Chewa	14°S	33°E	1920	Region VII
Kunda	15°S	32°E	1950	Region VII
Nyanja	16°S	36°E	1910	Region VII

Sources: Murdock (1967).
Names is parenthesis are as they appear in Murdock's Ethnographic Atlas (Murdock 1967a: 8-10).
*The ethno-geographic location in Zambia is based origin, region of traditional settlement and lineage group according to the data in Table 4.3.

5.3.1.2 Attributes underlying traditional reproduction in Murdock's Ethnographic Atlas

Determination of the dimensions that distinguish groupings is important in cluster analysis (Maxwell, Pryor and Smith 2002). These dimensions should include only attributes that define the phenomena under investigation. The literature review (Chapter 2) identified the attributes to which cluster analysis should be applied in order to determine traditional reproductive regimes in Zambia.

The analysis here is based on the updated electronic database of the Murdock's Ethnographic Atlas.[4] Gray (1999a) as well as Khaltourina, Korotayev and Divale (2002) have published details of the corrections made to this version. Appendix

[4] White, 2005–personal communication. An updated copy of the database was made available by Professor Douglas White (University of California at Irvine).

5.1 contains the attributes (and the respective codes) underlying fertility in traditional societies as captured in Murdock's Ethnographic Atlas. Gray (1999b) provides the codes of the revised Murdock Ethnographic Atlas and Evans-Pritchard (1940) and Radcliffe-Brown (1940; 1950) discuss the meaning of terminologies that describe the codes. To interpret the results, the original codes have been reordered to assign distance manually between the different "fertility states" so that high scores on each attribute are associated with low fertility and low scores with high fertility. The code for missing data is -9999 being the requirement of the cluster analysis software. Accompanying these codes, for each variable, is the frequency distribution of the 21 Zambian traditional societies for which data are available.

Table 5.2 presents a summary of the 24 dimensions underlying reproduction in traditional societies, divided into three groups. Nine dimensions describe various aspects of traditional economic and political organisation. Eight attributes present various forms of traditional social and community organisation. Finally, seven indicators specify the arrangements for governing courtship and sexual relationships in traditional societies. Some attributes have more than one variable—for example, subsistence economy has five variables. In total, there are 55 variables relating to the 24 attributes.

Table 5.2 Factors underlying reproduction in traditional societies obtained from Murdock's Ethnographic Atlas

	Group and description of dimension	Number of variables					
		Selected	Eliminated				Retained
			Scanty[1]	Duplicative[2]	Invariant[3]	Conflicting[4]	
	Traditional economic and political factors						
1	Subsistence economy	5	-	-	-	-	5
2	Type and intensity of agriculture	2	-	-	-	-	2
3	Type of animal husbandry	3	-	-	1	-	2
4	Mean size of local communities	1	1	-	-	-	0
5	Pattern of settlement	1	-	-	-	-	1
6	Jurisdictional hierarchy	2	-	-	-	-	2
7	Succession to the office of local headman	2	-	1	-	-	1
8	Class stratification	4	-	-	3	-	1
9	Presence of slavery	2	-	-	-	-	2
	Total	*22*	*1*	*1*	*4*	*0*	*16*
	Social and community factors						
1.a	Patrilineal kin groups and exogamy	2	-	-	1	-	1
1.b	Matrilineal kin groups and exogamy	2	-	-	-	-	2
2	Cognatic kin groups	2	-	-	-	-	2
3	Community organisation	1	-	-	-	-	1
4	Marital residence	5	-	-	-	2	3
5	Inheritance of real property	2	1				1
6	Sex delineated participation in provision of subsistenc	5	3	-	1	-	1
7	Kinship terminology for cousins	1	-	-	-	-	1
8	Recognition of high Gods	1	-	-	-	-	1
	Total	*21*	*4*	*0*	*2*	*2*	*13*
	Factors governing courtship and sexual relationships						
1	Norms of premarital sex behaviour	1	1	-	-	-	0
2	Male genital mutilations	1	-	-	-	-	1
3	Segregation of adolescent boys	1	1	-	-	-	0
4	Cousin marriage	4	-	2	-	-	2
5	Mode of marriage	2	-	-	-	-	2
6	Family organisation	2	-	1	-	-	1
7	Postpartum sex taboo	1	1	-	-	-	0
	Total	*12*	*3*	*3*	*0*	*0*	*6*
	Overall total	55	8	4	6	2	35

Notes: 1. Variable with more than 6 societies with missing data.
2. Two variables - primary and alternate dimensions which have the same have the same distribution - one is eliminated.
3. Variables with all the 21 societies reporting in the same category - apart from missing information.
4. Two variables - primary and alternate dimensions but providing information that is inconsistent.

Twenty variables are removed because they provide information that is either scanty (eight variables), exactly duplicative (four variables), invariant across all societies (6 variables) or inconsistent with another similar variable (2 variables). Only four of the seven attributes used to govern courtship and sexual relationships in traditional societies are retained while almost all attributes for the other two groups are represented. The variables dropped—especially norms of premarital sex behaviour for young women and postpartum sex taboo—are important determinants of fertility in traditional societies. Since this research cannot evaluate these attributes for Zambian traditional societies found in Murdock's Ethnographic Atlas, this poses a serious limitation. Lastly, the Shila society is dropped from the database because it is missing information on 13 of the 35 remaining variables.

5.3.2 Application of clustering analysis procedures

This section applies cluster analysis to the 35 ordinal coded attributes underlying reproduction in pre-industrial societies to determine Zambian traditional reproductive regimes. Pryor (2003; 2005b) has used cluster analysis to group pre-industrial societies with similar traditional economic systems using data collected by anthropological economists as well as that obtained from Murdock's Ethnographic Atlas. This study adopts his approach because it has similar objectives to those described by Pryor.

Pryor (2005a: 29) recommends that "…for such an approach to be objective, the calculations must be based on unbiased information and the analyst must select thoughtfully the dimensions by which the clusters are defined". Therefore, since there is no *a priori* criterion to determine the relative superiority of clusters that emerge from applying multivariate cluster analysis procedures to ordinal coded data, the results were evaluated against similar analyses applied to binary coded data for all variables and ordinal coded data for subsets of selected variables. This allowed us to gauge the relative similarity of the outcomes from the different procedures to ensure that they are not an artefact of the data employed or their configurations. The next section describes the clustering software used. Section 5.3.2.2 identifies and presents the most important variables. Section 5.3.2.3 determines the ideal number of clusters and Section 5.3.2.4 presents the clusters of traditional reproductive regimes.

5.3.2.1 Selection of the multivariate cluster analysis software

Several statistical software packages that carry out specific components of cluster analysis exist and most of them are specific to the scientific disciplines that formulate them (Everitt, Landau and Leese 2001). Most of these programs are difficult to apply

(Maxwell, Pryor and Smith 2002) and produce unreliable results if some objects have missing data—for example, the SPSS drops objects that have missing data. To define Zambian traditional reproductive regimes, this research applies LOICZView,[5] a web-based cluster analysis software. This is a "data-driven expert-guided program" for clustering objects using heterogeneous data sets (Maxwell and Buddemeier 2002: 77). The program is robust in handling of missing data because it uses the average scaled Euclidean (ASE) distance between two points. Further, the program has integrated all cluster analysis modules described in Section 5.2 on one platform making it easy and quicker to perform cluster analysis. Maxwell, Pryor and Smith (2002) provide guidance on how to apply this program for purposes of cross-cultural research with an example that uses data from the Standard Cross-Cultural Sample. Operation of this program was checked by analysing identical subsets of the data using SPSS (2005) version 14 modules. Identical results were obtained.

5.3.2.2 Identifying the most important variables

This section applies principal component analysis—discussed in Section 5.2.4—to identify the variables that explain the most variation in the data set. During analysis of clusters that emerge later, preference is given to variables that explain the most variation between societies. Further, these variables form a subset database—the reduced database—that is used to evaluate the results that emerge from applying all variables.

The literature review points out that the three dimensions presented in Table 5.2 influence traditional reproduction differently. Besides, the correlations of variables in Murdock's Ethnographic Atlas are higher between those that are closely linked—for example kinship lineages versus cognatic kin groups. Therefore, principal component analysis is applied to the three sets of variables independently. Sabater, Esteban, Iscar et al. (2004) use a similar approach when they apply principal component analysis to identify demographic variables that explain the most variation between regions.

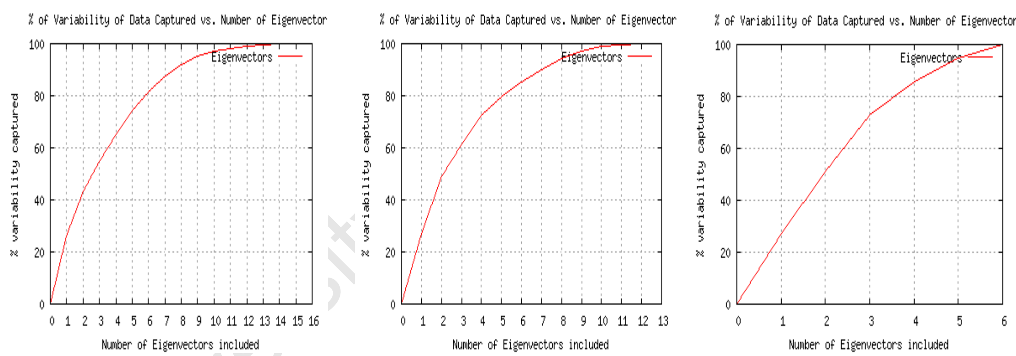
Table 5.3 and Figure 5.1 present a summary of variance accounted for by successive principal components for each set of attributes underlying reproduction in traditional societies. The first nine, eight and five principal components in each of the three respective sets of attributes—namely, economic and political organisation, social and community organisation as well as courtship and sexual governance—account for almost 95 per cent of the total variation.

[5] This programme is available online at www.palantir.swarthmore.edu/loicz/.

Table 5.3 Variance accounted for by successive principal components according to attributes underlying reproduction in traditional societies

Economic and political organisation			Social and community organisation			Courtship and sexual governance		
Value	Total variance		Value	Total variance		Value	Total variance	
	Per cent	Cumulated		Per cent	Cumulated		Per cent	Cumulated
1	26.11	26.11	1	27.16	27.16	1	27.22	27.22
2	17.32	43.43	2	21.90	49.06	2	23.94	51.16
3	11.15	54.58	3	12.22	61.28	3	21.61	72.77
4	10.75	65.33	4	11.25	72.53	4	12.92	85.69
5	8.74	74.07	5	6.88	79.41	5	8.82	94.51
6	7.27	81.34	6	5.69	85.10	6	5.46	99.97
7	6.23	87.57	7	4.84	89.94			
8	4.44	92.01	8	4.40	94.34			
9	3.04	95.05	9	2.92	97.26			
10	1.87	96.92	10	1.86	99.12			
11	1.14	98.06	11	0.55	99.67			
12	0.98	99.04	12	0.27	99.94			
13	0.50	99.54	13	0.00	99.94			
14	0.31	99.85						
15	0.06	99.91						
16	0.01	99.92						

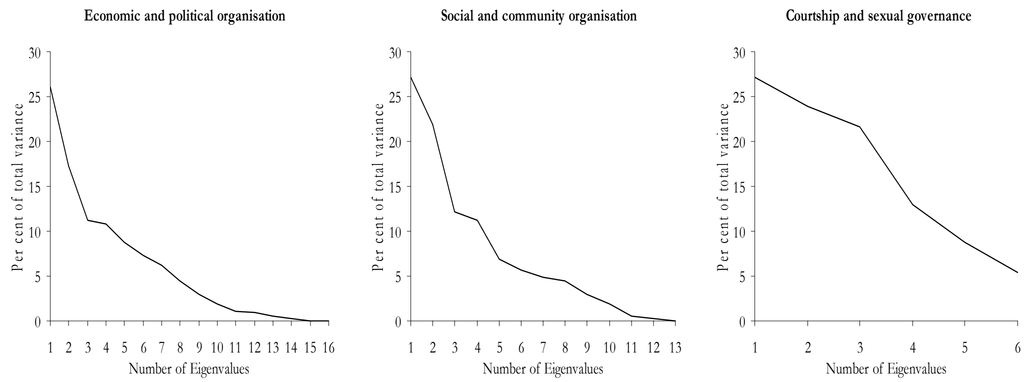
Figure 5.1 Variance accounted for by successive principal components according to attributes underlying reproduction in traditional societies



Scree tests determine the number of the most important principal components. This test is applied rather than the Kaiser criterion because it retains fewer factors most of the time. This is a desirable characteristic of the test considering there are several indirect determinants of traditional reproduction. Figure 5.2 presents the results of the scree tests—i.e. are plots of eigenvalues against total variance for each set of attributes underlying reproduction in traditional societies.

The number of eigenvalues at the first point where the decrease levels off—i.e. starts to decrease at a decreased rate—is the proposed number of the most important principal components. For economic and political as well as social and community organisation, the scree test indicates that the first three principal components are important while for traditional courtship and sexual governance attributes, the first four principal components are important.

Figure 5.2 Plots of eigenvalues by total variance—the scree test—according to attributes underlying reproduction in traditional societies



Finally, coefficients of the retained principal components provide a guide for selecting the most important variables. A negative coefficient indicates that a variable has an inverse relation with other variables in that particular principal component and vice versa. Further, variables whose coefficients are larger regardless of the sign are the most important.

Table 5.4 displays the first three principal components of economic and political features as well as social and community organisation attributes and the first four principal components for courtship and sexual governance dimensions. For traditional economic and political organisation, the first principal component shows that animal husbandry is important. The second principal component shows that economic and political features are important. It contrasts dependence on agriculture (negative coefficient) with jurisdictional hierarchy beyond local community (positive coefficient). The third principal component contrasts variables measuring political organisation only i.e. hereditary succession and history of slavery. In summary, selected features of both economic and political dimensions are important aspects of reproduction in traditional societies.

Kinship lineage, organisation of community marriage and marital residence are important components of social and community organisation. The first principal component shows an inverse relationship between matrilineal kinship (positive coefficient) and location of marital residence after several years of marriage (negative coefficient). The second principal component shows a similar relationship between patrilineal kinship and other variables in this set of dimensions. The third principal component shows a positive relationship between community marriage organisation and marital residence.

Table 5.4 Selected principal components for each of the three sets of attributes underlying reproduction in traditional societies

Variable		Principal Components			
Name	Description	First	Second	Third	Fourth
Economic and political organisation					
va_111	Dependence on gathering	-0.23	0.26	-0.01	na
va_112	Dependence on hunting	0.23	0.34	-0.09	na
va_113	Dependence on fishing	0.29	0.17	0.35	na
va_114	Dependence on animal husbandry	**-0.42**	-0.02	-0.03	na
va_115	Dependence on agriculture	-0.01	**-0.49**	-0.28	na
va_121	Intensity of agriculture	-0.23	0.38	0.20	na
va_122	Major crop type	-0.15	-0.32	0.17	na
va_131	Predominant type of animal husbandry	**-0.42**	0.02	0.06	na
va_133	Milking of domestic animals	**-0.40**	0.02	0.07	na
va_151	Settlement patterns	0.29	-0.02	-0.25	na
va_161	Jurisdictional hierarchy within local community	-0.05	0.11	-0.19	na
va_162	Jurisdictional hierarchy beyond the local community	0.00	**0.46**	-0.32	na
va_172	Type of hereditary succession	0.06	-0.21	**0.45**	na
va_181	Class stratification	-0.28	0.05	-0.26	na
va_191	Type of slavery	-0.21	0.01	0.20	na
va_192	Former presence of slavery	-0.08	-0.17	**-0.45**	na
Social and community organisation					
va_211	Largest patrilineal kin group	-0.31	**-0.41**	-0.09	na
va_213	Largest matrilineal kin group	**0.51**	0.13	0.01	na
va_214	Largest matrilineal exogamous group	0.18	0.06	0.37	na
va_221	Largest cognatic kin group_primary	0.22	-0.37	0.13	na
va_222	Largest cognatic kin group_secondary	0.33	-0.38	-0.27	na
va_231	Community marriage organisation_primary	0.11	-0.32	**0.52**	na
va_241	Marital residence with kin: first years	0.14	0.32	0.30	na
va_242	Transfer of residence at marriage: after first years	**-0.49**	-0.15	-0.17	na
va_244	Marital residence with kin: after first years	-0.18	-0.37	**0.49**	na
va_251	Inheritance rule for real property (land)	0.18	-0.19	-0.25	na
va_265	Sex differences: agriculture	0.06	-0.17	0.05	na
va_271	Kin terms for cousins	-0.33	0.32	0.25	na
va_281	Perception of High Gods	0.07	0.06	-0.10	na
Courtship and sexual governance					
va_321	Male genital mutilations	-0.13	**0.48**	0.29	-0.26
va_341	Type of cousin marriages allowed	**0.59**	-0.34	0.30	-0.17
va_342	Type of cousin marriages preferred	**0.69**	0.03	0.16	0.19
va_351	Primary mode of marriage	-0.06	0.35	**0.72**	-0.19
va_352	Secondary mode of marriage	0.24	**0.64**	-0.20	**0.58**
va_361	Domestic organisation (type of marriage)	0.31	0.35	**-0.49**	**-0.70**

Note: The values in boldface point out the important variables because their coefficients are relatively higher (≥40 per cent) than those for other variables.

All variables under the courtship and sexual governance dimensions are important. The first principal component shows a positive relationship between the types of cousin marriage allowed and preferred whilst the second principal component shows a similar relationship between male genital mutilations and secondary mode of marriage. The third principal component contrasts primary mode of marriage (positive coefficient) with domestic organisation (negative coefficient) whilst the fourth principal shows that secondary mode of marriage (positive coefficient) is inversely related to domestic organisation (negative coefficient).

The variables identified to be important variables (those whose values in Table 5.4 are boldfaced) are used to form the reduced model database. In total, this database comprises of 18 of the 35 attributes governing reproduction in traditional societies. Principal component analysis is then applied to this database. The first ten principal components account for ninety-six per cent of the total variation. The scree test also suggests that four principal components should be retained.

Table 5.5 displays the first four principal components of the reduced model. The reduced model suggests that dependence on agriculture, jurisdictional hierarchy beyond the local community, kinship lineage, community marriage organisation, marital residence and marriage typologies are important variables. In summary, some selected aspects of all the three sets of dimensions governing traditional reproduction—economic and political organisation, social and community organisation as well as courtship and sexual governance features are important differentiators of Zambian traditional reproductive regimes.

Table 5.5 Selected principal components of attributes underlying reproduction in traditional societies—reduced model

Variable	Principal Components			
	First	Second	Third	Fourth
Dependence on animal husbandry	-0.32	-0.22	0.19	-0.08
Dependence on agriculture	-0.01	0.32	**0.38**	0.05
Predominant type of animal husbandry	-0.31	-0.32	0.15	-0.04
Milking of domestic animals	-0.30	-0.32	0.14	-0.02
Jurisdictional hierarchy beyond the local community	-0.11	0.11	**-0.51**	-0.01
Type of hereditary succession	0.25	-0.27	0.23	-0.08
Former presence of slavery	-0.13	0.18	0.18	-0.07
Largest patrilineal kin group	0.28	**-0.39**	-0.16	-0.05
Largest matrilineal kin group	**-0.36**	0.20	-0.21	-0.05
Community marriage organisation_primary	-0.11	-0.21	-0.14	**0.52**
Transfer of residence at marriage: after first years	**0.42**	-0.07	0.02	-0.01
Marital residence with kin: after first years	0.16	-0.27	-0.01	**0.59**
Male Genital Mutilations	0.18	0.00	0.03	-0.35
Mode of Marriage - Primary	-0.22	-0.18	**-0.38**	-0.12
Mode of Marriage - Secondary	-0.19	-0.27	-0.10	-0.25
Type of cousin marriages allowed	0.25	-0.19	-0.23	-0.35
Type of cousin marriage preferred	0.07	-0.14	0.16	-0.15
Domestic Organisation	-0.14	-0.23	0.33	-0.07

Note: The values in boldface are important variables because their coefficients are relatively higher (≥35 per cent) than those for other variables.

To describe the traditional reproductive regimes in Zambia, Section 5.3.3 uses the variables identified as important after applying principal component analysis to the reduced model database. However, for purposes of assessing the contribution to governance of traditional fertility of each attribute identified in anthropological literature (Chapter 2), the main model comprises all the 35 ordinal coded attributes. The reduced model is only used to assess the results of the main model.

5.3.2.3 Determining the number of Zambian traditional reproductive regimes

This section applies the minimum description length procedure described in Section 5.2.3 to determine the number of Zambian traditional reproductive regimes. The LOICZView program has an algorithm that performs minimum description length analysis. For any data set, it computes the description length for each possible number of clusters from which it suggests the minimum and maximum clusters in the data set. From this range, the program proposes the ideal number of clusters.

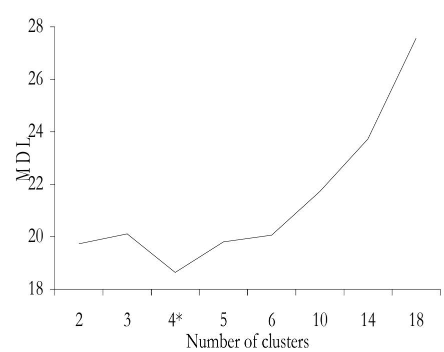
To perform a minimum description length analysis, the procedure needs the minimum and maximum number of clusters as well as the scale of distance measure (discussed in Section 5.2.1) to be specified. In the present study, the minimum number of clusters is set to two—that is the minimum number of possible clusters in a dataset—while the maximum is set to 20 (the number of societies in the sample). Distance calculation is set to "scaled" because, as discussed in Section 5.2.1, the variables in Murdock's Ethnographic Atlas measure different attributes using different units therefore scaling is required to standardise the units of measurement.

Table 5.6 presents results of the minimum description length analysis with an accompanying plot showing the trend in the description length and its accompanying evaluation statistics—the associated error and per cent error remaining. The results show that the suitable number of clusters is between two and six but suggest that four is the ideal number of clusters in Murdock's Ethnographic data on Zambian societies.

Table 5.6 Results from a minimum description length analysis set at minimum = 2 and maximum = 20, Zambian traditional societies using data from Murdock's (1967) Ethnographic Atlas

Number of clusters	Associated Error	Description Length	Per cent Err. remaining
2	0.837	19.73	0.841
3	0.781	20.11	0.785
4*	0.632	18.64	0.636
5	0.616	19.80	0.619
6	0.554	20.06	0.557
10	0.337	21.72	0.339
14	0.138	23.72	0.138
18	0.030	27.56	0.030

*Selected as ideal number of clusters.



5.3.2.4 Composition of clusters

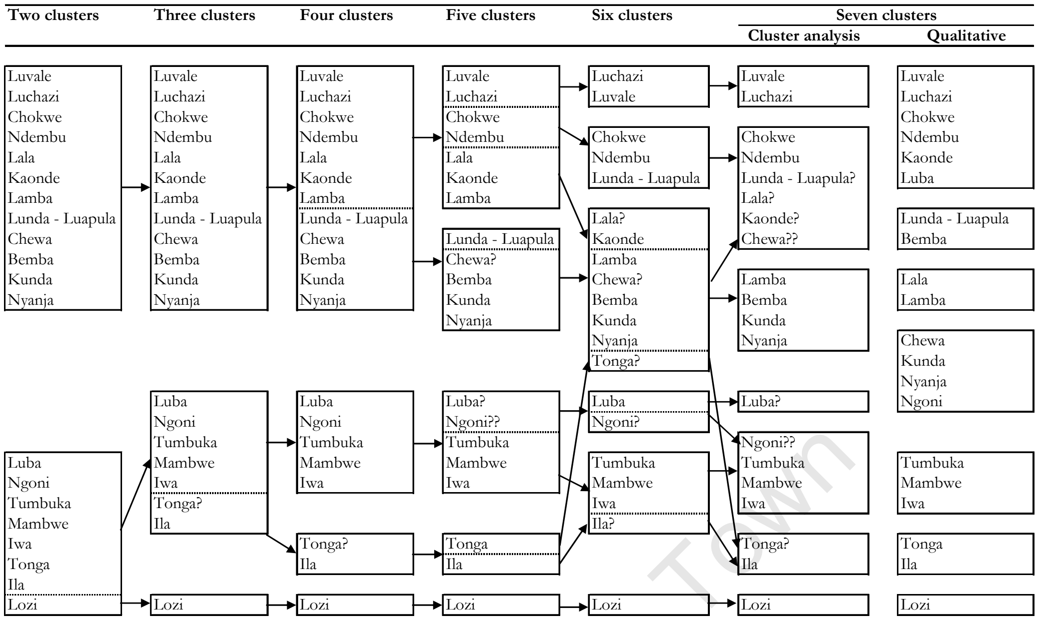
This section applies the scaled *k*-means classification algorithm—discussed in Section 5.2.2—to derive compositions of traditional reproductive clusters. Apart from the number of clusters, a classification algorithm requires specification of the number of iterations and clustering runs. This depends on the number of variables and observations, "for a 10 x 10 matrix, 200 iterations achieves a result that no longer changes significantly…" (Maxwell and Buddemeier 2002: 82). Further, since cluster classification is an iterative process and depends on a self-generated random start, the outcomes differ slightly. Therefore, Pryor (2003) suggests that the process should be repeated several times with several configurations and then each society placed in the cluster where it appears most often.

To get a good set of clusters from a 20 x 35 matrix (Murdock's data set on traditional societies in Zambia), the clustering procedure was set at 50 runs at 100 iterations for each run and repeated five times—in total 250 runs or 25,000 iterations for each model per number of clusters. Apart from the ideal number of clusters (four), the described clustering procedure was applied to different numbers of clusters to examine how societies change cluster memberships when the number of clusters is changed. This also allows for comparison with the clusters that emerged when classification was derived qualitatively in Chapter 4.

Figure 5.3 presents the cluster composition of Zambian societies derived from applying the scaled *k*-means classification algorithm to all ordinally coded attributes underlying traditional reproduction. For purposes of comparison, the last column shows the cluster composition derived using qualitative information (Section 4.4). At two clusters, the composition indicates that societies that came from the Great Lakes Region and those that are South African-influenced are similar but different from those that came from the Luba/Lunda Kingdoms. However, the Luba society (Luba/Lunda Kingdoms) is amongst societies that came from the Great Lakes Region and those that are South African-influenced.

At three and four clusters, the ethnic groups that migrated directly from the Great Lake Region split up into those that settled in the North-eastern and South-central regions, respectively. With five clusters, the societies that came from the Luba/Lunda Kingdom also split up according to region of settlement. One group comprises of societies that settled in the North-western and Central regions of Zambia while the other comprises those that settled in the North-central and Eastern regions.

Figure 5.3 Cluster composition of traditional societies in Zambia based on all ordinal coded attributes

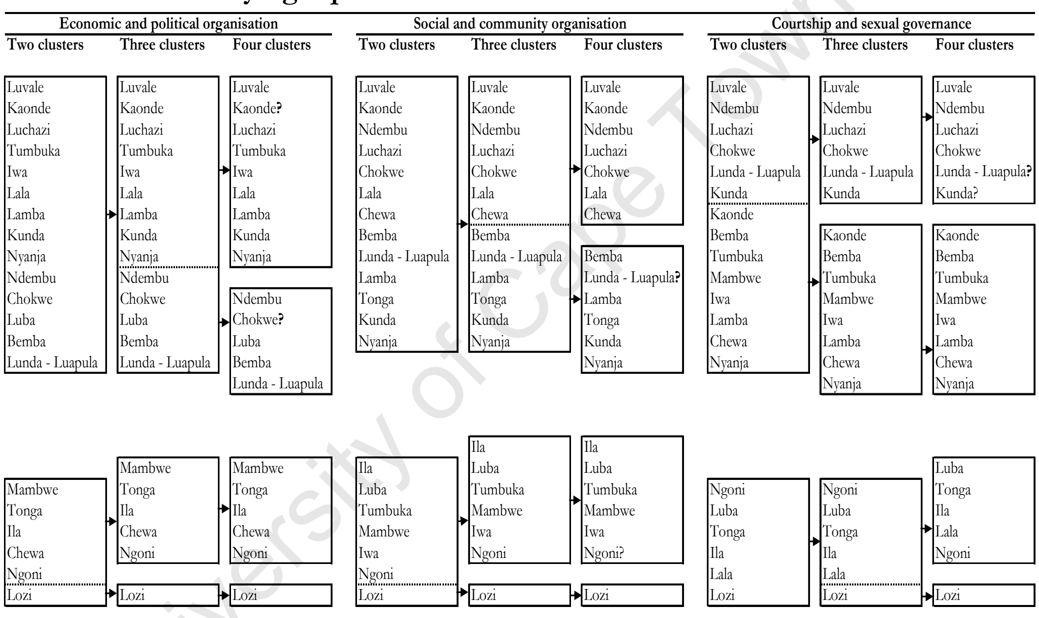


Notes ? Indicates that in only three of five clustering procedures placed that society in its designated group.
?? Indicates that less than three of five clustering procedures placed that society in its designated group.

Beyond five clusters, the group compositions become difficult to explain—implying that we can group the 20 Zambian ethnic societies found in Murdock's Ethnographic Atlas into a maximum of five clusters without losing reliability. In any clustering, this is the point at which "…the additional information gained by increasing the number of clusters is more than offset by the additional theoretical complexity of the resulting representation of reality" (Pryor 2005b: 257). Therefore, beyond five clusters, the composition becomes less heterogeneous between clusters and less homogenous within clusters. Further, four is the optimal number of clusters because the five-cluster composition has more than one society whose designated membership is uncertain. Of the five repeated clustering procedures, the Chewa and Ngoni appear in their respective groups less than five times. Below four clusters, the important features of traditional societies are merged. Despite this, at seven clusters, the membership compares well with those clusters derived using qualitative information—especially for the non-Luba/Lunda societies.

Figure 5.4 presents the cluster composition derived from cluster analysis applied to the ordinal coded data of the three sets of attributes underlying reproduction in traditional societies. The transition of cluster composition from two clusters to four is consistent for each of the three groups of dimensions. However, the cluster composition of each set of attributes is different although there are some societies whose membership—for example the Luvale and Lozi—is consistent across the three sets of attributes. At four clusters, the three sets of attributes display a particular pattern: two clusters comprise societies from the Luba/Lunda Kingdoms and those influenced by South African societies while the remaining two clusters comprise societies from all the three regions of origin—that is, the Great Lakes Region, the Luba/Lunda Kingdoms and those that are South African-influenced. This confirms that while some societies resemble one another in aggregate, others are alike in other dimensions underlying traditional fertility.

Figure 5.4 Cluster composition of traditional societies in Zambia that result from applying cluster analysis to the three sets of attributes underlying reproduction in traditional societies

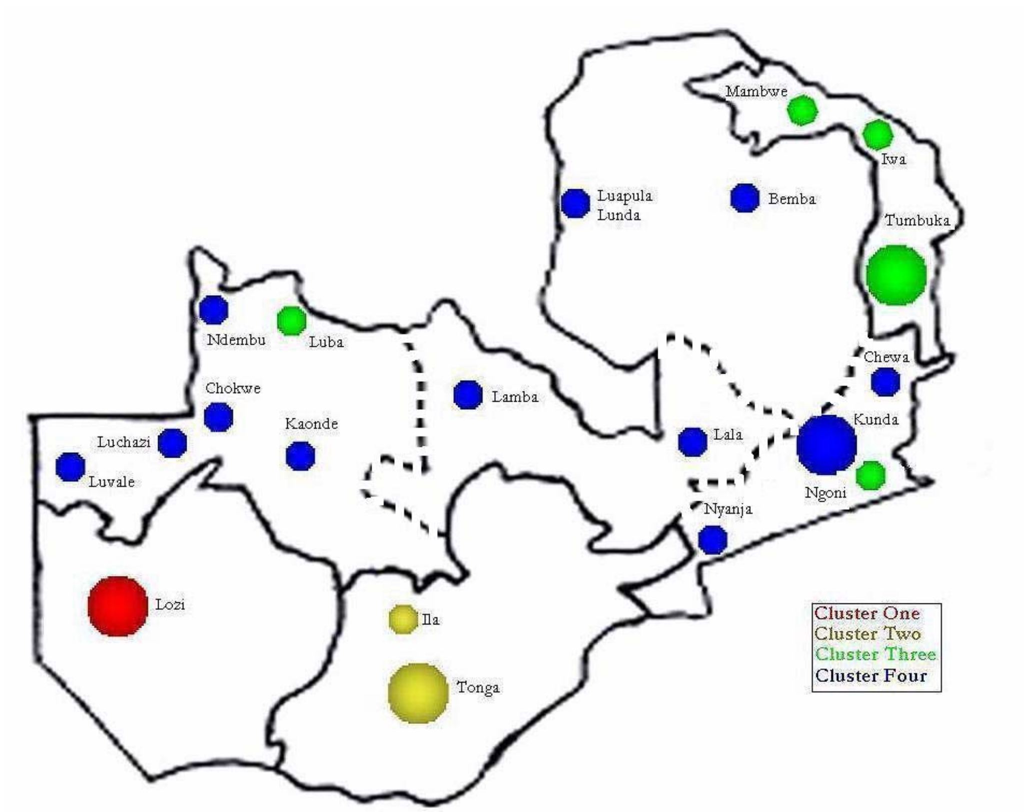


Note **?** indicates that of the five clustering procedures performed, this society only appears in this group three times.

Although not that different, the reduced and binary models (both not presented) do not describe Zambian reproductive clusters adequately. Compared with the models based on all variables, the reduced and binary models have at least two societies whose cluster membership is not certain because they appeared less than five times in the designated clusters. The groupings are more accurate when cluster analysis is applied to ordinal coded data comprising all variables and specifying four clusters.

Figure 5.5 provides a geographical positioning of societies belonging to the four reproductive clusters found in Zambia mapped according to their ethno-geographical location. The figure presents the **average-type society** of each cluster (suggested by the LOICZView program) using a big bubble—these are the Lozi, Tonga, Tumbuka and Kunda. The boundaries are ethno-geographical regional boundaries of clusters derived qualitatively in Section 4.4. The dotted lines show ethno-geographical clusters that have formed one traditional reproductive regime.

Figure 5.5 Traditional reproductive clusters in Zambia as described through application of cluster analysis to Murdock's Ethnographic Atlas data



Note: The lines inside the map represent ethno-geographical regional boundaries derived in Chapter 4

The Lozi form a one-society cluster (red) because, as discussed in the next section, their traditional reproductive characteristics—adopted mainly from South African traditional societies—are distinctively different from any other Zambian society in Murdock's sample. The Ila and Tonga (from the Great Lakes region) form one group—cluster two (yellow). Cluster four (blue)—comprising mostly societies whose descendants migrated from the Luba/Lunda—has the most societies spanning across a wide geographical area in Zambia, that is, extending from the North-western region to South-eastern. Two societies, the Luba and Ngoni from the Luba/Lunda Kingdoms and South African-influenced respectively, display reproductive traits of the traditional societies that migrated direct from the Great Lakes region. This is why these societies are in the third cluster (green) even though they settled among and near the societies in the fourth cluster. Chapter 4 has discussed the reasons underlying the traditional characteristics of the Ngoni. The Luba have also upheld most of the social and community characteristics of the Great Lakes region from where they previously originated despite having settled as part of the Luba Kingdom in Congo (Brelsford 1965).

5.3.3 Distinguishing characteristics of the four traditional reproductive clusters found in Zambia

This section describes and distinguishes the four clusters using the 35 attributes underlying reproduction in traditional societies. This discussion is not limited to results from the multivariate cluster analysis. Coast (2003) recommends that other accounts and well-established knowledge should confirm the validity and reliability of ethnographic information.

Table 5.7 presents the defining characteristics of the four traditional reproductive regimes in Zambia according to the three sets of attributes underlying reproduction in traditional societies. The figures in the table are weighted scores (total of one) derived from mean scores produced by the multivariate cluster analysis procedure. Assessments of the key variables identified in Section 5.3.2.2 and tests of statistical significance (t-test values[6]) show the variables that distinguish between the clusters.

Overall, Cluster 1 has the highest average score (64 per cent). This is an indication that compared with other clusters, this group has characteristics that are favourable to low fertility in traditional societies. Cluster 2 has the next highest score (58 per cent) and the last two clusters have the lowest score (55 and 53 per cent). Multidimensional distance indices computed in LOICZView show the same relationships. For instance, Cluster 1 is the furthest from Cluster 4 followed by Cluster 2 while the closest is Cluster 3.

Using these scores[7], Cluster 1 and 2 are designated as the "low and medium traditional fertility regimes" respectively. Clusters 3 and 4 are both high traditional fertility regimes but for purposes of identification, they are designated as "high traditional fertility patrilineal regime" and "high traditional fertility matrilineal regime", respectively. Figure 5.6 illustrates the profiles of the four regimes on the three sets of attributes underlying fertility in traditional societies.

[6] Because equal variance cannot be assumed, the degrees of freedom are calculated using the formula proposed by Satterthwaite (1946), as suggested by Pryor (2003).

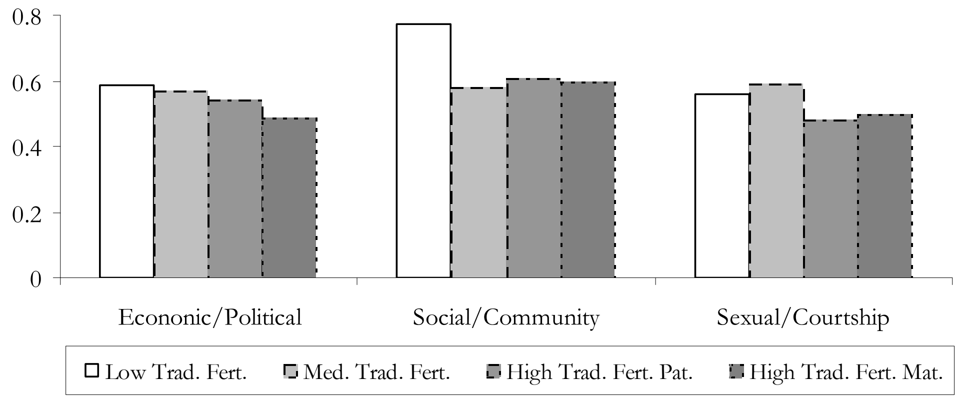
[7] In Section 5.3.1.2, we associated high scores on these variables with low fertility and vice versa.

Table 5.7 Defining characteristics of traditional reproductive regimes in Zambia derived from Murdock's Ethnographic Atlas

Traditional feature	Cluster				
	First	Second	Third	Fourth	All
Name of archetype society in each cluster	Lozi	Tonga	Tumbuka	Kunda	All
Number of societies in each cluster	1	2	5	12	20
Traditional economic and political organisation					
Dependence on gathering (0-1, low = 0)	0.20	0.15	0.12	0.13	0.13
Dependence on hunting (0-1, low = 0)	0.30	0.15	0.24	0.26	0.25
Dependence on fishing (0-1, low = 0)	0.20	0.15	0.18	*0.27	0.23
+Dependence on animal husbandry (0-1, low = 0)	0.30	0.35	0.22	*0.16	0.20
+Dependence on agriculture (0-1, low = 0	0.50	0.70	0.74	0.68	0.69
Intensity of agriculture (0-1, none = 0)	0.83	0.50	0.50	0.50	0.52
Major crop type (0-1, none = 0)	0.83	0.83	0.77	0.78	0.78
+Predominant type of animal husbandry (0-1, none = 0)	$\boxed{1.00}$	**1.00	0.57	**0.33	0.49
Milking of domestic animals (0-1, none/little = 0)	$\boxed{1.00}$	*1.00	0.70	0.54	0.65
Settlement patterns (0-1, nomadic = 0)	0.38	0.56	**0.88	0.76	0.75
Jurisdictional hierarchy within local community (0-1, four levels = 0)	$\boxed{0.67}$	0.33	0.53	0.44	0.47
+Jurisdictional hierarchy beyond the local community (0-1, none = 0)	0.80	0.30	0.64	0.52	0.54
+Type of hereditary succession (0-1, none = 0)	0.50	0.75	**0.38	**0.72	0.66
Class stratification (0-1, none = 0)	0.40	0.50	0.40	0.27	0.33
Type of slavery (0-1, absent = 0)	$\boxed{1.00}$	0.88	0.81	0.68	0.75
+Former presence of slavery (0-1, absent = 0)	0.50	1.00	1.00	0.80	0.85
Average - economic and political organisation	**0.59**	**0.57**	**0.54**	**0.49**	**0.52**
Traditional social and community organisation					
+Largest patrilineal kin group (0-1, advanced/complex = 0)	$\boxed{1.00}$	0.83	**0.43	**1.00	0.84
+Largest matrilineal kin group (0-1, advanced/complex = 0)	$\boxed{1.00}$	*0.17	**1.00	**0.17	0.42
Largest matrilineal exogamous group (0-1, advanced/complex = 0)	1.50	1.50	1.50	1.36	1.42
Largest cognatic kin group_primary (0-1, none/na = 0)	0.71	0.14	0.29	0.21	0.25
Largest cognatic kin group_secondary (0-1, none/na = 0)	$\boxed{1.00}$	0.00	0.00	0.00	0.05
+Community marriage organisation_primary (0-1, simple = 0)	$\boxed{1.00}$	*1.00	0.79	0.71	0.77
Marital residence with kin: first years (0-1, husband's kin = 0)	0.60	0.70	0.76	0.67	0.69
+Transfer of residence at marriage: after first years (0-1, husband's kin = 0)	$\boxed{0.20}$	0.30	**0.20	**0.60	0.45
+Marital residence with kin: after first years (0-1, none = 0)	0.30	0.35	**0.14	0.33	0.28
Inheritance rule for land (0-1, none = 0)	0.71	0.29	0.50	0.46	0.46
Sex differences: agriculture (0-1, males only = 0)	0.88	0.88	0.81	0.78	0.80
Kin terms for cousins (0-1, mixed = 1)	$\boxed{0.38}$	0.75	0.75	0.75	0.73
Perception of High Gods (0-1, supportive of human morality = 0)	0.75	0.63	0.75	0.71	0.72
Average - social and community organisation	**0.77**	**0.58**	**0.61**	**0.60**	**0.61**
Traditional courtship and sexual relationship governance					
+Male genital mutilations (0-1, absent = 0)	$\boxed{0.10}$	0.10	**0.10	*0.27	0.19
+Type of cousin marriages allowed (0-1, any first cousin = 0)	$\boxed{1.00}$	0.58	0.60	*0.55	0.59
+Type of cousin marriages preferred (0-1, symmetrical = 0)	$\boxed{1.00}$	0.87	0.73	**0.59	0.67
+Primary mode of marriage (0-1, bride price/wealth = 0)	0.38	*0.13	0.18	*0.30	0.26
+Secondary mode of marriage (0-1, bride price/wealth = 0)	0.25	*1.00	0.70	0.73	0.73
+Domestic org.: type of marriage (0-1, independ. polyandrous families = 0)	0.63	**0.88	0.60	0.55	0.60
Average - courtship and sexual governance	**0.56**	**0.59**	**0.48**	**0.50**	**0.51**
Overall	**0.64**	**0.58**	**0.55**	**0.53**	**0.54**

Note: ** Indicates that the cluster average is significantly different at the 0.01 level of confidence from the sample average excluding the reference cluster.
* Indicates that the cluster average is significantly different at the 0.05 level of confidence from the sample average excluding the reference cluster.
+Indicates variables identified, using principal components analysis, as key attributes of the traditional reproductive regimes.
- The boxed values are those in the extreme end of the range values or equal to a significant value in another cluster. This is because it is not possible to compute degrees of freedom for the first cluster because its sample size is one.

Figure 5.6 Profiles of the four clusters on the three sets of attributes underlying fertility in traditional societies



Cluster one (low traditional fertility regime) has a relatively advanced traditional economic and political arrangement conducive to lower fertility. By contrast, cluster four (high traditional fertility matrilineal regime) is less organised. Compared with cluster one, the other clusters have a social and community organisation that encourages higher fertility. Governance of courtship and sexual relations is more restrictive in clusters one and two (low and medium traditional fertility regimes).

In summary, patterns of traditional economic and political organisation as well as courtship and sexual governance are the features that separate low and medium traditional fertility regimes from the high fertility regimes. Further, social and community organisation in Zambian traditional societies is what separates the low from the medium traditional fertility regime. Lastly, the only distinction between the two high fertility regimes is traditional economic and political organisation—although as discussed later, kinship lineage also casts an important distinction.

5.3.3.1 Cluster 1—Low traditional fertility regime

Murdock's Ethnographic Atlas has only one traditional society with features conducive to low fertility—the Lozi. Therefore, it is not possible to test the statistical significance of this regime's estimates. As a result, this discussion uses the exceptional scores (those boxed in Table 5.7) to highlight the outstanding traditional features. The Lozi have several characteristics of a low traditional fertility society. These are an advanced traditional political and economic base, a less rigid social and community organisation, and strict governance of courtship and sexual relations.

The Lozi traditional society scores highly on the economic features because they settled in an environment granted with natural resources and therefore they managed a mixed traditional economy. Gluckman (1950: 168) observes that "they have to send their cattle to … grazing … when they are gardening and fishing on the Zambezi plain…". In addition, their agricultural system—that produced mostly cereal grain—was more intensive and advanced than any other society included in Murdock's sample of Zambian societies. A mixed economy and intensive agriculture are features of an advanced economic system. This is because the skills required to manage an advanced economy are sophisticated and specialised (Goody 1976).

The Lozi traditional society was also politically well-organised, probably because of their superior traditional economy (Roberts 1976). Traditional societies needed political organisation for both internal and external purposes (Radcliffe-Brown 1940). The former (internal) was to set up and preserve social order within a territory for purposes of coexistence and integration. One requirement of this objective was reproduction, a feature that could support high traditional fertility (Goody 1976). Traditional societies set up the latter (external) to create and keep order with other states. The superior political system of the Lozi existed, rather, as a means of military dominance (Gluckman 1968). Military dominance meant they conquered and subdued other traditional societies in their vicinity. This probably explains why anthropologists noted hereditary and socially significant slavery in this society (Table 5.7).

Compared with other societies, the social and community organisation of the Lozi is described as less rigid and centred on the nuclear family—a feature linked to low fertility in traditional societies (Caldwell and Caldwell 1987; van de Kaa 1996; Mason 1997). The Lozi may have had less need for communal living for purposes of survival because they had an economically advanced traditional society. In turn, this suggests why they lived in the simplest (agamous) family structures characterised by strong immediate family bonds. Inheritance circulated within the immediate rather than the extended family. Another prominent feature of this society is that their kinship lineage was cognatic with minimal emphasis on unilineal kinship (matrilineal or patrilineal). This is why the Lozi are reported to have had the widest cognatic kinship groups. Gluckman (1968) observes that in the third generation all siblings, half-siblings and cousins, however related, are called brother and sister. This applies equally to other generations—all relations in the second generation are referred to as father and mother while in the first as grandfather and grandmother. In addition, Gluckman (1968) observes that almost everyone was related through marriage because inter-class marriages existed—for example, between the royal family members and commoners.

Such practises cast affinity ties widely and as a result, finding a sexual partner was not easy—one of the characteristics that typify strict governance of courtship and sexual relations.

The marital home of the Lozi was patrilocal and therefore the community expected the husband (but not necessarily his family) to take care of his wife. In such circumstances, productive and reproductive decision making shifts to the husband, an arrangement that both Boserup (1985) and Lesthaeghe (1989b) link to high fertility in traditional societies. However, a woman's position in the Lozi society could have mitigated this outcome. Gluckman (1968) notes that the Lozi hold their women, including wives, in high esteem; they have notable authority and their opinion is important. Compared with other Zambian societies, on marriage, a wife becomes the head of the household and she has equal share of anything she produces using her husband's assets including land. She remains a member of her own kin-group and does not produce children for the husband's kin (Gluckman 1968). If her husband dies, she is free to marry where she pleases and the children belong to her new husband.

Governance of courtship and sexual relations in traditional societies addresses several important features of fertility variations between traditional reproductive regimes. Compared with the high fertility clusters, this regime had restricted courtships and sexual relations. The Lozi did not sanction sex or marriage between individuals related through a traceable genealogy and hence, cousin marriage was strictly taboo. Gluckman (1968: 79) observes that "a Lozi may not touch his sister or a female affine [as defined above] without committing *sindoye* (a breach of the sexual ban), and he must not be alone with her in a hut" as this may lead to accusations of sorcery. Widespread cognate relations made these controls even more repressive. Although average age is not given, Gluckman (1968) reports that the age at first marriage in this society was high. There is a possibility that marriage controls within the wider cognatic kinship made it difficult to find a partner. In turn, this could have resulted in delayed first marriage and therefore low fertility among the Lozi.

Further, the Lozi restricted sexual relations before marriage by encouraging sex abstinence until marriage and within marriage by discouraging adultery. Gluckman (1968) observes that virginity was subtly emphasised by doubling the bride price (even though this was very low—up to two heads of cattle) if the bride was a virgin. Adultery was not allowed and its definition was not limited to sleeping with someone's wife but any intention to do so by walking with her or assisting her in any form or offering her anything especially alcohol (Gluckman 1968). It is likely that these limited sexual outlets depressed fertility levels. Caldwell, Caldwell and Orubuloye (1992) suggest that limited sexual outlets are a feature of low traditional fertility in sub-Saharan African societies. Other dimensions of the Lozi society that would support its label as a low fertility traditional regime include less emphasis on bridal price. Placing less emphasis on bridal price may improve a women's decision-making status in a marriage. Further, higher proportions of polygyny and frequent divorces in the Lozi society may have reduced exposure to sexual intercourse (Gluckman 1968).

In summary, high social status of women and family nucleation—supported by an advanced traditional economic base—may account for low fertility in this traditional regime. Boserup (1985) as well as Caldwell and Caldwell (1987) have stated that these features account for low fertility in sub-Saharan traditional societies. Besides an advanced traditional economic base, these features had support from marriage bridal price and limited sexual outlets in the Lozi society—although insignificant.

5.3.3.2 Cluster 2—Medium traditional fertility regime

The Tonga and Ila are the only two medium traditional fertility regime societies in Murdock's Ethnographic Atlas. Seven of the 35 attributes are significantly different from the sample average of the other three regimes (Table 5.7). Their governance of courtship and sexual relations was stricter than the other three Zambian traditional fertility regimes. Compared with the two high traditional fertility regimes, this regime had an advanced traditional political and economic base.

This regime scores highly on their traditional economic features because they settled in an environment that was beneficial to animal and crop farming (Roberts 1976). According to Brelsford (1956: 124), "the Tonga … have a more highly developed agriculture …". Rearing bovine animals for beef and dairy products was the main preoccupation of societies in this regime. Jaspan (1953) and Colson (1968a) observe that the Ila and Tonga are mainly pastoralists who take pride in owning as many cattle as possible—hardly for sale—but as a source of beef and dairy products. For meat they reared goats (for milk as well) and sheep (Colson 1960). Colson (1968a) observes that apart from cattle rearing, the Tonga produced cereal grain. Compared with the Lozi, the literature does not show whether their traditional economy was either intensive or mixed. However, their traditional economy was relatively well-organised and probably supported low fertility.

The Tonga and Ila score highly on three features of traditional political organisation that are likely to support low fertility in this regime. However, none of these features is significantly different from the other Zambian traditional regimes. Reports show that traditions of chieftainship did not affect the Bantu Botatwe—as they are collectively called (Roberts 1976). Their political organisation did not go beyond village neighbourhood boundaries (Jaspan 1953). For the Tonga society "…each village was an independent unit, recognising the power of no superior political authority" (Colson 1968a: 110). For the Ila society, Smith and Dale (1920: 299) observe that "perhaps commune would be better, for *chishi* [group] connotes not only the body of people but also the locality in which they live…each *chichi* [group] is entirely independent".

Compared with the Lozi, the social and community organisation of the Tonga and Ila as well as the two high traditional fertility regimes was rigid and therefore conducive to high fertility in these societies. The traditional social and community organisation of the Tonga and Ila is centred on a complex matrilineal kinship and patri-line inheritance. Women and their children (regardless of whom the father was) belonged to the husband's lineage (Smith and Dale 1920). In these societies, if a husband could not beget children, one of his siblings or age-mates in his kinship lineage had intercourse with his wife to produce children for the lineage (Colson 1968a). Further, they had strong extended family bonds (significantly agamous) that encourage individuals to reproduce for the extended family. This is why marriage organisation, a feature of courtship and sexual governance, is significant in these societies and may have supported relatively high fertility as well. Affinity ties of the Tonga and Ila were restricted to matrilineal relatives only. Therefore, they still had a base of sexual outlets among their patrilineal relatives.

Marital residence was with the husband's family, on marriage "…the bride moves to her husband's home wherever this happens to be even if it is in another neighbourhood" (Colson 1960: 96). Women kept the earnings from selling their surplus produce only after consulting with the husband (Colson 1968a). Further, "when a wife dies, it was the duty of her matrilineal kin to provide the surviving husband with a substitute for her—even if this woman is married" (Jaspan 1953: 39). Therefore, marital residence arrangements compromised women's social status in these societies, a feature that could have supported relatively higher fertility in this regime.

Narrow cognatic kinship relations meant that finding a partner was easier, therefore removing a brake on fertility in this traditional regime. Both the Tonga and the Ila allowed marriage between cross-cousins—that is, father's sister's daughter (Jaspan 1953). Among the Tonga, "preferred marriages were either with those classified as cross-cousins or with those to whom there was some previous affinal link… Marriages with mother's brother's daughter and father's sister's daughter were equally good, and the two types of cross-cousins were terminologically equated" (Colson 1968a: 325). However, it was rare for a woman to marry into a homestead where any of her close relations were already resident because the Tonga regarded this as incestuous (Colson 1958, 1960).

The marriage arrangements of the Tonga and Ila were significantly different from the other traditional fertility regimes. Payment of bridal wealth at first marriage was expensive and held in high esteem. Bridal wealth involved a transfer of cattle from the groom's family to the family of the intended bride (Jaspan 1953; Colson 1968a). The woman's family recognised a man as a husband after his family had paid the full amount of the bridal price (Colson 1958). If the woman remarried outside the husband's matrilineal group then brideswealth had to be to returned (Colson 1968a). Traditional societies interpreted payment of bridal wealth as a transfer of reproductive rights from a woman's kinship to her husband's relatives. It also compromised a woman's social status in these societies and supported high fertility.

There are other traditional features that might have also supported high fertility among the Tonga and Ila. First, they did not stop children from sexual experimentation and it was common for the young to elope (Colson 1958). Second, they preferred infant or preinitiation engagements that resulted in marriage just after menarche. Marriage followed immediately after the initiation feast (preceded by menarche) and her relatives delivered the young woman to the groom's home (Jaspan 1953). As a result, by the age of twenty, almost all women had married once and/or had borne a child (Colson 1958).

Third, they allowed extramarital sexual relations and intercourse through customary arrangements—called *lubambo*, *musedia*, *kusena*, and *kupenda*—that encouraged wife exchange especially if a man could not father his own children (Jaspan 1953). Colson (1958: 152) observes that "the husband made a formal arrangement with a friend or relative, usually a cross-cousin, who had to be acceptable to the wife. The man then becomes the wife's lover only for the purpose of begetting her husband's children.

If the woman became pregnant, the child belongs to her husband, like any child conceived in adultery." Adultery was common and every adult incurred such an offence at least once in their lifetime as the sanctions were trivial (Colson 1958).

In summary, this regime had features that supported both high and low fertility in traditional societies. It could be that causes of high fertility countered the fertility depressing attributes and therefore ending as a medium traditional fertility regime. An advanced economic base and probably low exposure to sexual intercourse supported low fertility in this traditional regime because these societies were polygamous and divorces were common, as observed by Smith and Dale (1920) as well as Colson (1958; 1968a). However, patrilocal marital residence and significance of bridal wealth could have compromised a woman's social status in this regime. This could have resulted in relatively higher fertility because as suggested by Setel (1995) they could have lacked the capacity to negotiate their fertility. In both unilineal kinships, elderly female relatives control the onset and timing of childbearing among conjugal couples. This responsibility vests upon the woman's kin in matrilineal societies and upon the man's kin in patrilineal kinships (Zulu and Kalipeni 2003). The limited controls in sexual outlets because of narrow affinity ties as well as pre-and extramarital sexual relations also supported high fertility.

5.3.3.3 Cluster 3—High traditional fertility patrilineal regime

In Murdock's Ethnographic Atlas, five patrilineal Zambian societies make up this traditional fertility regime. Table 5.7 shows that seven out of the 35 attributes underlying fertility in traditional societies distinguish this regime from the sample average of the other three regimes. With a less advanced traditional economic base, a rigid social and community organisation, and flexible governance of courtship and sexual relations, this regime displays the assumed characteristics of a high traditional fertility society. Cluster analysis has selected the Tumbuka as the society with the average features in this regime. However, the discussion in the next paragraphs uses literature on the Mambwe and the Ngoni because more information on these societies is available.

Compared with the low and medium traditional fertility regimes, this regime's traditional economic features—apart from dependence on agriculture—have low scores. Reports show that traditional economies of societies in this regime were neither mixed nor intensive. Phiri (2000) observes that the Tumbuka practiced extensive agriculture—largely shifting cultivation—producing cereal grain such as finger millet, sorghum and maize. Watson (1958) and Barnes (1968) report that the Mambwe and the Ngoni owned cattle. However, it is most likely that the numbers were less than those owned by societies in the low and medium traditional fertility regimes. This is because, as discussed in Chapter 4, the environment in this part of Zambia is not that conducive to animal husbandry.

Traditional political features of some societies in this regime were well organised—a feature that Goody (1976) associates with patrilineal societies. For example, the Ngoni had a well-organised political structure comprising of paternal lineages organised in age-sets to promote tribal military needs (Barnes 1968). Societies in this regime had advanced settlement patterns i.e. compact and permanent—an attribute that is significantly different from the other three Zambian reproductive regimes. This suggests that they organised their traditional politics to address internal order—Radcliffe-Brown (1940) links this feature to the need for coexistence among individuals. Further, (significantly different from other Zambian regimes) they did not limit succession to political office to family members only. Succession was open to all members of the patrilineal kinship—another signal of lack of family nucleation. Without an advanced traditional economic base, these traditional political features suggest that societies in this regime had a need to expand as well as coexist in larger communities. This could have resulted in customs and norms that supported high fertility.

The need to coexist explains the rigid community and social organisation. The kinship lineage of societies in this regime was patrilineal without any traces of matri-lineage. Further, they narrowed affinity ties to patrilineal relatives. Their marital home was patrilocal and the extended family was involved in marital unions of individuals—this feature is significantly different from the other traditional fertility regimes in Zambia. Barnes (1967) reports that the Ngoni lineages were exogamous and practiced patrilocal marital residence. This meant that on marriage, women's productive and reproductive rights belonged to the husband's lineage. For example, among the Mambwe, women and their children belonged to the husband's lineage and they practiced levirate (Watson 1958). These male-centred features point to a consistency that the status of women in this cluster was low and therefore they could not negotiate their fertility. In summary, the need to expand their population size and the low status of women living in patrilocal residence suggests that societies in this regime configured traditional customs and norms to support high fertility.

Relative to the low and medium traditional fertility regimes, governance of courtship and sexual relations in this regime was not as strict. In principle, societies in this regime did not allow marriage between close genealogical relatives apart from cross-cousins and siblings-in-law. However, tracing genealogical relations was of little interest to individuals and therefore "distant relationships between the couple-to-be were conveniently forgotten by the parties concerned" (Barnes 1968: 226). This, coupled with narrow cognatic kinship relations, suggests that finding a partner was easier and marriage was almost universal—these features might have contributed to high fertility in these traditional societies.

Although not significantly different from the other regimes, the literature shows that transfer of bridal wealth on marriage was important among these societies. Watson (1958: 113) observes that "when a Mambwe marries, he pays out a considerable sum…the essential item in their marriage contract is an exchange of cattle and money, and the wife comes to live in her husband's village". Effectively, this payment transferred her procreative capacity to her husband's lineage. Similarly, reports show that the Ngoni demanded cattle for payment of bride-wealth because this determined marital residence and affiliation of the children. The Ngoni only paid bridal-wealth if a man decided to move his wife to his relatives and they rarely paid "…until after several children have been born" (Barnes 1968: 226). Divorce was not very common among the Ngoni women because they could only divorce on the grounds of desertion or proven cruelty (Barnes 1968). Significance of bridal wealth may have augmented the low status of women in this reproductive regime and can explain its relative high fertility.

In summary, low social status of women living in patrilocal patrilineal societies with a less advanced traditional economic base may help to account for high fertility in this traditional regime. Boserup (1985) has suggested that this feature accounts for high fertility in pre-industrial societies. The significance of bridal wealth that transferred their productive and reproductive rights further worsened and upheld their low status. Age at marriage was low because narrow affinities ties made finding a partner easy. Further, the absence of circumcision meant that there could have been no barrier to early marriage. In these societies, only low marital sex exposure moderated fertility. Watson (1958) reports that among the Mambwe, polygamy was common and individuals avoided extramarital affairs because fines were high.

5.3.3.4 Cluster 4—High traditional fertility matrilineal regime

Societies belonging to the high traditional fertility matrilineal regime make up 60 per cent of the Zambian sample in Murdock's Ethnographic Atlas. Cluster analysis results show that in this regime the Kunda have the average characteristics. However, additional anthropological literature on the Kunda is not available. Therefore, the discussion below uses information on other societies in this cluster to discuss features of this traditional reproductive regime. Eleven attributes significantly distinguish this regime from the other Zambian traditional fertility regimes. Like the high traditional fertility patrilineal regime, it displays the assumed characteristics of a high traditional fertility regime. Nevertheless, reports show that the status of women in this regime was higher than their patrilineal equivalents.

Like their patrilineal counterparts, this regime has low scores on four of the five traditional economy features. Societies in this regime had a mixed traditional economy that was neither intensive nor advanced. This is despite most of these societies settling in regions that were suitable for farming because of several rivers and streams (Corinaldi 1966). Compared with the other three traditional fertility regimes, societies in this regime relied significantly more on fishing and less on animal agriculture (Table 5.7). Goody (1976) classifies hunting and fishing at the lower bottom of subsistence sources in traditional societies and animal farming among the most advanced. Turner (1979) reports that the Ndembu society (North-western) placed a high value on hunting while Cunnison (1959) reports that fishing was the main source of subsistence for the traditional societies in North-central region. There is also evidence of little animal farming in these traditional societies. Richards (1968: 166) reports that the Bemba "are not a pastoral people…and have no tradition or knowledge of handling cattle…" According to Brelsford (1956: 124), "…the Bemba are subsistence cultivators".

Further, the methods of farming that some societies in this regime applied were basic and so were the products. Robert (1976) reports that most traditional societies in this regime cultivated extensively and produced only tuber crops and cereal grain. Traditional societies in the North-central and North-western regions of Zambia cultivated extensively and produced tuber crops such as cassava (Corinaldi 1966; Spring 1976; Turner 1979). Similarly, Richards (1968) and Roberts (1973) observe that the Bemba traditional society practised extensive agriculture—largely shifting cultivation and produced only cereal grain.

Table 5.7 shows that most traditional political features of this regime have low scores. This suggests that overall traditional political features of societies in this regime supported high fertility. However, a few features supported low fertility. Societies in this regime based succession to political office on seniority i.e. it was non-hereditary—the only traditional political feature that is significantly different from the other three

Zambian reproductive regimes. Further, their community organisation was exogamous rather than agamous—an arrangement that may rule out the possibility of strong immediate family bonds. This suggests that traditional political organisation went beyond the family. Such advanced levels of political organisation support low fertility. Other traditional political features that could have supported low fertility in this regime include settlement patterns and the presence of slavery. On average, settlement patterns arose from separate hamlets condensing into single communities. Slavery did exist because military dominance of these societies enabled them to conquer and subdue other traditional societies.

The traditional political organisation of the Bemba was centralised under one hereditary paramount chief. According to Richards (1968: 168) this was "…the main source of tribal cohesion throughout this scarcely populated area." Unlike many traditional societies in Zambia who do not identify themselves with a specific leader, the Bemba are those peoples who considered themselves subjects of their paramount chief—Chitimukulu (Roberts 1973). The paramount chief divided the Bemba traditional society into five districts (each ruled over by a chief). The chiefs further subdivided the districts into groups of villages ruled over by headmen (Richards 1940).

Roberts (1976) observes that the Kingdom of Kazembe (Luapula-Lunda) was politically organised and had a solid military force. As a result, they had conquered and subdued other traditional societies in their vicinity (Cunnison 1959). Similarly, the Bemba used their well-organised military to attack their neighbours—for instance, the Iwa and the Mambwe—for food needs (Roberts 1976). Doke (1931) observes that the Lamba had four territorial chieftainships under the paramount chief Mushili and subparamount chief Nkana. Although chief Mushili or Nkana did not tax their subjects, the territorial chiefs paid tribute not as dues but as gifts—in the form of meat products and grain. In case of war, the paramount chief had the right to demand volunteer warriors from his territorial chiefs.

With a less advanced traditional economy, individuals belonging to societies in this regime needed to coexist in order to survive. Like their patrilineal counterparts, this explains the full corporate matrilineal kinship. Lesthaeghe (1989b) states that this full corporate matrilineal kinship is unique to this part of Africa. Societies in this region found in the geographical band that extends from the Western DRC and Northern Angola to Zambia, Malawi, and Northern Mozambique are the only ones that trace through matrilineal. Table 5.7 shows that the presence of matrilineal and the absence of patrilineal kinship among these societies are significantly different from the other three Zambian traditional reproductive regimes.

Another community and social organisation feature of societies belonging to this regime—that is significantly different from societies in other Zambian regimes—is marital home. Richards (1968) states that marital home among the Bemba-speaking people is matrilocal. This means these societies expected husbands to live among the maternal relatives of their wives and maternal uncles brought up their children. Depending on his social rank and position, he occupied an inferior position in the village of his wife's family. However, his sister had a say in his children's affairs because they believed that she "…could bless or curse the fertility of the union" (Richards 1968: 175). Besides, this is the only regime in which polygamy was rare because of resistance from women (Richards 1968). In summary, women of this regime had a much greater say in decision-making because of the matrilocal living arrangements. As a result, compared with other regimes, their status was higher than the patrilineal group—a feature that could have been moderating fertility among women belonging to this regime.

Further, modest requirements for a man to marry—a courtship and sexual relations governance feature—might have moderated fertility of this regime. Compared with other regimes, the groom in societies belonging to this regime was significantly more likely to offer only services to the bride's family rather than transfer cash or cattle. According to Richards (1968), the requirement of marriage was important among the Bemba but it was in the form of a token or service to the bride's family and there were no repayments in cases of divorce. While this had the potential of encouraging early marriage since the requirement was not prohibitive, we speculate that it upheld the status of women. High women's status coupled with matrilocal marital home might have placed women in a position of negotiating their fertility (Boserup 1985).

However, societies in this regime were not strict in their governance of courtship and sexual relations. Compared with other Zambian traditional reproductive regimes, Table 5.7 shows that societies in this regime were significantly more likely to allow and prefer marriages between cross-cousins and other relations. Richards (1968) observes that the Bemba preferred marriage between relatives such as cross-cousins, granddaughters and sons, to daughter of his own son (but not among commoners) and to his brother's son—but rarely to the daughter of a daughter. In addition, individuals passed on their marriages to the next generations. For instance, "…a woman has definite rights over her brother's daughter, and may demand this girl as an additional wife for her husband or a substitute wife if she herself is tired of married life" (Richards 1968: 181).

There is evidence that some societies in this regime encouraged young women to marry at young ages. The Bemba (North-central region) encouraged marriage subtly because "rather than the number of cattle and possessions…the Bemba father counts his assets in terms of the number of sons-in-law whose services he can command, such a system being correlated with the institution of matrilocal marriage" (Richards 1968: 180). The Luvale (North-western region) "…regard the attainment of puberty by a girl and the time for marriage as normally coincident occasions" and this is mostly below the age of 12 years (White 1962: 1).

Table 5.7 shows that societies in this regime were significantly more likely to perform male circumcision. White (1953) states that there is evidence that societies from the Luba-Lunda Kingdom were performing male circumcision when they migrated to Zambia. However, "frequent enquiry has failed to reveal any general tradition to explain the source …" of male circumcision (White 1953: 42). By the 1950s, most societies had abandoned this tradition except for societies in the North-western region (Chokwe, Luchazi, Lunda, Luvale and Lwena). Other societies abandoned this tradition probably due to Christian missionaries who described the rite as pagan as well as obscene and instead provided facilities for circumcision at mission hospitals.

There is no evidence to show that male circumcision was a barrier to early marriage. First, although the average age of circumcision had declined over the years, it was rarely over fifteen years "… so much so that the sexual aspect of the rite must have been of limited significance …" (White 1953: 43; Turner 1962; White 1962). It is possible that circumcision prepared the boys for adult life early because these societies did not have any tribal military needs for them (White 1957). Second, allowing premarital sexual intercourse among young women could have mitigated the impact of male circumcision on fertility. White (1962: 1, 8) observes that "premarital virginity is not expected of Luvale girls, and many therefore have sexual relations…as young girls today have commonly had considerable sexual experience before puberty."

Apart from marrying at young ages, these societies expected women to remain married indefinitely. This norm guaranteed long exposure to sexual intercourse. They achieved this by using initiation ceremonies to teach young women how to keep a marriage (Richards 1968). The Luvale marriage ritual "…includes a very strong sexual element in the instruction…with elements regarded as sexually exciting to men" (White 1962: 7). "The girl is enjoined to live harmoniously, and to avoid jealousy in respect of her husband or co-wives in a polygamous marriage; she is warned to get on well with the relatives of her husband; in particular she is advised that if the father-in-law makes sexual advances to her she must conceal the fact from her husband" (White 1962: 8). The Aushi, Bisa, Lamba, Shila Tabwa and Unga (North-central region) had a common secret society that among other things instructed young recruits in sex (Roberts 1976). Other traditional norms also guaranteed long exposure to sexual intercourse. The Bemba performed a sexual ritual for a bereaved woman. They let her have intercourse with an individual considered to be the successor to her dead husband and this man had the right to inherit her (Richards 1968).

Table 5.7 and the discussion above suggest that less advanced traditional economic organisation (and therefore the need to coexist as a community) supports high fertility. Further, traditional features governing courtship and sexual relations show that societies in this regime had many sexual outlets. These societies allowed both premarital sex and marriage between relatives. These outlets are a potential for high fertility in the absence of contraception. However, the high social status of women mitigated this high fertility potential. Matrilocal marital residence and marriage that required token payment promoted the high social status of women that might have placed them in a position to negotiate their fertility. This suggests that between the two high traditional fertility regimes, the matrilineal regime had lower fertility.

From the discussion, we expect that societies belonging to the low traditional fertility regime would have the lowest fertility followed by those belonging to the medium traditional fertility regime. The patrilineal high traditional fertility regime should have the highest.

5.4 Review of the adopting the approach of perceiving ethnicity as traditional reproductive regimes

5.4.1 Summary and results

Chapter 2 reviewed the methodological drawbacks of past research that has attempted to explain features underlying subnational fertility differentials in Zambia. The main problem affecting these studies is the confounding regional and ethnic fertility differentials (Section 2.4.2.2). For reasons detailed in Section 2.7, this thesis took on to pursue the hypothesis that subnational fertility variations in Zambia are a reflection of ethnic fertility differentials—using solutions proposed in Section 2.4.3. To achieve this aim, Chapter 5 has derived Zambian traditional reproductive regimes—each with similar multivariate fertility governing traditions.

Traditional reproductive regimes are multidimensional re-expressions of ethnicity derived from applying multivariate cluster analysis procedures to 35 attributes underlying fertility in traditional societies for twenty Zambian societies for which there are data in the Murdock Ethnographic Atlas. To ensure reliability of these regimes and facilitate analysis, Chapters 4 and 5 provided independent historical and anthropological information to supplement Murdock's ethnographic data. Like ethnicity, this multivariate approach identifies a collection of societies with similar multivariate traditions. Therefore, these regimes will be used in the chapters that follow as units of analysis (instead of ethnic, regional, or provincial administrative units) to assess if fertility differentials exist between ethnic societies in Zambia.

Chapter 5 reveals four distinct traditional reproductive regimes in Zambia. We named them according to their relative fertility—that is, low traditional reproductive regime, the medium traditional reproductive regime, the high traditional reproductive matrilineal regime and the high traditional reproductive patrilineal regime. Using information provided in Chapter 4, we note that the derived Zambian traditional reproductive regimes do <u>not</u> map neatly on to the standard approaches of grouping Zambian ethnic societies based on region or language or monodimensionally on social organisation attributes. However, the regimes are consistent with their migration histories and the four kinship arrangements found in Zambia.

The low traditional reproductive regime (South African-influenced) comprises of societies that trace their relatives through cognatic kinship lineage—that is, no dominant unilineal kinship lineage. The medium traditional reproductive regime (directly from the Great Lakes Region) comprises of societies that trace their relatives through dual kinship lineage—that is, matrilineal kinship lineage with a strong emphasis on patrilineal inheritance. The high traditional reproductive matrilineal regime (from Luba and Lunda Kingdoms) comprises of matrilineal kinship societies. The high traditional reproductive patrilineal regime (directly from the Great Lakes Region) comprises of societies that trace their relatives through the patrilineal kinship.

Since the features underlying fertility in traditional societies—used to derive traditional reproductive regimes in Zambia—are interlinked, this chapter divided them into three groups for simplicity and ease of presentation. The three groups are economic and political organisation, social and community arrangements, as well as arrangements used to govern courtship and sexual relations. We identified the important pre-industrial features underlying fertility differentials between Zambian traditional reproductive regimes using multivariate cluster analysis mean scores and principal component analysis (PCA).

The results show that unlike other regimes, the traditional economic and political organisation of the low traditional fertility societies (cognatic kinship societies) is advanced and its social and community arrangements are not rigid. Overall, the community rules and norms, which individuals should subscribe to, were less rigid in traditional societies with advanced traditional economic and political arrangements. The high traditional fertility patrilineal societies have the most rigid social and community arrangements. It has less advanced traditional economic and political arrangements and the weakest grip on its governors of courtship and sexual relations. The remaining two regimes fall in between these two extremes.

5.4.2 Reliability of deriving traditional reproductive regimes using multivariate cluster analysis

Smith (2002) recommends cluster validation to ensure that they are numerically objective and stable. Clusters are objective and stable if they are replicable and unchanging under varying circumstances. Ascertaining that classifications exist in a data set serves the purpose of certifying clusters (Everitt, Landau and Leese 2001). The MDL is one such test—if MDL analysis indicates that there are no clusters in the data, then cluster analysis results are invalid. A clustering is robust—i.e. not an artefact of the method—if different methods as well as sub-samples of observations and attributes produce similar clusters.

Using different configurations and subsamples, Section 5.3.2.3 shows that classifications exist in Murdock's Ethnographic Atlas data on Zambian societies and that between three and seven clusters are ideal. Further, principal component analysis (Section 5.3.2.2) proves the variability of traditional attributes of Zambian societies for whom there is data in the Atlas. Evaluations with different configurations show that compositions of clusters derived from Murdock's Ethnographic Atlas data are fundamentally similar. These results show that Zambian traditional reproductive regimes derived from Murdock's Ethnographic Atlas data are numerically stable, objective and robust. Lastly, as recommended by Coast (2003), the consistency with anthropological accounts and well-established knowledge on traditional societies in Zambia confirms the validity and reliability of Murdock's Ethnographic Atlas data on Zambian societies.

5.4.3 Problems of using anthropological and ethnographic information

One obvious problem is making comparisons using information collected at different times by different people for different reasons. There is a possibility that a comparison of societies using information collected at different points might not portray accurately societal differentials.

Second, most anthropological accounts on Zambian traditional societies were "written against a background of the then concern that in both rural and urban areas, there is a very obvious breakdown of the old family organisation and marriage institutions…" (White 1962: 27). The information available is not enough to confirm how quickly the cultural changes took place and if the impact was different between traditional societies. However, Watson (1958) observes that industrialisation among the Mambwe did not erode their indigenous cultures rapidly. Probably, this was the case with the rest of Zambian ethnic societies.

Another problem is that generalisation of anthropological accounts assumes that all individuals in a community adhere to group morals and norms. The discussions in Chapter 2 show that this assumption may not be correct. Clusters of societies are even more likely to circum to this problem because it is unlikely that all societies in a group may adhere to cluster norms. Therefore, the generalisations made on Zambian traditional reproductive regimes may not be accurate and it is likely that some traditional norms varied even between similar societies.

Chapter 8 discusses additional analytical merits of multivariate reproductive regimes after evaluating them empirically in Chapters 6 and 7.

6 CONVERGING FERTILITY LEVELS: PAST TRENDS AND FERTILITY ESTIMATES FOR ZAMBIAN TRADITIONAL REPRODUCTIVE REGIMES

> "…suggested constructs should evolve from substantive theory…data should only be used to verify the existence of hypothesised constructs…This would be well and good if the substantive theory of interest is refined and has been studied to the extent of suggesting meaningful and interpretable constructs…" (Huberty and Olejnik 2006: 399).

6.1 Comparing fertility between traditional reproductive regimes

This chapter begins with classifying women of reproductive age in contemporary data sources accordingly for purposes of comparing fertility levels and trends between the Zambian traditional reproductive regimes derived in Chapter 5. However, Chapter 5 only describes regimes of societies for whom information is available in Murdock's Ethnographic Atlas. Therefore, the next section assigns Zambian traditional societies not covered in the Murdock Ethnographic Atlas to one of the four traditional reproductive regimes described in Chapter 5. Section 6.3 uses the self-reported tribe or ethnic group to classify women to respective traditional reproductive regimes. After that, to assess ethnic fertility differentials in Zambia, Section 6.4 presents and compares fertility levels and trends between Zambian traditional reproductive regimes. To get fertility indices for each traditional reproductive regime, the approaches described in Chapter 3 are applied. Section 6.5 draws some conclusions based on past and present fertility trends of each traditional regime.

6.2 Extending the traditional reproductive regimes to other Zambian societies

This section assigns Zambian traditional societies not covered by the Ethnographic Atlas to one of the four traditional reproductive regimes derived in the preceding chapter. Doing so allows for larger sample sizes when estimating and assessing fertility differentials between traditional reproductive regimes in the sections that follow. The discussion in Chapter 4 weighs the benefit against the risks arising from misclassification. Both Sections 4.4 and 4.5 justify this generalisation by showing that traditional societies not in the Ethnographic Atlas are either similar to, or represented by, those left out. Murdock (1967b) also reports that Africa is one of three regions whose ethnographic literature was surveyed for most of its societies. He states that "societies omitted…in all cases [were those] where the ethnographic sources are substantially less adequate or …substantially less complete, than for included societies with similar cultures" (1967b: 109). Multivariate cluster analysis results in Chapter 5 (Figure 5.5) show that clusters of societies are similar to those presented in Table 4.3 except for the Luba society. Table 6.1 presents traditional reproductive regimes in Zambia shown in Figure 5.5 after mapping other societies that do not appear in Murdock's Ethnographic Atlas clusters using the information in Table 4.3.

Table 6.1 Traditional reproductive regimes in Zambia according to region

High fertility - matrilineal

Region I

Society	Population in 1953 Number	Per cent
1 **Luvale**	**49,097**	**24.4**
2 **Kaonde**	**42,354**	**21.1**
3 **Ndembu**	**33,216**	**16.5**
4 **Luchazi**	**21,442**	**10.7**
5 **Chokwe**	**11,355**	**5.7**
6 Lunda	40,131	20.0
7 Mbowe	2,941	1.5
8 Mbwela	280	0.1
9 Lwena*		
Total	200,816	100.0

Region II

Society	Population in 1953 Number	Per cent
1 **Bemba**	**144,511**	**32.5**
2 **Lunda**	**82,050**	**18.4**
3 **Shila****	**7,300**	**1.6**
4 Bisa	50,804	11.4
5 Aushi	43,163	9.7
6 Chishinga	28,735	6.5
7 Ngumbo	28,047	6.3
8 Mukulu	20,882	4.7
9 Tabwa	15,320	3.4
10 Kabende	9,355	2.1
11 Unga	9,204	2.1
12 Bwile	5,899	1.3
13 Batwa*		
14 Ngwela*		
Total	445,270	100.0

High fertility - patrilineal

Region III

Society	Population in 1953 Number	Per cent
1 **Ngoni**	**66,589**	**30.1**
2 **Tumbuka**	**25,300**	**11.4**
3 **Mambwe**	**21,388**	**9.7**
4 **Iwa**	**12,249**	**5.5**
5 **Luba**	**N/S**	
6 Lungu	38,073	17.2
7 Senga	25,811	11.7
8 Inamwanga	12,400	5.6
9 Tambo	5,340	2.4
10 Yombe	4,234	1.9
11 Fungwe	2,849	1.3
12 Nyika	2,630	1.2
13 Lambya	1,953	0.9
14 Wenya	900	0.4
15 Wandya	800	0.4
16 Kamanga	500	0.2
17 Sukwa*		
Total	221,016	100.0

Region V

Society	Population in 1953 Number	Per cent
1 **Lala**	**55,936**	**41.5**
2 **Lamba**	**35,175**	**26.1**
3 Swaka	17,647	13.1
4 Lima	15,210	11.3
5 Seba	6,000	4.5
6 Luano	4,808	3.6
Total	134,776	100.0

Region VII

Society	Population in 1953 Number	Per cent
1 **Chewa**	**127,824**	**54.0**
2 **Kunda**	**19,447**	**8.2**
3 **Nyanja*****	**N/S**	
4 Nsenga	73,568	31.1
5 Ambo	11,657	4.9
6 Chikunda	4,383	1.9
Total	236,879	100.0

Low fertility

Region IV

Society	Population in 1953 Number	Per cent
1 **Lozi**	**54,605**	**22.9**
2 Kwangwa	34,866	14.6
3 Mbunda	32,111	13.5
4 Nkoya	28,785	12.1
5 Kwandi	13,841	5.8
6 Totela	13,765	5.8
7 Subiya	9,705	4.1
8 Ndundulu	7,649	3.2
9 Lushange	7,000	2.9
10 Makoma	6,557	2.7
11 Mashasha	5,876	2.5
12 Nyengo	5,833	2.4
13 Simaa	5,440	2.3
14 Mwenyi	4,804	2.0
15 Shanjo	3,385	1.4
16 Mashi	3,377	1.4
17 Lukolwe	892	0.4
Total	238,491	100.0

Medium fertility

Region VI

Society	Population in 1953 Number	Per cent
1 **Tonga**	**164,829**	**58.8**
2 **Ila**	**17,737**	**6.3**
3 Lenje	42,723	15.2
4 Soli	19,208	6.8
5 Toka	16,257	5.8
6 Goba/Gowa	7,436	2.7
7 Leya	6,256	2.2
8 Sala	4,034	1.4
9 Lumbu	2,063	0.7
10 We	N/S	
Total	280,543	100.0

Notes: Regional grouping based on Brelsford's (1956) Tribal and Linguistic map.
The layout of the table broadly reflects geographical location in Zambia - for example Region I is North-western and Region VI is South-central.
Traditional societies used to derive the clusters - i.e. those whose data are available in the Murdock's Ethnographic Atlas - are in boldface.
* Not in the Tribal and Linguistic Map but discussed by Brelsford.
** Dropped from the cluster analysis because most information on this society is missing.
*** Not in the Tribal and Linguistic Map presented/discussed by Brelsford but recognised in contemporary data sources.
NS The population figure of the specific society not stated but included in other larger societies which however are not stated by Brelsford.

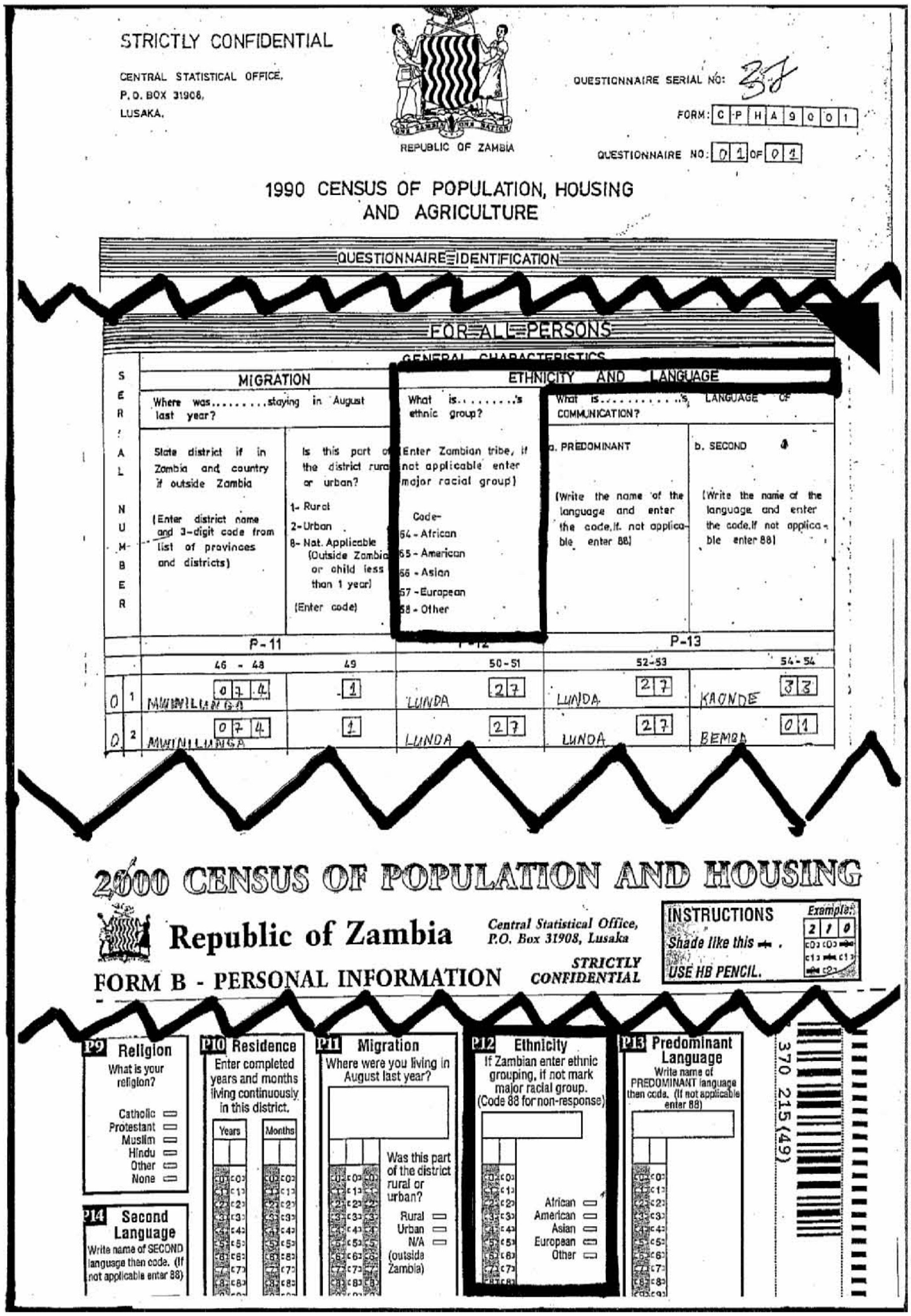
The low and medium traditional fertility regimes comprise traditional societies found in the South-western and South-central regions (Table 4.3) of Zambia, respectively. The high traditional fertility patrilineal regime consists of societies found in the North-eastern region (Table 4.3). The Luba was in North-western region of Table 4.3. However, multivariate cluster analysis results suggest that, overall, this society is similar to those in the high traditional fertility patrilineal regime. The discussion in Section 5.3.2.4 provides a rationale for this outcome. The fourth cluster (high traditional fertility matrilineal regime) covers four regions: North-western, North-central, Central and South-eastern Zambia (Regions I, II, V and VII of Table 4.3).

6.3 Assigning women in contemporary data sources to respective traditional reproductive regimes

This section assigns women of reproductive age to traditional reproductive regimes using the ethnicity variable found in present-day data sources. Besides questions enquiring about their main and secondary languages, both the census and the DHS collect information on the race or ethnic group of respondents (Figure 6.1). Apart from codes for non-Zambians, the census and DHS provide codes for sixty-one of the 78 Zambian ethnic societies identified in Chapter 4. The 1953 population estimates presented in Brelsford (1956) suggest that the seventeen traditional societies without unique ethnic codes have small population sizes (Table 6.1). Non-Zambians are excluded from this analysis because the research question does not cover this group.

Comparing past and present total population counts and proportions of ethnic groups allows for evaluation of tribal reporting consistencies as well as effects of fertility, mortality and migration. Table 6.2 shows the total population distributions of Zambian ethnic/tribal groups according to traditional reproductive regimes. DHS data cannot give the same information at a population level because the household recode file does not have an ethnicity or tribal variable. The table shows that the population distribution of ethnic societies within each cluster varies. Considering population size, the low (Region IV) and medium (Region VI) traditional reproductive regimes have one large society (the Lozi and Tonga, respectively). The high traditional fertility patrilineal regime (Region III) has two large societies, namely the Ngoni and Tumbuka. The largest society in the high traditional fertility matrilineal regime (Regions I, II, V and VII) is the Bemba (around 35 per cent). However, the proportions of the Chewa and Nsenga (about 12 and 10 per cent respectively) are large because the proportions of each of the remaining societies in this regime are small (less than ten per cent).

Figure 6.1 Parts of the 1990 and 2000 Census questionnaires showing the questions on ethnicity



STRICTLY CONFIDENTIAL

CENTRAL STATISTICAL OFFICE,
P.O. BOX 31908,
LUSAKA.

REPUBLIC OF ZAMBIA

QUESTIONNAIRE SERIAL NO: 37

FORM: C P H A 9 0 0 1

QUESTIONNAIRE NO: 01 OF 01

1990 CENSUS OF POPULATION, HOUSING AND AGRICULTURE

QUESTIONNAIRE IDENTIFICATION

FOR ALL PERSONS

GENERAL CHARACTERISTICS

SERIAL NUMBER	MIGRATION		ETHNICITY AND LANGUAGE		
	Where was.........staying in August last year?		What is.........'s ethnic group?	What is.........'s LANGUAGE OF COMMUNICATION?	
	State district if in Zambia and country if outside Zambia (Enter district name and 3-digit code from list of provinces and districts)	Is this part of the district rural or urban? 1- Rural 2- Urban 8- Not Applicable (Outside Zambia or child less than 1 year) (Enter code)	Enter Zambian tribe, if not applicable enter major racial group) Code- 64 - African 65 - American 66 - Asian 67 - European 68 - Other	a. PREDOMINANT (Write the name of the language and enter the code, if not applicable enter 88)	b. SECOND (Write the name of the language and enter the code, if not applicable enter 88)
	P-11		P-12	P-13	
	46 - 48	49	50-51	52-53	54-55
01	MWINILUNGA 074	1	LUNDA 27	LUNDA 27	KAONDE 33
02	MWINILUNGA 074	1	LUNDA 27	LUNDA 27	BEMBA 01

2000 CENSUS OF POPULATION AND HOUSING

Republic of Zambia

Central Statistical Office,
P.O. Box 31908, Lusaka

STRICTLY CONFIDENTIAL

INSTRUCTIONS
Shade like this.
USE HB PENCIL.
Example: 2 1 0

FORM B - PERSONAL INFORMATION

P9 Religion
What is your religion?
Catholic
Protestant
Muslim
Hindu
Other
None

P14 Second Language
Write name of SECOND language then code. (If not applicable enter 88)

P10 Residence
Enter completed years and months living continuously in this district.
Years
Months

P11 Migration
Where were you living in August last year?
Was this part of the district rural or urban?
Rural
Urban
N/A (outside Zambia)

P12 Ethnicity
If Zambian enter ethnic grouping, if not mark major racial group.
(Code 88 for non-response)
African
American
Asian
European
Other

P13 Predominant Language
Write name of PREDOMINANT language then code. (If not applicable enter 88)

370 215 (49)

Table 6.2 also shows that major differences exist between the 1953 population counts and the 1990/2000 Census distributions. There are also minor inconsistencies between ethnic distributions in the 1990 Census and 2000 Census. Various reasons may account for these disparities. First, natural increase could be different between ethnic/tribal groups. The second reason could be ethnic classification errors arising from poor data collected in earlier enumerations (Kuczynski 1949; Musambachime 1990)—as discussed in Section 2.2.1. Lastly, ethnic classification errors may also arise from shifting identities in the later population counts—as suggested by Kreager (1997) although not in direct reference to Zambia.

Table 6.2 Zambian ethnic/tribal distribution according to traditional reproductive cluster: 1953 population estimates; 1990 and 2000 Censuses

Region I				Region II				Region III			
Society	Proportion			Society	Proportion			Society	Proportion		
	1953	1990	2000		1953	1990	2000		1953	1990	2000
1 Luvale	24.4	21.6	23.3	1 Bemba	32.5	60.6	65.2	1 Ngoni	30.1	27.7	26.4
2 Kaonde	21.1	33.9	33.4	2 Lunda	18.4	5.3	5.2	2 Lungu	17.2	7.7	5.9
3 Lunda	20.0	28.0	30.3	3 Bisa	11.4	8.0	6.5	3 Senga	11.7	6.3	5.7
4 Ndembu	16.5	1.5	0.7	4 Aushi	9.7	10.0	8.5	4 Tumbuka	11.4	27.5	28.1
5 Luchazi	10.7	6.7	5.5	5 Chishinga	6.5	4.5	3.3	5 Mambwe	9.7	13.5	15.5
6 Chokwe	5.7	7.4	6.5	6 Ngumbo	6.3	3.9	3.2	6 Inamwanga	5.6	16.3	17.9
7 Mbowe	1.5	0.8	0.4	7 Mukulu	4.7	0.8	0.4	7 Iwa	5.5	0.4	0.2
8 Mbwela	0.1	NC	NC	8 Tabwa	3.4	3.0	2.9	8 Tambo	2.4	0.4	0.2
9 Lwena*		NC	NC	9 Kabende	2.1	1.5	2.0	9 Yombe	1.9	0.3	0.1
				10 Unga	2.1	0.7	0.8	10 Fungwe	1.3	NC	NC
				11 Shila	1.6	0.5	0.8	11 Nyika	1.2	NC	NC
				12 Bwile	1.3	1.0	1.4	12 Lambya	0.9	NC	NC
				13 Ngwela*		NC	NC	13 Wenya	0.4	NC	NC
				14 Batwa*		NC	NC	14 Wandya	0.4	NC	NC
								15 Kamanga	0.2	NC	NC
								16 Luba		NC	NC
								17 Sukwa*		NC	NC
Number	200,816	652,200	894,560	**Number**	445,270	1,922,204	2,736,228	**Number**	221,016	1,058,536	1,484,264

Region IV				Region V				Region VII			
Society	Proportion			Society	Proportion			Society	Proportion		
	1953	1990	2000		1953	1990	2000		1953	1990	2000
1 Lozi[1]	22.9	57.6	62.0	1 Lala	41.5	52.1	55.1	1 Chewa	54.0	49.1	50.6
2 Kwangwa	14.6	5.6	4.4	2 Lamba	26.1	36.7	36.3	2 Nsenga	31.1	39.8	38.7
3 Mbunda	13.5	14.5	15.2	3 Swaka	13.1	8.2	7.3	3 Kunda	8.2	5.7	5.3
4 Nkoya	12.1	6.8	6.4	4 Lima	11.3	2.5	0.7	4 Ambo	4.9	0.1	0.1
5 Kwandi	5.8	2.8	1.1	5 Seba	4.5	NC	NC	5 Chikunda	1.9	2.5	1.9
6 Totela	5.8	1.2	0.9	6 Luano	3.6	0.5	0.6	6 Nyanja**		2.8	3.4
7 Subiya	4.1	1.3	0.8	**Number**	134,776	457,428	591,096	**Number**	236,879	1,034,872	1,400,004
8 Ndundulu[2]	3.2	0.5	0.3								
9 Lushange	2.9	NC	NC	**Region VI**							
10 Makoma	2.7	2.2	1.7	Society	Proportion						
11 Mashasha	2.5	0.1	0.0		1953	1990	2000				
12 Nyengo	2.4	2.0	1.8	1 Tonga	58.8	72.5	75.8				
13 Simaa	2.3	1.2	0.8	2 Lenje	15.2	11.1	9.8				
14 Mwenyi	2.0	1.0	0.6	3 Soli	6.8	5.2	4.4				
15 Shanjo	1.4	NC	NC	4 Ila	6.3	5.0	5.0				
16 Mashi	1.4	3.2	4.0	5 Toka	5.8	3.8	3.3				
17 Lukolwe	0.4	NC	NC	6 Goba/Gowa	2.7	1.2	0.9				
				7 Leya[3]	2.2	NC	NC				
				8 Sala	1.4	1.1	0.8				
				9 Lumbu	0.7	NC	NC				
				10 We	N/S	NC	NC				
Number	238,491	713,304	935,264.0	**Number**	280,543	1,177,584	1,685,092				

Sources: Brelsford (1956), 1990 and 2000 Censuses.

Notes: The layout of the table broadly reflects geographical location in Zambia - for example Region I is North-western and Region VI is South-central.
The 1990 and 2000 Census figures have been multiplied by 4 because they are derived from the 25 per cent sample.
* Not in the Tribal and Linguistic Map but discussed by Brelsford (1956).
** Not in the Tribal and Linguistic Map presented/discussed by Brelsford (1956) but recongnised in comtemporary data sources.
NC - Not coded separately in the current data sources but most likely included in other larger traditional societies or other Zambians.
1. The Lozi also coded using their original name i.e. Luyana (Code 34). This is combined with the Lozi code (43).
2. This society is coded as Imilangu but as stated by Brelsford (1956) this refers to the same society.
3. This society is coded as part of the Toka i.e. Toka-Leya (Code 23).

Despite these differences and inconsistencies, intercluster distributions are almost similar—especially for the high traditional reproductive matrilineal regime and the medium traditional reproductive regime (Table 6.3). The largest difference (low traditional reproductive regime) between the 1953 and 1990/2000 distributions is less than 5 per cent. Intercluster distributions are less different or less inconsistent because a person is more likely to report that they are a member of a group that is close to his or her own society.

Table 6.3 Population distributions of Zambian traditional reproductive regimes: 1953 population estimates; 1990 and 2000 Censuses

Traditional reproductive regime	Proportion		
	1953	1990	2000
Low traditional reproductive regime	13.6	10.2	9.6
Medium traditional reproductive regime	16.0	16.8	17.3
High traditional reproductive patrilineal regime	12.6	15.1	15.3
High traditional reproductive matrilineal regime	57.9	58.0	57.8
Total, all groups	1,757,791	7,016,128	9,726,508

Sources: Brelsford (1956), 1990 and 2000 Censuses.

The 1990 and 2000 Censuses (Table 6.3) show that the low traditional reproductive regime has the smallest population size (about 10 per cent of the national total). The medium traditional reproductive regime and the high traditional fertility patrilineal regime have, each, a population size of about 15 per cent of the national total population. The high traditional fertility matrilineal regime has the largest population size of roughly 60 per cent of the national total.

As expected, the proportion of the low traditional reproductive regime declined the most (0.6 per cent points) between 1990 and 2000. However, rather than the high traditional reproductive regimes, the medium traditional reproductive regime increased the most (0.5 per cent points). This is probably because ethnic societies in Zambia, like elsewhere, have different rates of natural increase (fertility and mortality) or even population growth where ethnic migration differentials are significant.

Table 6.4 and Table 6.5 present distributions of women aged 15-49 by self-reported ethnicity according to Zambian traditional reproductive regimes[1]. The census distributions for women aged 15-49 are similar to the distributions on total populations. There are differences between census and DHS distributions (especially the 1992 DHS) for women aged 15-49 probably due to sampling procedures. However, the largest

[1] For the 1992 DHS, I used variable s116 instead of v131 to identify and recode Zambian ethnic societies. In the 1992 DHS, variable s116 includes all the 61 Zambian ethnic societies while v131 only has the seven larger groups. However, for the other DHSs, v131 includes all the 61 Zambian ethnic societies.

difference (medium traditional reproductive regime) is only about 2.5 per cent. In all, this section describes the same population groups discussed in Chapter 4 and Chapter 5. Therefore, to prove that fertility variations exist between ethnic societies, these traditional reproductive regimes serve as units of analysis in the sections that follow.

Table 6.4 Distribution of Zambian women aged 15-49 by self-reported ethnicity according to each traditional reproductive regime: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS

High traditional fertility - matrilineal

Region I

Society	1990	2000	1992	1996	2001/02
1 Kaonde	35.8	34.8	35.1	32.4	35.0
2 Lunda	27.4	30.1	21.6	25.1	28.0
3 Luvale	21.1	22.6	25.1	29.4	27.1
4 Chokwe	7.0	6.1	10.4	4.9	4.6
5 Luchazi	6.4	5.3	6.5	7.8	5.1
6 Ndembu	1.5	0.6	1.0	0.0	0.0
7 Mbowe	0.8	0.3	0.3	0.4	0.2
8 *Lwena**					
9 *Mbwela*					
Number	38,588	47,815	537	601	628

Region II

Society	1990	2000	1992	1996	2001/02
1 Bemba	61.1	66.4	67.3	74.7	66.1
2 Aushi	9.9	8.2	6.4	8.7	8.7
3 Bisa	8.2	6.3	6.6	4.1	5.8
4 Lunda	5.4	5.2	6.6	2.1	4.7
5 Chishinga	4.3	3.1	3.8	1.3	4.2
6 Ngumbo	3.9	3.0	4.1	3.6	2.6
7 Tabwa	2.8	2.7	0.9	1.7	4.6
8 Kabende	1.5	1.9	1.0	0.7	0.2
9 Bwile	1.0	1.4	1.2	0.8	1.3
10 Mukulu	0.7	0.4	0.0	0.0	0.0
11 Unga	0.7	0.7	1.7	2.3	1.1
12 Shila	0.5	0.8	0.2	0.1	0.7
13 *Batwa**					
14 *Ngwela**					
Number	117,640	155,206	1,973	2,423	2,365

High traditional fertility - patrilineal

Region III

Society	1990	2000	1992	1996	2001/02
1 Ngoni	28.6	27.0	27.3	23.4	26.2
2 Tumbuka	27.1	27.7	28.7	31.9	27.9
3 Inamwanga	16.2	18.0	13.2	17.7	18.6
4 Mambwe	13.0	15.6	17.2	16.4	17.9
5 Lungu	7.5	5.4	5.4	4.9	2.6
6 Senga	6.5	5.7	6.9	5.8	6.9
7 Iwa	0.4	0.2	0.0	0.0	0.0
8 Tambo	0.4	0.2	1.0	0.0	0.0
9 Yombe	0.3	0.1	0.1	0.0	0.0
10 *Fungwe*					
11 *Kamanga*					
12 *Lambya*					
13 *Luba*					
14 *Nyika*					
15 *Sukwa**					
16 *Wandya*					
17 *Wenya*					
Number	62,180	81,568	1,064	1,169	1,182

Low traditional fertility

Region IV

Society	1990	2000	1992	1996	2001/02
1 Lozi[1]	57.6	62.9	60.7	65.5	61.1
2 Mbunda	14.2	14.3	18.2	18.4	24.2
3 Nkoya	6.8	6.2	5.7	5.6	3.8
4 Kwangwa	5.7	4.4	1.6	2.1	1.3
5 Mashi	3.3	3.9	6.4	2.8	2.9
6 Kwandi	2.5	0.9	0.2	0.6	0.0
7 Makoma	2.3	1.8	1.0	0.1	1.3
8 Nyengo	2.1	1.9	1.0	0.4	3.7
9 Simaa	1.3	0.8	0.2	0.1	0.6
10 Totela	1.3	0.9	1.2	1.5	0.3
11 Subiya	1.2	0.9	0.2	0.7	0.4
12 Mwenyi	1.0	0.7	0.9	0.2	0.3
13 Ndundulu[2]	0.6	0.3	0.2	0.3	0.0
14 Mashasha	0.1	0.1	2.4	1.8	0.1
15 *Lukolwe*					
16 *Lushange*					
17 *Shanjo*					
Number	42,884	52,201	593	740	792

Region V

Society	1990	2000	1992	1996	2001/02
1 Lala	51.9	55.5	58.7	52.4	51.9
2 Lamba	36.8	36.3	32.3	39.1	42.9
3 Swaka	8.5	7.2	8.2	8.5	5.1
4 Lima	2.4	0.4	0.2	0.0	0.0
5 Luano	0.4	0.6	0.5	0.0	0.0
6 *Seba*					
Number	28,930	33,682	457	431	389

Region VII

Society	1990	2000	1992	1996	2001/02
1 Chewa	47.6	49.2	50.5	53.7	50.8
2 Nsenga	40.9	39.7	43.0	38.8	40.3
3 Kunda	6.0	5.7	3.1	4.2	4.5
4 Nyanja**	2.9	3.4	2.1	1.6	1.5
5 Chikunda	2.5	1.9	1.3	1.6	2.9
6 Ambo	0.1	0.1	0.0	0.0	0.0
Number	61,442	77,575	947	1,213	958

Medium traditional fertility

Region VI

Society	1990	2000	1992	1996	2001/02
1 Tonga	71.5	75.5	77.5	71.1	78.4
2 Lenje	11.6	9.9	9.4	11.1	8.9
3 Soli	5.5	4.6	4.9	5.4	3.0
4 Ila	5.1	4.8	3.2	6.6	6.0
5 Toka	4.0	3.4	3.5	5.2	3.1
6 Goba/Gowa	1.3	1.0	0.7	0.0	0.1
7 Sala	1.1	0.8	0.8	0.7	0.5
8 *Leya*[3]					
9 *Lumbu*					
10 *We*					
Number	69,338	90,525	1,308	1,232	1,138

(Columns 1990–2001/02 are Proportion.)

Sources: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS.

Notes: The layout of the table broadly reflects geographical location in Zambia - for example Region I is North-western and Region VI is South-central.

* Not in the Tribal and Linguistic Map but discussed by Brelsford (1956).

** Not in the Tribal and Linguistic Map presented/discussed by Brelsford (1956) but recognised in contemporary data sources.

Societies in italic font are not coded separately in the current data sources but most likely included in other larger traditional societies or other Zambians.

1. The Lozi also coded using their original name i.e. Luyana (Code 34). This is combined with the Lozi code (43).

2. This society is coded as Imilangu but as stated by Brelsford (1956) this refers to the same society.

3. This society is coded as part of the Toka i.e. Toka-Leya (Code 23).

Table 6.5 Distributions of women aged 15-49 according to Zambian traditional reproductive regimes: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS

Traditional reproductive regime	Proportion				
	1990	2000	1992	1996	2001/02
Low traditional reproductive regime	10.2	9.7	8.6	9.5	10.6
Medium traditional reproductive regime	16.5	16.8	19.0	15.8	15.3
High traditional reproductive patrilineal regime	14.8	15.1	15.5	15.0	15.9
High traditional reproductive matrilineal regime	58.6	58.4	56.9	59.8	58.2
Total, all groups	421,002	538,572	6,879	7,808	7,452

Sources: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS.

6.4 Fertility differentials between traditional reproductive regimes

This section applies the procedures and considerations applied in Chapter 3 when computing national fertility estimates and trends to women belonging to each of the traditional reproductive regimes derived in Chapter 5. The next section (6.4.1) presents lifetime fertility estimates for each traditional reproductive regime and Section 6.4.2 presents current fertility estimates. Lastly, Section 6.4.3 presents fertility trends for each traditional reproductive regime.

6.4.1 Lifetime fertility estimates for traditional reproductive regimes

Table 6.6 and Figure 6.2 show the mean parity estimates for each traditional reproductive regime alongside their confidence intervals[2]. Apart from the 1996 DHS, all data sources confirm that women belonging to societies that make up the low traditional reproductive regime had the lowest average completed family size. For the 1996 DHS, women belonging to medium traditional reproductive regime societies had the lowest average completed family size. However, up to age 39, women belonging to societies that make up the low traditional reproductive regime still reported the lowest lifetime fertility. The departure from this trend is only at age groups 40-44 and 45-49. Visual inspection of Figure 6.2 suggests that this is most likely random error due to small numbers at these ages especially that the difference is less than a tenth of a child.

All DHS data sources show that women belonging to the high traditional fertility matrilineal regime had the highest completed family size. Similarly, apart from the 1992 DHS, all data sources confirm that women belonging to societies that make up the high traditional fertility patrilineal regime had the second highest average completed family size.

---

[2] Pullum (2004: 421) and Smith (1992: 242-243) presents the formulae, computational procedures and interpretations of confidence intervals.

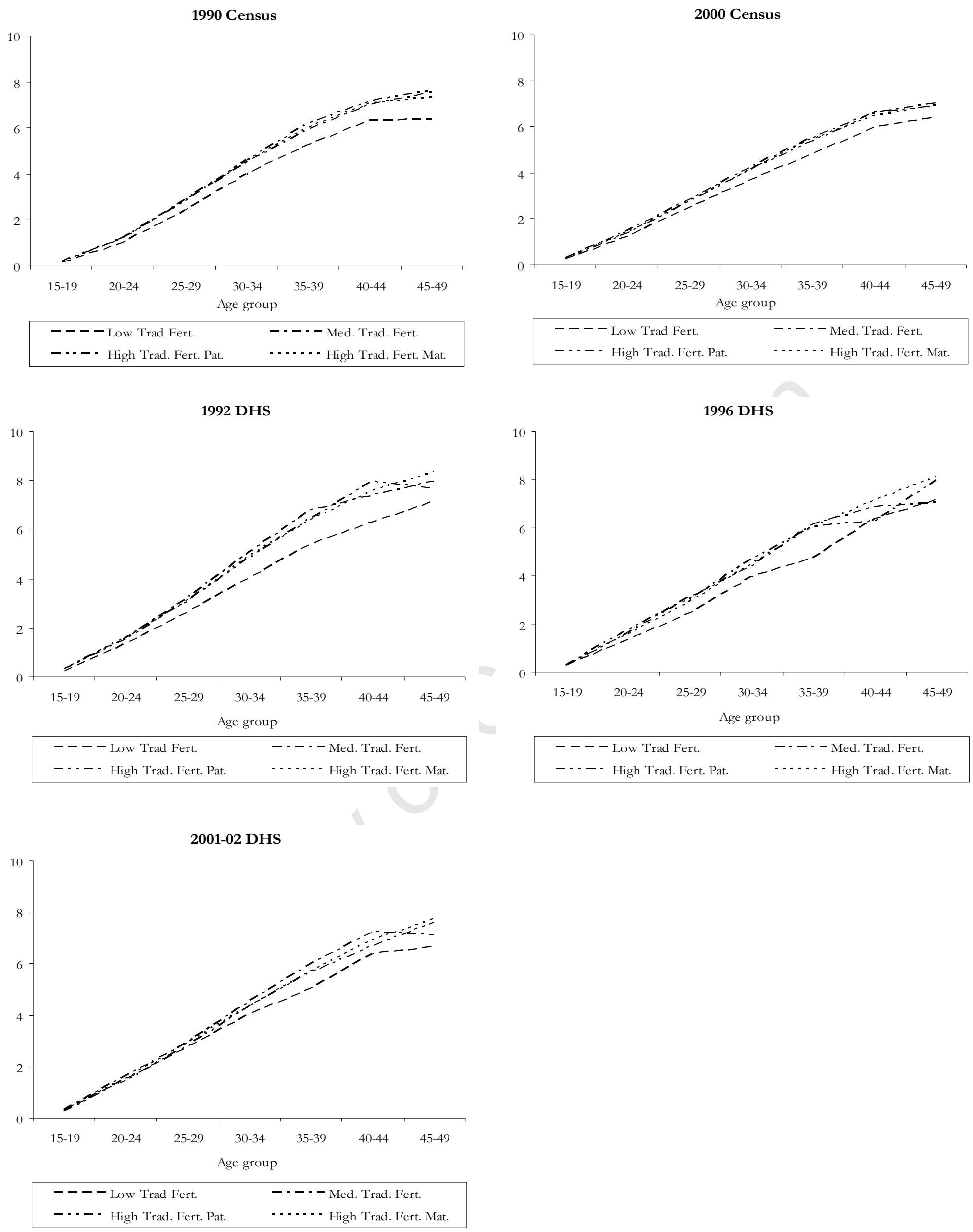
The difference between regimes with the lowest and highest parity is about 1.3 children. The 2000 Census shows that women belonging to the medium traditional reproductive regime had the highest completed family size. For this data source, the difference between regimes with the lowest and highest parity was only 0.6 of a child. In all the four regimes, lifetime fertility declined by less than a child in ten years.

Table 6.6 Mean parity by age group tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Age Group	Low Traditional Fertility Regime		Medium Traditional Fertility Regime		High traditional fertility regime				Coefficient of variation (%)*
					Patrilineal		Matrilineal		
	MCEB	CI (+/-)	MCEB	CI (+/-)	MCEB	CI (+/-)	MCEB	CI (+/-)	
1990 Census									
15-19	0.1	*0.0*	0.2	*0.0*	0.2	*0.0*	0.2	*0.0*	13.8
20-24	1.0	*0.0*	1.2	*0.0*	1.2	*0.0*	1.2	*0.0*	8.8
25-29	2.4	*0.0*	2.9	*0.0*	2.8	*0.0*	2.8	*0.0*	8.0
30-34	4.0	*0.0*	4.5	*0.0*	4.6	*0.0*	4.5	*0.0*	6.4
35-39	5.3	*0.0*	5.9	*0.0*	6.2	*0.0*	6.0	*0.0*	6.7
40-44	6.3	*0.0*	7.0	*0.0*	7.2	*0.0*	7.1	*0.0*	5.7
45-49	6.3	*0.0*	7.5	*0.0*	7.6	*0.0*	7.3	*0.0*	8.2
2000 Census									
15-19	0.2	*0.0*	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	10.3
20-24	1.2	*0.0*	1.5	*0.0*	1.4	*0.0*	1.4	*0.0*	8.1
25-29	2.5	*0.0*	2.8	*0.0*	2.7	*0.0*	2.8	*0.0*	5.9
30-34	3.7	*0.0*	4.2	*0.0*	4.1	*0.0*	4.1	*0.0*	5.8
35-39	4.8	*0.0*	5.5	*0.0*	5.4	*0.0*	5.4	*0.0*	6.0
40-44	6.0	*0.0*	6.6	*0.0*	6.5	*0.0*	6.5	*0.0*	4.4
45-49	6.4	*0.0*	7.0	*0.0*	6.9	*0.0*	6.9	*0.0*	3.8
1992 DHS									
15-19	0.2	*0.0*	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	13.4
20-24	1.3	*0.1*	1.6	*0.0*	1.5	*0.0*	1.6	*0.0*	8.6
25-29	2.7	*0.1*	3.2	*0.0*	3.1	*0.0*	3.1	*0.0*	8.5
30-34	4.0	*0.1*	5.1	*0.1*	4.8	*0.1*	4.9	*0.0*	10.1
35-39	5.4	*0.1*	6.8	*0.1*	6.4	*0.1*	6.4	*0.0*	9.4
40-44	6.3	*0.2*	7.4	*0.1*	8.0	*0.1*	7.6	*0.0*	9.8
45-49	7.2	*0.2*	8.0	*0.1*	7.7	*0.2*	8.4	*0.0*	6.5
1996 DHS									
15-19	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	3.8
20-24	1.3	*0.0*	1.6	*0.0*	1.8	*0.0*	1.6	*0.0*	12.0
25-29	2.5	*0.1*	3.1	*0.0*	3.0	*0.0*	3.0	*0.0*	10.1
30-34	4.0	*0.1*	4.4	*0.0*	4.7	*0.0*	4.5	*0.0*	7.0
35-39	4.7	*0.1*	6.1	*0.1*	6.0	*0.1*	6.1	*0.0*	11.9
40-44	6.4	*0.1*	6.9	*0.1*	6.3	*0.1*	7.1	*0.0*	6.0
45-49	7.1	*0.1*	7.0	*0.1*	8.0	*0.1*	8.1	*0.0*	7.5
2001-02 DHS									
15-19	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	0.3	*0.0*	10.7
20-24	1.5	*0.0*	1.6	*0.0*	1.4	*0.0*	1.5	*0.0*	5.3
25-29	2.8	*0.0*	2.9	*0.0*	2.8	*0.0*	3.0	*0.0*	3.0
30-34	4.0	*0.1*	4.5	*0.1*	4.3	*0.0*	4.3	*0.0*	4.7
35-39	5.0	*0.1*	6.0	*0.1*	5.6	*0.1*	5.7	*0.0*	7.1
40-44	6.4	*0.1*	7.2	*0.1*	6.7	*0.1*	6.9	*0.0*	5.4
45-49	6.7	*0.1*	7.1	*0.1*	7.6	*0.1*	7.7	*0.0*	6.7

Note: The 1990 Census CEB data has been corrected for misreporting and misclassification prior to computing parity estimates.
CI is the 95 per cent confidence interval range.
* The coefficients of variation for the age group 15-19 are not reliable because CEB for this age group is almost zero. The coefficient of variation is less efficient if the mean is close to zero (Sørensen 2002).

Figure 6.2 Mean parity by age group tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS



The 95 per cent confidence intervals show that fertility estimates derived from census data are statistically more reliable than those derived from data collected in DHSs. Further, estimates derived from DHS data become less reliable with age. Unreliability of these statistics explains why we are getting implausible estimates at the oldest age groups (40-49)—for example, the 1992 and 1996 DHS lifetime fertility estimates for the high traditional fertility patrilineal regime.

The widest confidence interval is about 0.4 of a child (1992 DHS). However, within this range, there is little overlapping of lifetime fertility estimates between traditional reproductive regimes. This suggests that in 1990 through to 2002, lifetime fertility differentials existed between traditional reproductive regimes. However, the coefficients of variation show that at each age group (20-49), lifetime fertility between traditional reproductive regimes does not differ from the mean by more than 15 per cent. This indicates that during this period, lifetime fertility differentials between Zambian reproductive regimes were not large. This alerts us that by 1990, lifetime fertility between all regimes apart from the low traditional reproductive regime had converged (Figure 6.2). However, before affirming and explaining this conclusion, the next section presents current fertility estimates for each regime.

6.4.2 Current fertility estimates for traditional reproductive regimes

Table 6.7 (1990 Census) and Table 6.8 (2000 Census) show adjusted total fertility estimates for each traditional reproductive regime. For comparison, the tables show estimates derived from all the approaches described in Chapter 3. For the 1990 Census, estimates adjusted using the different approaches are within a broad range (about 0.7 of a child) because this source has several fertility data problems (Appendix 6.1.a)[3]. This is not the case with the 2000 Census (Appendix 6.1.b), which explains why estimates derived from this source fall within 0.2 of a child. Only in one case—the high traditional fertility patrilineal regime—is the range slightly broader (0.4 of a child).

Table 6.9 and Figure 6.3 show the computed and standardised age specific and total fertility estimates for each traditional reproductive regime. Standardised schedules of fertility do not reveal any notable differences in age pattern of fertility between traditional regimes[4]. However, apart from the 2001-02 DHS, all data sources suggest that women belonging to societies that make up the low traditional fertility regime had the lowest current fertility. The latest DHS (2001-02) shows that the lowest current fertility was among women who make up the medium traditional fertility regime and the high traditional fertility patrilineal regime. However, inspection of Figure 6.3 suggests that random error due to small numbers affects the 2001-02 DHS fertility estimate for societies that make up the low traditional fertility regime.

---

[3] Identified and described by the Relational Gompertz Model plots for transformed parity at each age and cumulated age specific fertility rates.

[4] The tests of statistical significance (t-test and analysis of variances) confirm this conclusion. However, they are not presented here because these procedures are hardly used for evaluating age specific fertility rates in demography.

Table 6.7 Current fertility estimates for each traditional reproductive regime derived from Brass P/F Ratio (traditional), Brass P/F (Feeney factor) and Relational Gompertz Model: Zambia 1990 Census

Age Group	Mean children ever born P_i	Age spec fertility rates f_i	Estimated parity equiva. F_i	P_i/F_i ratios	Adjusted age specific fertility rates: Brass P/F[1]	Brass P/F[2] Feeney Factor	Relational Gompertz Model	Gompertz[3] Brass P/F Feeney Fact.
Low traditional fertility regime								
15-19	0.1	0.078	0.2	0.84	0.109	0.124	0.083	0.123
20-24	1.0	0.180	0.9	1.11	0.222	0.252	0.230	0.249
25-29	2.4	0.196	1.9	1.28	0.235	0.267	0.270	0.267
30-34	4.0	0.183	2.8	1.40	0.216	0.246	0.253	0.243
35-39	5.3	0.153	3.7	1.44	0.178	0.202	0.205	0.196
40-44	6.3	0.087	4.2	1.51	0.095	0.108	0.115	0.105
45-49	6.3	0.040	4.6	1.39	0.040	0.046	0.021	0.017
TFR		4.59			5.47	6.23	5.89	6.00
Mean age at childbearing applied:						30.1		29.7
Relational Gompertz fitting based on 'F' and 'P' points for women aged 20-44 and 15-29 years, respectively.								
Medium traditional fertility regime								
15-19	0.2	0.104	0.2	0.82	0.133	0.147	0.103	0.149
20-24	1.2	0.235	1.2	1.01	0.264	0.292	0.267	0.287
25-29	2.9	0.252	2.5	1.17	0.273	0.303	0.304	0.301
30-34	4.5	0.218	3.6	1.24	0.234	0.259	0.278	0.268
35-39	5.9	0.183	4.6	1.28	0.194	0.215	0.222	0.213
40-44	7.0	0.105	5.3	1.34	0.105	0.116	0.122	0.112
45-49	7.5	0.042	5.7	1.33	0.038	0.042	0.022	0.018
TFR		5.70			6.21	6.87	6.60	6.74
Mean age at childbearing applied:						29.8		29.4
Relational Gompertz fitting based on 'F' and 'P' points for women aged 20-44 and 15-39 years, respectively.								
High traditional fertility patrilineal regime								
15-19	0.2	0.079	0.2	1.08	0.115	0.126	0.096	0.128
20-24	1.2	0.227	1.1	1.15	0.284	0.312	0.281	0.296
25-29	2.8	0.235	2.2	1.27	0.284	0.311	0.331	0.323
30-34	4.6	0.214	3.4	1.37	0.256	0.280	0.305	0.286
35-39	6.2	0.178	4.3	1.42	0.208	0.228	0.240	0.220
40-44	7.2	0.092	4.9	1.46	0.102	0.112	0.128	0.109
45-49	7.6	0.041	5.3	1.44	0.042	0.046	0.022	0.015
TFR		5.33			6.45	7.08	7.02	6.89
Mean age at childbearing applied:						29.9		29.6
Relational Gompertz fitting based on 'F' and 'P' points for women aged 20-44 and 15-39 years, respectively.								
High traditional fertility matrilineal regime								
15-19	0.2	0.086	0.2	1.08	0.126	0.139	0.102	0.139
20-24	1.2	0.212	1.0	1.16	0.269	0.296	0.271	0.291
25-29	2.8	0.224	2.2	1.31	0.277	0.305	0.308	0.308
30-34	4.5	0.206	3.2	1.40	0.250	0.275	0.279	0.272
35-39	6.0	0.159	4.1	1.46	0.190	0.209	0.219	0.212
40-44	7.1	0.090	4.7	1.51	0.102	0.112	0.118	0.107
45-49	7.3	0.040	5.1	1.45	0.042	0.046	0.021	0.016
TFR		5.08			6.28	6.91	6.59	6.72
Mean age at childbearing applied:						29.8		29.4
Relational Gompertz fitting based on 'F' and 'P' points for women aged 20-44 and 15-34 years, respectively.								

Notes: 1. Based on the average for age groups 20-24 and 25-29.
2. The mean age at child bearing applied is shown below the total fertility estimate.
3. The Relational Gompertz Model has been applied to correct the shape of the fertility schedule and then Brass P/F Method using the Feeney factor to scale fertility upwards. Mean age at child bearing applied is shown below the total fertility estimate.

Table 6.8 Current fertility estimates for each traditional reproductive regime derived from Brass P/F Ratio (traditional), Brass P/F (Feeney factor) and Relational Gompertz Model: Zambia 2000 Census

Age Group	Mean children ever born P_i	Age spec fertility rates f_i	Estimated parity equiva. F_i	P_i/F_i ratios	Adjusted age specific fertility rates: Brass P/F[1]	Brass P/F[2] Feeney Factor	Relational Gompertz Model	Gompertz[3] Brass P/F Feeney Fact.
				Low traditional fertility regime				
15-19	0.2	0.076	0.2	1.37	0.125	0.127	0.104	0.128
20-24	1.2	0.165	0.9	1.41	0.238	0.242	0.235	0.243
25-29	2.5	0.181	1.8	1.39	0.251	0.255	0.250	0.249
30-34	3.7	0.142	2.5	1.46	0.196	0.199	0.222	0.217
35-39	4.8	0.130	3.2	1.49	0.177	0.180	0.174	0.168
40-44	6.0	0.066	3.7	1.63	0.084	0.086	0.095	0.085
45-49	6.4	0.024	3.9	1.65	0.026	0.027	0.017	0.013
TFR		3.92			5.48	5.58	5.49	5.51
Mean age at childbearing applied:						29.4		29.1
Relational Gompertz fitting based on 'F' and 'P' points for women aged 15-44 and 15-34 years, respectively.								
				Medium traditional fertility regime				
15-19	0.3	0.110	0.2	1.17	0.162	0.167	0.130	0.167
20-24	1.5	0.214	1.2	1.23	0.269	0.279	0.266	0.270
25-29	2.8	0.194	2.2	1.27	0.241	0.249	0.268	0.260
30-34	4.2	0.171	3.1	1.36	0.210	0.217	0.229	0.218
35-39	5.5	0.132	3.9	1.43	0.159	0.165	0.174	0.165
40-44	6.6	0.072	4.3	1.52	0.082	0.085	0.093	0.083
45-49	7.0	0.023	4.6	1.53	0.022	0.023	0.016	0.012
TFR		4.58			5.73	5.93	5.87	5.88
Mean age at childbearing applied:						28.7		28.5
Relational Gompertz fitting based on 'F' and 'P' points for women aged 15-44 and 15-34 years, respectively.								
				High traditional fertility patrilineal regime				
15-19	0.3	0.093	0.2	1.31	0.151	0.157	0.120	0.152
20-24	1.4	0.179	1.0	1.37	0.253	0.262	0.253	0.266
25-29	2.7	0.182	1.9	1.41	0.252	0.262	0.254	0.259
30-34	4.1	0.156	2.8	1.50	0.213	0.221	0.215	0.216
35-39	5.4	0.118	3.4	1.57	0.158	0.164	0.161	0.160
40-44	6.5	0.060	3.8	1.72	0.077	0.080	0.084	0.078
45-49	6.9	0.028	4.1	1.70	0.032	0.034	0.014	0.011
TFR		4.09			5.68	5.90	5.51	5.71
Mean age at childbearing applied:						29.0		28.6
Relational Gompertz fitting based on 'F' and 'P' points for women aged 15-44 and 15-29 years, respectively.								
				High traditional fertility matrilineal regime				
15-19	0.3	0.099	0.2	1.32	0.158	0.163	0.127	0.155
20-24	1.4	0.187	1.0	1.34	0.258	0.266	0.268	0.271
25-29	2.8	0.186	2.0	1.39	0.252	0.260	0.269	0.262
30-34	4.1	0.164	2.9	1.44	0.219	0.226	0.226	0.216
35-39	5.4	0.125	3.6	1.52	0.164	0.169	0.168	0.158
40-44	6.5	0.058	4.0	1.63	0.073	0.075	0.086	0.075
45-49	6.9	0.026	4.2	1.65	0.028	0.029	0.014	0.010
TFR		4.22			5.77	5.94	5.79	5.73
Mean age at childbearing applied:						28.8		28.4
Relational Gompertz fitting based on 'F' and 'P' points for women aged 15-44 and 15-34 years, respectively.								

Notes: 1. Based on the average for age groups 20-24 and 25-29.

2. The mean age at child bearing applied is shown below the total fertility estimate.

3. The Relational Gompertz Model has been applied to correct the shape of the fertility schedule and then Brass P/F Method using the Feeney factor to scale fertility upwards. Mean age at child bearing applied is shown below the total fertility estimate.

Table 6.9 Age-specific and total fertility estimates by age group tabulated according to traditional reproductive regime: Zambia 1990, 2000 Census, 1992, 1996, and 2001-02 Zambia DHS

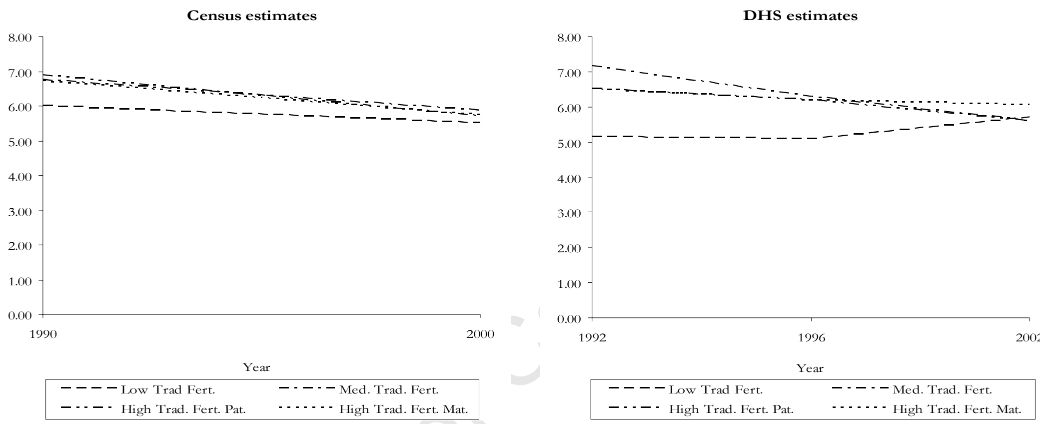
Age Group	Low Traditional Fertility Regime		Medium Traditional Fertility Regime		High Traditional Fertility Regime: Patrilineal		High Traditional Fertility Regime: Matrilineal	
	ASFR	Std	ASFR	Std	ASFR	Std	ASFR	Std
1990 Census								
15-19	0.123	*0.10*	0.149	*0.11*	0.128	*0.09*	0.139	*0.10*
20-24	0.249	*0.21*	0.287	*0.21*	0.296	*0.22*	0.291	*0.22*
25-29	0.267	*0.22*	0.301	*0.22*	0.323	*0.23*	0.308	*0.23*
30-34	0.243	*0.20*	0.268	*0.20*	0.286	*0.21*	0.272	*0.20*
35-39	0.196	*0.16*	0.213	*0.16*	0.220	*0.16*	0.212	*0.16*
40-44	0.105	*0.09*	0.112	*0.08*	0.109	*0.08*	0.107	*0.08*
45-49	0.017	*0.01*	0.018	*0.01*	0.015	*0.01*	0.016	*0.01*
TFR	6.00	*1.00*	6.74	*1.00*	6.89	*1.00*	6.72	*1.00*
*Confidence Interval (+/-)	0.0		0.0		0.0		0.0	
Mean age	29.7		29.4		29.5		29.4	
2000 Census								
15-19	0.128	*0.12*	0.167	*0.14*	0.152	*0.13*	0.155	*0.14*
20-24	0.243	*0.22*	0.270	*0.23*	0.266	*0.23*	0.271	*0.24*
25-29	0.249	*0.23*	0.260	*0.22*	0.259	*0.23*	0.262	*0.23*
30-34	0.217	*0.20*	0.218	*0.19*	0.216	*0.19*	0.216	*0.19*
35-39	0.168	*0.15*	0.165	*0.14*	0.160	*0.14*	0.158	*0.14*
40-44	0.085	*0.08*	0.083	*0.07*	0.078	*0.07*	0.075	*0.07*
45-49	0.013	*0.01*	0.012	*0.01*	0.011	*0.01*	0.010	*0.01*
TFR	5.51	*1.00*	5.88	*1.00*	5.71	*1.00*	5.73	*1.00*
*Confidence Interval (+/-)	0.0		0.0		0.0		0.0	
Mean age	29.1		28.5		28.6		28.4	
1992 DHS								
15-19	0.140	*0.14*	0.172	*0.12*	0.150	*0.12*	0.156	*0.12*
20-24	0.249	*0.24*	0.292	*0.20*	0.316	*0.24*	0.294	*0.23*
25-29	0.212	*0.21*	0.297	*0.21*	0.285	*0.22*	0.269	*0.21*
30-34	0.205	*0.20*	0.255	*0.18*	0.231	*0.18*	0.250	*0.19*
35-39	0.131	*0.13*	0.242	*0.17*	0.202	*0.16*	0.193	*0.15*
40-44	0.093	*0.09*	0.110	*0.08*	0.105	*0.08*	0.104	*0.08*
45-49	0.000	*0.00*	0.063	*0.04*	0.010	*0.01*	0.035	*0.03*
TFR	5.15	*1.00*	7.16	*1.00*	6.50	*1.00*	6.51	*1.00*
*Confidence Interval (+/-)	0.1		0.1		0.1		0.0	
Mean age	28.5		29.9		28.9		29.3	
1996 DHS								
15-19	0.151	*0.15*	0.161	*0.13*	0.167	*0.14*	0.157	*0.13*
20-24	0.211	*0.21*	0.280	*0.22*	0.313	*0.25*	0.280	*0.23*
25-29	0.234	*0.23*	0.295	*0.23*	0.251	*0.20*	0.280	*0.23*
30-34	0.215	*0.21*	0.208	*0.17*	0.264	*0.21*	0.226	*0.18*
35-39	0.121	*0.12*	0.181	*0.14*	0.178	*0.14*	0.185	*0.15*
40-44	0.073	*0.07*	0.074	*0.06*	0.042	*0.03*	0.088	*0.07*
45-49	0.013	*0.01*	0.056	*0.04*	0.023	*0.02*	0.021	*0.02*
TFR	5.09	*1.00*	6.27	*1.00*	6.19	*1.00*	6.18	*1.00*
*Confidence Interval (+/-)	0.1		0.1		0.1		0.0	
Mean age	28.5		29.1		28.3		28.9	
2001-02 DHS								
15-19	0.148	*0.13*	0.163	*0.15*	0.152	*0.14*	0.164	*0.14*
20-24	0.261	*0.23*	0.253	*0.23*	0.253	*0.23*	0.273	*0.23*
25-29	0.220	*0.19*	0.248	*0.22*	0.230	*0.21*	0.261	*0.22*
30-34	0.209	*0.18*	0.203	*0.18*	0.236	*0.21*	0.217	*0.18*
35-39	0.159	*0.14*	0.181	*0.16*	0.135	*0.12*	0.179	*0.15*
40-44	0.093	*0.08*	0.065	*0.06*	0.083	*0.07*	0.082	*0.07*
45-49	0.049	*0.04*	0.008	*0.01*	0.028	*0.03*	0.035	*0.03*
TFR	5.70	*1.00*	5.61	*1.00*	5.59	*1.00*	6.06	*1.00*
*Confidence Interval (+/-)	0.1		0.1		0.1		0.0	
Mean age	29.5		28.4		28.9		29.0	

Notes: *95 per cent confidence interval range.

Std (Standardised) fertility distribution achieved by equating total fertility to 1 and subsequent age-specific fertility estimates are derived as proportions.

Figure 6.3 shows that current fertility estimates for Zambian traditional reproductive regimes converged over the ten-year period. The difference between the regime with the highest and lowest fertility was around 1.0 child and 2.1 children in the 1990 Census and 1992 DHS respectively. The gap lessened to about half a child in both the 2000 Census and 2001-02 DHS. To place converging current fertility between traditional reproductive regimes in context of historical trends, the next section discusses fertility trends.

Figure 6.3 Total fertility estimates by year tabulated according to traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

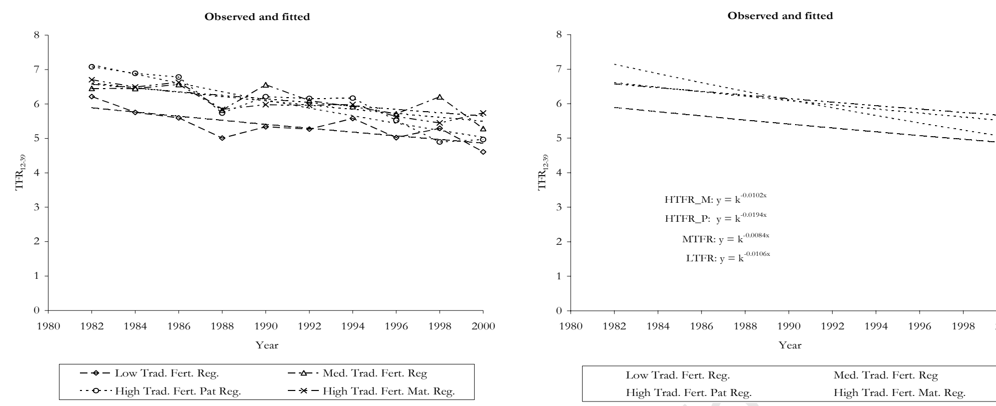


The 95 per cent confidence intervals show that the current fertility estimates derived from both the census and DHS are different between traditional reproductive regimes. However, estimates derived from the censuses and the 1996 DHS do not show large differences between all regimes other than the low traditional reproductive regime. In the 1992 DHS, estimates for both the low traditional regime and medium traditional regime are different from the two high traditional reproductive regimes. Only the high traditional reproductive matrilineal regime estimate stands out in the 2001-02 DHS. In addition, random fluctuations due to small numbers seem to be affecting estimates derived from the DHS data—especially age specific fertility estimates at older ages for the low traditional reproductive regime and the high traditional fertility patrilineal regime (Table 6.9).

6.4.3 Fertility trends for each traditional reproductive regime

Figure 6.4 shows overall trends in cumulated fertility up to age 40 for each traditional reproductive regime derived from birth histories using the approach described in Section 3.5. Figure 6.5 presents the trends in each regime tabulated by residence classification: urban and rural. Table 6.10 shows the statistical description of trends in Figure 6.4 and Figure 6.5.

Figure 6.4 Cumulated fertility up to age 40 according to traditional reproductive regime: 1992, 1996 and 2001-02 Zambia DHS



Note: HTFR_M represents the high traditional fertility matrilineal regime.
HTFR_P represents the high traditional fertility patrilineal regime.
MTFR represents the medium traditional fertility regime.
LTFR represents the low traditional fertility regime.

Figure 6.5 Cumulated fertility up to age 40 by urban/rural residence classification according to traditional reproductive regime: 1992, 1996 and 2001-02 Zambia DHS

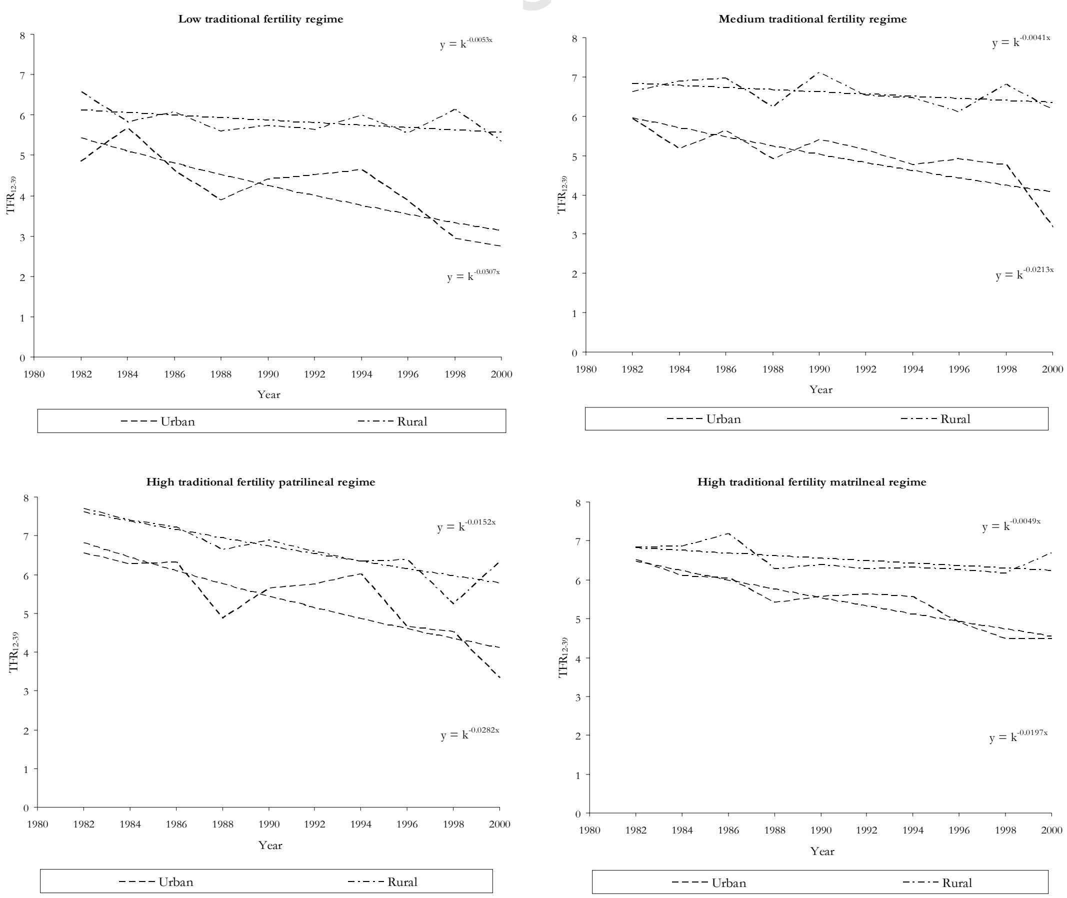


Table 6.10 Statistics describing fertility trends for each traditional reproductive regime

	Low trad. Fert.	Medium trad. Fert.	High trad. Fert. Pat.	High trad. Fert. Mat.
Urban/rural				
Number of births	4,204	8,109	7,627	28,284
Slope (exponential)	-0.011	-0.008	-0.019	-0.010
Standard error on the slope	0.003	0.003	0.003	0.002
P-value	0.009	0.019	0.000	0.001
Significance	**	*	**	**
Urban				
Number of births	1,054	2,092	3,513	12,203
Slope (exponential)	-0.031	-0.021	-0.028	-0.020
Standard error on the slope	0.008	0.006	0.007	0.003
P-value	0.004	0.011	0.004	0.000
Significance	**	*	**	**
Rural				
Number of births	3,150	6,017	4,115	16,081
Slope (exponential)	-0.005	-0.004	-0.015	-0.005
Standard error on the slope	0.003	0.003	0.003	0.002
P-value	0.116	0.174	0.002	0.082
Significance	ns	ns	**	ns

Notes: ** Indicates that the slope is significantly different from 0 at 0.01 level of confidence.
* Indicates that the slope is significantly different from 0 at 0.05 level of confidence.
ns Indicates that the slope is not significantly different from 0.

In the early 1980s, women belonging to the high traditional fertility patrilineal regime had the highest fertility while the low traditional fertility regime women had the lowest. Those belonging to the medium traditional fertility regime and high traditional fertility matrilineal regime had the same fertility. However, the differences in the pace of fertility transition between these two regimes—0.8 versus 1.0 per cent per annum, respectively—suggest that before 1980, fertility among women belonging to the high traditional fertility matrilineal regime was higher than that for women belonging to the medium traditional fertility regime.

Twenty years later, the fertility of high traditional fertility patrilineal regime women had declined rapidly—at 1.9 per cent per annum—and was approaching that for the low traditional fertility regime women. Significant and simultaneous fertility declines for both rural and urban women belonging to the former regime (Figure 6.4 and Table 6.10) explain the rapid fertility decline among women belonging to this regime. In 2000, fertility of the medium traditional fertility regime was the highest because their fertility decline—at 0.8 per cent per annum—was the slowest.

Although the pace of fertility decline among women belonging to the medium traditional fertility regime was the slowest, it was not very different from that for women belonging to the low traditional reproductive regime (1.1 per cent per annum) and the high traditional fertility matrilineal regime (1.0 per cent per annum). The pace of rural fertility decline—that is, 0.4 and 0.5 per cent per annum—of these three regimes is also similar. The rural fertility decline among the high traditional fertility patrilineal regime women stood out at 1.5 per cent per annum.

The pace of fertility decline is a bit more distinct between women residing in urban areas. Urban fertility among women belonging to the low traditional fertility regime was declining the most at 3.1 per cent per annum. This is 0.3 per cent per annum higher than that for the high traditional fertility patrilineal regime women (2.8 per cent per annum). However, urban fertility decline was almost similar among women belonging to the medium traditional reproductive regime (2.1 per cent per annum) and the high traditional fertility matrilineal regime (2.0 per cent per annum). However, as discussed in Chapter 3, the approach used to estimate fertility trends suffers from the 'current variable problem'.

6.5 Converging fertility levels

This chapter applied the approaches employed at a national level in Chapter 3—that is robust evaluations and corrections to fertility data as well as selection of suitable adjustment techniques—to compute lifetime, current fertility and past fertility trends for each traditional reproductive regime. The resulting fertility estimates and trends supplement and—in general—support the discussions and conclusions drawn in Chapter 5. As predicted using data from Murdock's Ethnographic Atlas, fertility trends derived from DHS data suggest that before 1980, fertility differentials might have existed between the different traditional reproductive regimes. It is most likely that, before 1980, women belonging to the low traditional fertility regime had the lowest fertility followed by those belonging to the medium traditional fertility regime. The high traditional fertility patrilineal regime women had the highest fertility. This confirms our hypothesis that subnational fertility differentials are outcomes of ethnic fertility differentials in Zambia.

However, with time, fertility levels of Zambian traditional reproductive regimes have been converging. This is because fertility among women belonging to the two high traditional reproductive regimes, especially the patrilineal cluster of societies, has been falling more rapidly than among women who belong to the low and medium traditional reproductive regimes. The converging fertility levels signal that the importance of traditional arrangements in determining current Zambian fertility is eroding at varying paces in different ethnic societies. This raises some important questions. First, what present-day features have taken over fertility governance? Second, how different are these attributes between the four Zambian traditional reproductive regimes? Third, is fertility decline among women belonging to the high traditional fertility patrilineal regime the fastest because they have embraced present-day features underlying fertility the most, if so why? The next chapter addresses these questions.

7 CONTEMPORARY FEATURES UNDERLYING THE EROSION OF TRADITIONAL GOVERNORS OF FERTILITY: CONVERGING FERTILITY EXPLAINED

7.1 Identifying features underlying differential fertility trends between Zambian traditional reproductive regimes

This chapter evaluates and compares selected present-day features underlying fertility—both proximate and background—to explain the disparities in fertility trends between women belonging to the four Zambian traditional reproductive regimes. Features of modernisation such as industrialisation, urbanisation and education are responsible for the erosion and transformation of traditional governors of fertility (Hayes 1994). The erosion and transformation of traditional governors of fertility can explain fertility change. The most effective way of noting erosion and transformation of traditional governors of fertility in each reproductive regime is using historical and recent ethnographies and then evaluating the changes. However, doing so would require a time-demanding task of collecting both recent and historical data on traditional societies and then evaluating the changes in the ethnographies. However, it is possible to evaluate differences in exposure to modern determinants of fertility between the four traditional reproductive regimes. Such an approach can also suggest if differences in erosion and transformation of traditional governors of fertility between the four regimes exist and assist in explaining disparities in fertility trends.

Bongaarts' (1978) proximate determinants framework is not applied to evaluate and compare present-day determinants of fertility between traditional reproductive regimes in Zambia. This is because 'regime' specific data are not available or require much more stringent assumptions. Data required for each regime includes the average contraceptive use effectiveness, the mean postpartum infecundability and total abortion rate among married women. Therefore, this chapter applies multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA) to evaluate and compare present-day features underlying fertility between traditional reproductive regimes in Zambia. The methods allow for simultaneous statistical comparisons of several independent variables for more than two groups which, in turn, increases statistical power for testing group differences (Huberty and Olejnik 2006). It also controls for errors that result when making statistical assessments between related variables—in this case present-day determinants of fertility—(Hair, Black, Babin *et al.* 2006b).

Both social and natural sciences apply discriminant analysis (DA) in predictive and descriptive research studies. Discriminant analysis dates from 1920 and originally it was for predictive purposes only (Huberty and Olejnik 2006). This study applies descriptive discriminant analysis (DDA) instead of predictive discriminant analysis (PDA). DDA is more appropriate since Chapter 5 has defined the groups—traditional reproductive regimes—*a priori* (Hair, Black, Babin *et al.* 2006b).

DDA describes overall group differences but it cannot show the variables contributing to the differences (Hair, Black, Babin *et al.* 2006c). Therefore, one needs multivariate analysis of variance (MANOVA) to identify variables underlying group differences. Applied jointly, these procedures compare and contrast groups and then describe variables underlying the differences. To perform MANOVA and DDA procedures, a research design must have at least one grouping variable and more than one response variable (Hair, Black, Babin *et al.* 2006b, 2006c).

The next section describes the grouping and response variables used in this evaluation.[1] Section 7.3 describes briefly the MANOVA and DDA techniques and Section 7.4 presents the results. The last section (7.5) summarises the chapter and provides an overall interpretation of the results.

7.2 The traditional reproductive regimes and the present-day determinants of fertility

There are two fundamental aspects of multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA): the grouping variable and the response variables (Huberty and Olejnik 2006).[2] The grouping variable (traditional reproductive regimes) shows the group to which each observation belongs. Meanwhile, response variables (present-day determinants of fertility) describe the characteristics of each observation.

[1] Huberty and Olejnik (2006: 11), describes one source of confusion in DDA, "a grouping variable plays the role of an "independent" variable whereas response variables play the role of "dependent" variable. (This common usage is unfortunate and potentially misleading…)".

[2] To discuss multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA), this section relies heavily on the materials presented by Hair, Black, Babin and others (2006) as well as Huberty and Olejnik (2006). They also provide for approaches and examples of applying MANOVA/DDA in behavioural sciences.

7.2.1 The grouping variable: Traditional reproductive regimes

The grouping variable for this study, traditional reproductive regimes, is manipulable[3] because it was composed in Chapter 5 by applying multivariate cluster analysis to Murdock's (1967a) Ethnographic data. Chapters 5 and 6 describe the derivation of the four Zambian traditional reproductive regimes. Huberty and Olejnik (2006) state that when selecting or forming grouping variables, one needs to address internal and external validity, so that emerging differences are not attributed to other factors. To assess validity, they propose presenting details of the procedure of selecting or formulating a grouping variable. Huberty and Petoskey (2000: 185-186) also state that "grouping variables … should be well defined in the sense that the membership of an analysis unit in any group … should be determined unambiguously at the start of the study". Our grouping variable, traditional reproductive regimes, was derived in Chapter 5 from the results of a multivariate cluster analysis. Therefore, the grouping is not subjective and the robust approach addressed the issues of internal and external validity.

To describe the distribution of our grouping variable, we re-present Table 6.5 as Table 7.1 derived from data sources (1990 and 2000 Censuses as well as the 1992, 1996 and 2001-02 DHS) described in Section 3.2. The majority (more then 55 per cent) of the sample comprises of women who belong to the high traditional fertility matrilineal regime. The smallest group (about 10 per cent) is comprised of the low traditional fertility regime women.

Table 7.1 Sample size for each of the four traditional regimes (grouping-variable)

Data source	Low trad. fertility	Med. trad. fertility	High traditional Patrilineal	High traditional Matrilineal	TOTAL
1990 Census	42,884	69,338	62,180	246,600	421,002
2000 Census	52,201	90,525	81,568	314,278	538,572
1992 DHS	593	1,308	1,064	3,914	6,879
	715	*1,193*	*977*	*4,004*	*6,889*
1996 DHS	740	1,232	1,169	4,667	7,808
	926	*1,242*	*1,033*	*4,627*	*7,828*
2001-02 DHS	792	1,138	1,182	4,340	7,452
	792	*1,088*	*1,085*	*4,476*	*7,441*

For the DHS, non-weighted figures are in italics.

[3] By contrast, a researcher has no control over nonmanipulable variables such as age and sex (Huberty and Olejnik 2006).

7.2.2 The response variables: Present-day features underlying fertility

Keselman, Huberty, Lix *et al.* (1998) as well as Huberty and Olejnik (2006) propose that the response variables should meet four conditions. First, they should have purpose in the matter the research is exploring. Second, response variables should be interrelated to simplify interpretation of DDA results. Third, the variables should be measurable in integer or ordinal scaling. Lastly, the ideal number of response variables should not exceed twelve (Huberty and Olejnik 2006).

The material on determinants of fertility was used to select the response variables. They comprise of both proximate and background determinants of fertility available in the census and DHS data. Appendices 7.1.a to 7.1.e present the tabulations of present-day features underlying fertility according to Zambian traditional reproductive regimes produced using STATA (2003) version 8. The tables do not include all features because they are either not available in the data sources or they are not easy to measure. The census has fewer variables because it does not collect information on some present-day determinants of fertility such as contraceptive use. All the present-day determinants of fertility satisfy requirements of MANOVA and DDA designs. To compare the response variables across Zambian traditional reproductive regimes, the following paragraphs discuss results presented in Appendices 7.1.a to 7.1.e.

Age distribution, age at first marriage and first birth

The age distributions of Zambian women aged 15-49 tabulated according to traditional reproductive regimes are similar. Only the 1990 Census and 1992 DHS report that women belonging to the low traditional reproductive regime have larger proportions at older ages countered by smaller proportions at younger ages.

The table shows that larger proportions of women belonging to the high traditional fertility patrilineal regime and medium traditional fertility regime marry before age twenty. Meanwhile, the proportions of women marrying after age 20 are higher for the low traditional reproductive regime women. Almost the same distribution applies to age at first birth. Although not quantified, anthropological accounts have stated that age at marriage among the Lozi—the largest society in the low traditional reproductive cluster—is high (Gluckman 1968).

Appendix 7.1.f shows the singulate mean age at marriage (SMAM) and mean age at first birth (MAFB) from proportions nulliparous (Booth 1994). This is the mean age at first marriage/first birth of those in a hypothetical or synthetic cohort who eventually marry by age 50—in our case by age 45[4] (Faust 2004). These estimates are higher than the median age because they exclude women who never marry or become parents. Both SMAM and MAFB have been higher among women belonging to the low traditional reproductive regime. However, MAFB increased by one year among women belonging to the high traditional fertility patrilineal regime.

Urban/Rural classification of residence and province of residence

All the data sources show that, at the time of enumeration, approximately 45 per cent of women belonging to the two traditional high fertility regimes were living in an urban area. For the other two regimes, the proportion of women living in an urban area was less than 30 per cent.

Most women (over 60 per cent) who belong to societies that make up the low traditional fertility regime lived in Western Province—one of the most rural provinces in Zambia. Approximately 50 per cent of women belonging to societies that make up the medium traditional fertility regime lived in Southern and Central Provinces. Large proportions of women belonging to the two traditional high fertility regimes were found in more than one province. The majority (about 30 per cent) of women belonging to the high traditional fertility patrilineal regime societies lived in Eastern Province according to all the data sources apart from the 1992 DHS. Meanwhile the majority (between 25 and 34 per cent) of those belonging to societies that make up the high traditional fertility matrilineal regime lived on the Copperbelt—one of the most urbanised provinces in Zambia. For this variable, there are no large differences between the 2000 Census and the 2001-02 DHS. However, there are large difference between the 1990 Census and the 1992 DHS. As Section 3.3.2 points out, this is could be because the 1992 and 1996 DHS failed to cover rural provinces adequately.

For our purpose, this variable is recoded into three categories to measure accessibility to modern determinants of fertility due to location. The first category is for women living in provinces that are largely rural and not easily accessible because the Zambian "traditional line-of-rail" does not go through these provinces. The second category is for women living in rural provinces—Central and Southern—that are accessible by the Zambian "traditional line-of-rail". The last category is for women

[4] Both SMAM and MAFB were computed without using the age group 50-54. A personal communication with Dr. Heather Booth and the example in Faust (2004) shows that excluding this age group does not affect these parameters drastically.

living in provinces—Copperbelt and Lusaka—that are urban and accessible by the Zambian "traditional line-of-rail".

Table 7.2 presents the distribution of Zambian women aged 15-49 according to the traditional reproductive regime and location of regional residence. In general, the majority of women belonging to low traditional fertility regime societies are situated in the most inaccessible Zambian locations. Meanwhile, the majority of those belonging to the medium traditional fertility regime were situated in rural locations that are easily accessible. More than a third of women belonging to the two high traditional fertility regimes were situated in the most urbanised and accessible Zambian regions.

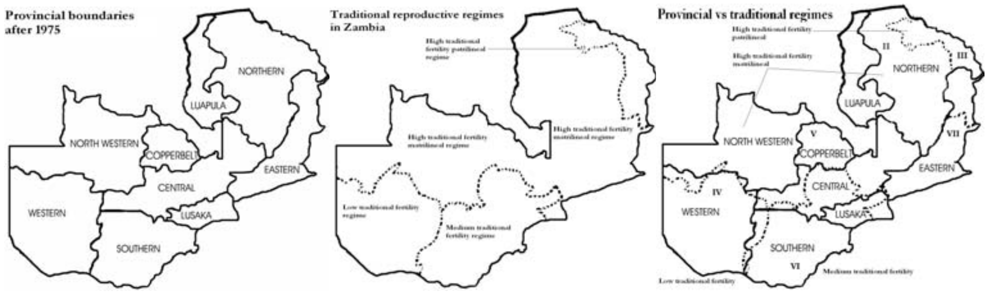
Table 7.2 Location of regional residence for Zambian women aged 15-49 according to traditional reproductive regime, 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

	Low Trad. Fert.			Med. Trad. Fert.			High Traditional fertility					
							Patrilineal			Matrilineal		
	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.
	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number
1990 Census												
Not on traditional line of rail and rural	72.4	31,046		2.2	1,538		55.6	34,601		49.7	122,531	
On traditional line of rail but rural	14.5	6,236		75.8	52,591		7.4	4,595		11.2	27,662	
On traditional line of rail and urban	13.1	5,602		21.9	15,209		37.0	22,984		39.1	96,407	
2000 Census												
Not on traditional line of rail and rural	71.7	37,453		2.2	1,847		52.0	45,464		49.8	161,628	
On traditional line of rail but rural	14.2	7,424		73.8	62,851		13.6	11,929		13.9	44,948	
On traditional line of rail and urban	14.0	7,324		24.0	20,427		34.3	30,014		36.3	117,780	
1992 DHS												
Not on traditional line of rail and rural	63.0	374	514	1.7	23	27	44.7	476	435	38.6	1,510	1,793
On traditional line of rail but rural	21.8	129	118	75.0	981	887	7.9	84	77	11.3	444	404
On traditional line of rail and urban	15.2	90	83	23.2	304	279	47.4	504	465	50.1	1,960	1,807
1996 DHS												
Not on traditional line of rail and rural	67.5	499	719	2.0	25	33	54.4	636	619	50.2	2,345	2,792
On traditional line of rail but rural	12.6	93	95	67.3	829	914	6.2	72	71	9.4	439	475
On traditional line of rail and urban	20.0	148	112	30.6	377	295	39.4	461	343	40.4	1,883	1,360
2001-02 DHS												
Not on traditional line of rail and rural	73.5	582	606	2.3	27	32	55.3	654	681	52.6	2,284	2,843
On traditional line of rail but rural	13.2	105	109	73.3	835	852	4.9	58	77	7.3	315	465
On traditional line of rail and urban	13.3	105	77	24.3	277	204	39.7	469	327	40.1	1,741	1,168

Source: 1990 and 2000 Censuses; 1992, 1996 and 2001-02 DHS.

Figure 7.1 compares the ethnographic regional boundaries of traditional reproductive regimes (derived in Chapter 5) with Zambia's provincial boundaries. The dotted lines show the ethno-geographic regional boundaries while the solid line represents the provincial administrative boundaries. The figure shows that Copperbelt and Lusaka Provinces are far from the villages of women belonging to the high traditional fertility patrilineal regimes. This suggests that women belonging to societies that make up this regime had to migrate to the two most-urban provinces in Zambia.

Figure 7.1 Zambian traditional reproductive regimes according to location of their villages relative to provincial boundaries



Educational attainment

All the data sources indicate that women belonging to medium traditional fertility regime societies had the largest proportions of women with primary education. High traditional fertility patrilineal regime women had the largest proportion of women with more than primary education. Only the 1996 DHS shows that the low traditional fertility regime women had the largest proportion of women with more than primary education. This could be data error rather than a reflection of the actual distribution because this point does not fit in the expected trend for this regime.

Marital status and type of union for those married

All the data sources show that most (over 60 per cent) high traditional fertility patrilineal regime women are married. Less than 50 per cent of low traditional fertility regime women are married or cohabiting. The 1992 DHS suggests a different distribution from the other data sources which is difficult to explain.

For those married, differences exist in the type of marital union between traditional reproductive regimes. High traditional fertility matrilineal regime women report the highest proportions (more than 85 per cent) of women married in monogamous unions. Those belonging to the medium traditional fertility regime societies report the lowest proportions (less than 75 per cent) of monogamous marriages. In this regime, notable proportions (56.1 per cent in 1992 and above 30 per cent in both the 1996 and 2001-02 DHS) of women are in polygamous unions of more than two wives. These differentials between regimes confirm the anthropological descriptions of societies constituting these clusters as presented in Chapter 5.

Economic activity and status in household

The censuses show that the low traditional fertility regime women had the lowest proportions (8.6 and 7.0 per cent respectively) of women working for pay or profit. Although not remarkably, high traditional fertility patrilineal regime women report the highest proportions of women working for pay or profit.

In all traditional reproductive regimes, most respondents are wives or children. However, all data sources show that low traditional reproductive regime women have the largest proportions of female-headed households—ranging from 8 per cent in 1990 to 14 per cent in 2002. The next largest proportions of female-headed households are among high traditional fertility matrilineal regime women. Therefore, the low traditional reproductive regime and the high traditional fertility matrilineal regime had the lowest proportions of women whose household status is spouse. This is probably because, as Section 5.3.3.1 points out, women belonging to these regimes are not dependent on men. For the low traditional reproductive regime, controls on marriage and sexual relationships due to wide cognatic kinships might explain their autonomy.

Religion

Larger proportions of the high traditional fertility matrilineal regime women report that they are Catholic. Meanwhile, most women belonging to other traditional reproductive regimes report that they are Protestants.

Contraceptive use

All the DHS data sources show that larger proportions of high traditional fertility patrilineal regime women report having used contraceptives before (all methods combined). However, the differences in proportions with other regimes (apart from the low traditional fertility regime) are minimal. For folkloric contraceptive methods, they share this 'highest' rank with the low traditional fertility regime women.

Other than high traditional fertility patrilineal regime women, the results show that larger proportions of women belonging to the other three regimes had never used contraception. The same distribution applies to current use of contraception. Larger proportions of high traditional fertility patrilineal regime women report using contraception at enumeration. Meanwhile, smaller proportions of the low traditional fertility regime women report using contraception at enumeration.

In multivariate analysis of variance and descriptive discriminant analysis, this study is a single-factor multiple-groups design because it comprises of one grouping variable (traditional reproductive regimes) with four groups. The next section describes this model.

7.3 Describing the single-factor multiple-group multivariate analysis of variance and descriptive discriminant analysis

The above single-factor multiple-group multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA) model can be described using a multivariate data set matrix **Y** (Equation 7.1). For each dataset, the matrix in Equation 7.1 describes a population of women aged 15-49 (*n*) and the grouping and response variables (*p*).

$$\mathrm{Y} = n \times p = \begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1p} \\ y_{21} & y_{22} & \cdots & y_{2p} \\ . & & & \\ . & & & \\ . & & & \\ y_{n1} & y_{n2} & \cdots & y_{np} \end{bmatrix} \qquad 7.1$$

The grouping variable can be any column vector in this matrix—that is any of the *p* attributes. Let the first column vector be the grouping variable describing the four traditional reproductive regimes each comprising *n* individuals. Figure 7.2 illustrates the multivariate data matrices for each traditional reproductive regime. Figure 7.2 does not have the first column vector of Equation 7.1 ($p = 1$) because this is the grouping variable. The number of individuals in each group does not need to be equal but the sum should equal to the population in Equation 7.1.

Figure 7.2 An illustration of the multivariate data set matrices representing each Zambian traditional reproductive regime

$$\underset{\textit{Cluster one}}{\begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1p} \\ y_{21} & y_{22} & \cdots & y_{2p} \\ . & & & \\ . & & & \\ . & & & \\ y_{n1} & y_{n2} & \cdots & y_{np} \end{bmatrix}} \quad \underset{\textit{Cluster two}}{\begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1p} \\ y_{21} & y_{22} & \cdots & y_{2p} \\ . & & & \\ . & & & \\ . & & & \\ y_{n1} & y_{n2} & \cdots & y_{np} \end{bmatrix}} \quad \underset{\textit{Cluster three}}{\begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1p} \\ y_{21} & y_{22} & \cdots & y_{2p} \\ . & & & \\ . & & & \\ . & & & \\ y_{n1} & y_{n2} & \cdots & y_{np} \end{bmatrix}} \quad \underset{\textit{Cluster four}}{\begin{bmatrix} y_{11} & y_{12} & \cdots & y_{1p} \\ y_{21} & y_{22} & \cdots & y_{2p} \\ . & & & \\ . & & & \\ . & & & \\ y_{n1} & y_{n2} & \cdots & y_{np} \end{bmatrix}}$$

MANOVA and DDA compare groups with respect to means on linear composites of response variables, that is "the effect of the grouping variable on the linear composites of the outcome variables…" (Keselman, Huberty, Lix *et al.* 1998: 359

361). Like any other multivariate techniques, MANOVA and DDA tests the null hypothesis of no difference between groups using vector mathematics (Hair, Black, Babin *et al.* 2006c).

The null hypothesis for MANOVA and DDA designs is that the mean score for *cluster one* does not differ from the mean score of the other groups (Huberty and Olejnik 2006). Therefore, the null hypothesis for the single-factor multiple-group design for evaluating differences between Zambian traditional reproductive regimes is that population centroids[5] do not differ between traditional reproductive regimes. If the null hypothesis is true, then there are no differences between Zambian traditional reproductive regimes. The alternative means that differences exist between Zambian traditional reproductive regimes

To test the null hypothesis, two matrices—the error sum-of-squares and cross-products (**SSCP**) matrix for groups, as well as the hypothesis or mean centroids—are determined from the matrices in Figure 7.2. The following sections use these matrices to discuss the required MANOVA and DDA assessments.

7.3.1 Univariate tests for single-factor multiple-groups

Univariate (or omnibus) tests assess variations between and within group means of each response variable (Huberty and Olejnik 2006). For fixed-effects designs (grouping variable defined *a priori*), they show the correlation between the grouping variable and a response variable. Univariate assessments use the F ratio statistic to test the null hypothesis that the group population means are equal for each response variable. The test assumes that the observations are independent and populations have normal distributions and equal variance.

7.3.2 Assessments to ensure data is suitable for multivariate analysis

Apart from univariate analysis, there is a need to assess whether the data meets the necessary conditions for performing multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA). Huberty and Mohamed (2003) recommend that these assessments should include examining data for missing data, outlying data vectors and multivariate normality of the response variables. Most importantly, researchers should assess if correlations between response variables exist, and whether group covariance matrices are equal.

Correlation analysis assesses the relationship between categories or values of different pairs of response variables. If two response variables are highly correlated then

[5] In our case, a centroid is a vector of means for each present-day determinant of fertility.

one of the variables should be excluded because it will not add value to a multivariate enquiry (Brown and Wicker 2000). Researchers use the Pearson correlation coefficient (*r*) to measure error correlations between two variables *x* and *y* (Norušis 1993). Correlation coefficients (*r*-values) close to $+/-1$ (greater than 0.75 or less than -0.75) show a strong correlation between *x* and *y* (SPSS Inc 1999). Absolute correlation coefficients greater than 0.9, generally imply that one of the two correlated variables should be excluded from the model (SPSS Inc 1999).

Selecting a correct multivariate analysis of variance (MANOVA) test statistic depends on whether the group or population covariance matrices are different or similar (Huberty 2002). Researchers use the Box *M*-statistic to test the hypothesis that covariance matrices are identical (Huberty and Olejnik 2006). The Box *M*-statistic is sensitive and may produce invalid results under certain conditions. First, the Box *M*-statistic is not always useful because it is oversensitive to mild departures from multivariate normality (Foerster and Stemmler 1990). Second, for large samples—therefore large degrees of freedom—small differences in covariance matrices will yield significant Box *M*-statistic even when the group covariance matrices are equal (SPSS Inc 1999).

Therefore, when the Box *M*-statistic is significant, there is need for a visual assessment of the natural logarithms of each group's covariance matrix as well as that for the error matrix before deciding that the covariance matrices differ (Huberty 2002). Another assessment involves inspecting the sums of outcome variable variances (*traces*) for each group and that of error matrix. These parameters should be within a narrow range or "in the same ballpark" across groups (Huberty 2002: 588). Finally, one should only apply the common MANOVA test statistics (next section) if the group or population covariance matrices are equal. Failure to prove covariance matrix equality implies using alternative MANOVA test statistics—such as the Yao or the Johansen test (Huberty and Olejnik 2006).

7.3.3 Single-factor multiple-groups multivariate tests for assessing the significance of group differences

The next step is comparing if the population centroids between groups are different. Multivariate analysis of variance (MANOVA) test statistics for this evaluation include: Wilks' lambda, Bartlett-Pillai, Roy's largest root and Hotelling-Lawley (Huberty and Olejnik 2006). Each measure has two accompanying statistics—the significance test and the measure of association. If group differences exist—that is, the null hypothesis is rejected—the former statistic assesses the significance of the group difference using the F distribution. The latter evaluates the strength of association between the grouping variable and the response variables.

Since the measures of effect-size for the four MANOVA test statistics overestimate the strength of association, the adjusted estimate should be considered instead (Huberty and Olejnik 2006). Lastly, interpretation of this statistic is still problematic because statisticians have not defined what forms a "large" or "small" multivariate effect-size index (Huberty and Olejnik 2006). The next section describes methods used to identify variables that contribute the most to multivariate group differences.

7.3.4 Identifying important features in a single-factor multiple-groups multivariate environment

Selection of response variables that should be included in a study depends on theory, past studies, data availability and measurement (Huberty and Olejnik 2006). However, researchers need to ascertain the importance of the selected response variables in explaining group differences and probably delete less important variables because they are not adding any value to the model. Variable "importance" refers to its capability to explain group differences and not its contribution to the construction of linear discriminant functions—discussed in the next section (Huberty and Lowman 1998).

Descriptive discriminant analysis (DDA) has response variable ranking or ordering procedures (Huberty and Olejnik 2006). These procedures (called *F*-to-remove in SPSS) rank response variables according to importance and therefore allow for identification of attributes that explain the largest proportion of group differences.

7.3.5 Linear combinations of response variables that describe group differences

In descriptive discriminant analysis (DDA), linear discriminant functions (LDFs) or variates—also known as latent or construct variables—are linear combinations of response variables that maximise inter group differences (Hair, Black, Babin *et al.* 2006b; Huberty and Olejnik 2006). The next section briefly describes latent variables while Section 7.3.5.2 presents methods for identifying useful latent variables in a model.

7.3.5.1 Description and interpretation of linear discriminant functions

A linear discriminant function is an adaptation of multiple linear regression to allow for multiple groups (Huberty and Olejnik 2006). Equation 7.2 defines a multiple linear regression with one dependent variable (Y_1) and several independent variables (X_p). The constant term is excluded for simplicity.

$$Y_1 = b_1 X_1 + b_2 X_2 + \ldots + b_p X_p \qquad 7.2$$

The relationship between Y and X is described through maximisation of partial regression coefficients—the *b* values. The *b* values for each variable are obtained from minimising the sums of squared deviations from the mean of each variable (Afifi and Clark 1984). Each *b* value describes the change in Y_1 due to a particular X assuming all other X_s are constant. Collectively, *b* values define a linear combination of outcome variables that have a maximised correlation with the dependent variable (Huberty and Olejnik 2006). Therefore, any other combination of *b* values for the same data will result in an inefficient correlation.

However, in DDA, the dependent variable (Y_1) has more than one group. Therefore, LDFs are defined from several linear combinations of outcome variables (several Equation 7.2s). Maximisation of the *b* values is equivalent to maximising the correlation between the grouping variable and linear combinations of response variables (Huberty and Olejnik 2006). In DDA, this maximisation procedure produces coefficients called error structures *r's*—these are equivalent to *b* values in multiple regression analysis—that have a larger *F* ratio than any other combination of *r's*. It is the various combinations of error structures *r's* that define latent variables that share the most variation (Huberty and Olejnik 2006).

Interpretation of latent variables depends on the standardised relative weights of error structures *r's*. The relative weights of error structures *r's* denote the variance shared by the grouping variable and the latent variable (Huberty and Lowman 1998). Therefore, variables contributing the most to defining a latent variable have larger absolute error structures *r's*. The negative or positive sign shows the direction of the relationship. As with Principal Components and Factor Analysis, interpretation of latent variables involves researcher judgement (Huberty 2000). However, "structure matrix correlation coefficients less than 0.30 typically are not interpreted because the square of the structure matrix coefficient reveals that such discriminators account for less than 10 per cent variability in the function" (Brown and Wicker 2000: 221).

7.3.5.2 Identifying the number of significant and eligible linear discriminant functions

Some models have more than one variate. Therefore, researchers need to identify the number of LDFs present in a model. The possible number of latent variables in a DDA model equals the number of groups less one (LDFs = $j - 1$). Each subsequent latent variable is orthogonal to the previous ones and accounts for less variance (Hair, Black, Babin *et al.* 2006c). Latent variables that account for less variance cannot effectively describe variables underlying group differences. Therefore, to explain group differences, one needs to identify significant or eligible latent variables (Huberty and Olejnik 2006).

There are several methods that researchers use to identify significant or eligible latent variables (Huberty and Olejnik 2006). The first method involves comparing squared canonical correlations associated with each eigenvalue. However, few researchers use this method because there is no clear distinction between small and large canonical correlations. The second method evaluates the significance of *Wilks lambda* (Λ_i) statistic of each latent variable. However, this statistic "…cannot be used to test the significance of the individual eigenvalues or individual LDFs" (Huberty and Olejnik 2006: 91). Therefore, one cannot conclude that the v^{th} LDF is significant. The third method involves evaluating the total variance resulting from adding the v^{th} latent variable. The fourth method uses plots of latent variable centroids—*r* latent variable means—to evaluate the distances between groups on each latent variable. Compared with short distances, latent variables with longer distances between groups are eligible. Brown and Wicker (2000) suggest that it is better to apply all methods to be able to reach a definite conclusion. If the methods produce different results, researchers should use their judgement to adopt one method.

7.3.6 Measuring differences between specific groups in multiple-groups multivariate designs

Rather than comparing overall differences, in multiple-groups multivariate designs, sometimes a need arises to compare between individual groups or a group with a collection of other groups (Huberty and Olejnik 2006). In DDA, this procedure is called contrast measures. Broadly, there are two types of group contrast measures: pairwise and complex. Pairwise contrast measures compare two groups while complex contrasts compare the mean of one group to the grand mean of a collection of groups. Since group contrast measures compare two groups, they have a single degree of freedom, and hence one latent variable. This implies that there is no need to test for the number of significant or eligible latent variables. Lastly, all multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA) assessments discussed above are also applicable to group contrast measures.

The next section uses multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA) to assess differences of present-day determinants of fertility between Zambian traditional reproductive regimes.

7.4 Explaining features underlying converging fertility trends

Using SPSS (2005) version 14 software, this section applies the multivariate analysis of variance (MANOVA) and descriptive discriminant analysis (DDA) procedures described in the preceding section to present-day determinants of fertility. The analysis involves the six census and ten DHS response variables presented in the previous section. Usually, in DDA and MANOVA designs, the age of a respondent is not a relevant discriminating variable (Spatz, Thombs, Byrne *et al.* 2003). Therefore, this study does not include age in its analysis models. Similarly, ages at marriage and at birth are not included because of missing information for respondents who had not married or had a child before enumeration. The information in Appendix 7.2.a describes the values for the codes used in the analysis with low scores corresponding to high fertility.

7.4.1 Descriptive and univariate differences between Zambian traditional reproductive regimes

Appendix 7.3.a and 7.3.b present descriptive information (means and standard deviations) and univariate test results for Zambian traditional regimes on selected present-day determinants of fertility. The univariate analysis of variance (ANOVA) hypothesis tests show that the traditional regimes differ significantly on all the variables. Judging from the size of the *F*-statistic, the censuses and the 1992 DHS show that the most distinctive features are location and classification of residence. The 1996 DHS and 2001 DHS show that location accounts for the most univariate separation. In addition, the 2001 DHS shows that religion also accounts for a considerable univariate separation. Economic activity, marital status, and contraceptive use account for the least variation between Zambian traditional fertility regimes. However, ANOVA results are not conclusive because they are single-variable group difference assessments (Brown and Wicker 2000). Therefore, we proceed with MANOVA to assess differences between traditional reproductive regimes based on multiple outcome variables.

7.4.2 Suitability of census and DHS data on Zambian traditional reproductive regimes for multivariate analysis

Before proceeding with MANOVA assessments, we need to ascertain the suitability of the data for such assessments (Huberty and Olejnik 2006). This section discusses the status of missing values, outliers and normality in the Zambian data sources. It also presents results of important data assessments, namely: correlations between response variables and covariance matrix equality.

7.4.2.1 Missing data, outliers and normality assessments

In all the data sets, missing data is not a problem. For DHS data, SPSS rejected less than 1 per cent of observations because of missing data on any of the ten outcome variables. Rejected observations were more common in census data—1.4 per cent (2000 census) and 4.2 per cent (1990 Census). The proportions of rejected observations are approximately equal in all the groups. Examination of the five data matrices shows that there are no outliers or aberrant scores in the data. Application of probability plots does not provide useful information needing discussion because our response variables are limited to three categories[6] (Appendix 7.2.a).

7.4.2.2 Correlations between fertility determinants

Appendix 7.4.a presents correlation coefficients between pairs of present-day fertility determinants. Correlations between almost all variables are in the small-to-moderate range (below 0.5). Some pairs of location and classification of residence as well as all pairs of marital status and marriage type are in the moderate-to-high range. For all DHS data, the latter pair is greater than 0.75 but not above 0.90. None of the response variables is redundant and each variable captures different aspects of present-day background determinants of fertility.

7.4.2.3 Covariance matrix equality assessments

To select an appropriate MANOVA assessment approach, this section applies the Box *M*-statistic to test for covariance matrix equality between the four reproductive regimes. Table 7.3 presents the Box *M*-statistic parameters for the five data sets. This test—using either F or X^2 transformation of *M*—suggests that the four population covariance matrices differ. This means that other MANOVA tests cannot be performed unless there is evidence that the four population covariance matrices between the groups are similar. However, this is almost likely due to the large sample sizes of our models. Other researchers—for example, Huberty and Lowman (1998)—have encountered a similar problem with group sizes of only 1,000 objects.

The recommended alternative of the *M*-statistic yields a *P* value of less than .005 is to compare the k+1 logarithms of the error covariance matrix and the k group covariance matrix (Huberty and Petoskey 2000). Therefore, before deciding that

[6] However, the plots (not presented) show that deviations from the straight-line plot for perfect multivariate normal distributions is minimal for all the four regimes.

covariance matrices of the Zambian traditional reproductive regimes do indeed differ, we need to perform a visual assessment of the logarithms of the error covariance matrix and the *k* group covariance matrix. Table 7.4 presents parameters for the visual assessment of the equality of the covariance matrices.

Table 7.3 Parameters of the Box *M*- statistic for assessing homogeneity of variance-covariance matrices: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

	Census		Demographic Health Survey		
	1990	2000	1992	1996	2001-02
Sample size (n)	403,216	531,152	6,853	7,754	7,400
M	57,715.154	68,740.945	2,001.589	1,802.884	1,627.661
F with (*,*) degrees of freedom	916.076	1,091.092	12.083	10.889	9.828
P (significance of *F*)	0.000	0.000	0.000	0.000	0.000
X^2 with (*) degrees of freedom	57,712.792	68,738.790	1,993.769	1,796.964	1,621.613
P (significance of X^2)	0.000	0.000	0.000	0.000	0.000

Notes: *,* degrees of freedom = 63, 33434818 (1990 Census); 63, 84872145 (2000 Census); 165, 22629552 (1992 DHS); 165, 31988894 (1996 DHS); 165, 26189895 (1996 DHS).
* degrees of freedom = 63 (1990 and 2000 Census); 165 (1992, 1996 and 2001-02 DHS).

Table 7.4 Parameters assessing covariance matrix equality: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

	Low trad. fertility	Med. trad. fertility	High traditional fert. Patrilineal	High traditional fert. Matrilineal	Error
1990 Census					
Natural logarithms of determinants	-8.96	-10.11	-8.73	-8.47	-8.69
Traces of covariance matrix	2.26	1.88	2.65	2.60	2.45
2000 Census					
Natural logarithms of determinants	-8.40	-9.52	-7.87	-7.89	-8.08
Traces of covariance matrix	2.33	1.85	2.66	2.61	2.46
1992 DHS					
Natural logarithms of determinants	-14.58	-16.10	-13.55	-13.90	-14.01
Traces of covariance matrix	3.96	3.51	4.68	4.64	4.38
1996 DHS					
Natural logarithms of determinants	-13.52	-15.38	-13.26	-12.95	-13.21
Traces of covariance matrix	4.40	3.84	4.74	4.73	4.55
2001-02 DHS					
Natural logarithms of determinants	-13.80	-14.22	-13.01	-12.38	-12.67
Traces of covariance matrix	4.52	4.25	4.93	4.99	4.82

Both the natural logarithms of the determinants and traces of the covariance matrices for all the four traditional reproductive regimes fall in a narrow range. The range for the former is less than 3.0 while it is less than 1.0 for the latter. This suggests that the four population covariance matrices between the groups are similar. These assessments show that the Box *M*-statistic results are invalid because of the large sample sizes of the censuses and DHS data. We should, therefore, continue with multivariate analysis since the assumption of covariance matrix equality between the four reproductive regimes is not violated. Overall, this section (7.4.2) suggests that our data are suitable for multivariate analysis.

7.4.3 Significance of multivariate differences between Zambian traditional reproductive regimes

Table 7.5 presents multivariate analysis of variance (MANOVA) test statistics for assessing differences between Zambian traditional reproductive regimes. The table presents values for the Bartlett-Pillai and Wilks lambda test statistics for two reasons. First, the Bartlett-Pillai is the recommended test statistic for models with multiple linear combinations of response variables (Section 7.4.5). Second, the other assessments in the sections that follow are based on this test statistic. Besides, this test statistic is the most commonly used criterion (Huberty and Olejnik 2006).

Table 7.5 Parameters of MANOVA test statistics assessing group contrasts between traditional fertility regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

	Census		Demographic Health Survey		
	1990	2000	1992	1996	2001-02
Sample size (n)	403,216	531,152	6,853	7,754	7,400
Hypothesis degrees of freedom (all tests)	18	18	30	30	30
Bartlett-Pillais	0.139	0.108	0.225	0.233	0.201
Error degrees of freedom	1,209,627	1,593,435	20,526	23,229	22,167
F	3267.485	3306.970	55.516	65.142	52.932
P (significance of F)	0.000	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.046	0.036	0.075	0.078	0.067
Adjusted effect-size estimate (ξ^2_{adj})	0.046	0.036	0.075	0.078	0.067
Wilks	0.864	0.894	0.788	0.778	0.809
Error degrees of freedom	1,140,442	1,502,300	20,077	22,722	21,683
F	3373.828	3372.870	56.632	67.735	54.232
P (significance of F)	0.000	0.000	0.000	0.000	0.000
Effect-size estimate (τ^2)	0.048	0.037	0.076	0.080	0.068
Adjusted effect-size estimate (τ^2_{adj})	0.048	0.037	0.076	0.080	0.068

The results show that the centroids for the four Zambian traditional fertility regimes differ significantly. Therefore, these differences can be generalised to the populations these samples represent for response variables included in the models. Further, the effect-size indices show that compared with the two censuses (less than 5.0 percent), the DHS grouping variables share larger variations (about 7.0 percent) with their respective linear composites of response variables. This implies that strength of association between the grouping variable and the response variables is greater in the DHS compared with the census. Between the two censuses, the 1990 Census grouping variable shares a larger variation while between the DHSs, the 2001-02 DHS grouping variable shares the least variation. For all data sets, the adjusted estimate of effective size is not different from the unadjusted estimate because of large sample sizes. However, it is difficult to assess the magnitude of these values because research literature rarely reports this index (Huberty and Lowman 1998; Huberty and Olejnik 2006). Overall, this section demonstrates that the differences between the four Zambian traditional fertility regimes are significant.

7.4.4 Important features accounting for differences between Zambian traditional reproductive regimes

To identify important features accounting for differences between Zambian traditional reproductive regimes, we applied the SPSS discriminant *F*-to-remove procedure to rank the variables according to importance. There was no need to perform a variable deletion procedure because the selection of response variables included in the Zambian models was based on substantive considerations of present-day features that underlie fertility. In such a context, variable deletion is not recommended because the aim of conducting a descriptive discriminant analysis is to describe the grouping variable effects on all response variables (Huberty and Olejnik 2006).

Table 7.6 and Table 7.7 present results of the *F*-to-remove and Wilks lambda values according to importance. Results from both the census and DHS data show that region of location and rural-urban classifications of residence are the most important variables contributing to overall group differences between Zambian traditional reproductive regimes.

Table 7.6 Variable ordering for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses

1990 Census			2000 Census		
Variable	$F_{(i)}$	$\Lambda_{(i)}$	Variable	$F_{(i)}$	$\Lambda_{(i)}$
Location	16,458.23	0.969	Location	14,434.30	0.967
Residence	11,875.32	0.940	Residence	8,891.79	0.939
Education	617.53	0.867	Marital status	946.69	0.899
Marital status	254.27	0.865	Education	477.24	0.896
Head of the household	103.47	0.864	Head of the household	250.04	0.895
Economic activity	67.07	0.864	Economic activity	147.55	0.895

For the DHS, which has a religion variable as well, the contribution of religion to group differentials is also notable. This is most probably because different religious denominations in Zambia are confined to different locations: Catholics are more prominent in the Northern region of Zambia while most Protestant churches are in the Southern region. Judging from the Wilks lambda values, the contributions of the remaining variables to group differences are almost equal. Overall, location of residence and rural-urban classifications of residence are the variables that account for the most difference between Zambian traditional reproductive regimes.

Table 7.7 Variable ordering for the four traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS

1992 DHS			1996 DHS			2001-02 DHS		
Variable	$F_{(i)}$	$\Lambda_{(i)}$	Variable	$F_{(i)}$	$\Lambda_{(i)}$	Variable	$F_{(i)}$	$\Lambda_{(i)}$
Location	269.12	0.881	Location	433.73	0.908	Location	325.08	0.915
Residence	219.49	0.864	Residence	285.13	0.864	Residence	173.88	0.866
Religion	81.75	0.816	Religion	76.15	0.801	Religion	99.92	0.841
Type of marriage	25.67	0.797	Type of marriage	23.68	0.785	Economic activity	41.55	0.822
Ever used contraception	24.33	0.796	Marital status	22.00	0.784	Marital status	18.57	0.815
Marital status	23.87	0.796	Head of the household	14.26	0.782	Type of marriage	15.68	0.814
Education	18.79	0.794	Ever used contraception	9.75	0.781	Education	15.32	0.814
Head of the household	10.37	0.791	Education	8.72	0.780	Head of the household	4.27	0.810
Economic activity	5.52	0.790	Economic activity	6.45	0.780	Ever used contraception	0.13	0.809
Currently using contraception	1.30	0.788	Currently using contraception	0.19	0.778	Currently using contraception	0.13	0.809

7.4.5 Using linear discriminant functions to explain differences between Zambian traditional reproductive regimes

This section—divided into two parts—uses descriptive discriminant techniques to account for the converging ethnic fertility trends between the four Zambian traditional reproductive regimes.

7.4.5.1 The number of significant and eligible linear discriminant functions

For the four Zambian traditional fertility regimes, the possible number of linear discriminant functions is three (LDFs = $j-1$). Table 7.8 presents statistical test results assessing the significance of each of the three linear discriminant functions for each data source. The results (fifth column) show that for each data source, all three linear discriminant functions are significant. However, for both censuses, the third linear discriminant function (last column) accounts for less than two per cent of the variability in the data.

Table 7.9, Figure 7.3 and Figure 7.4 present information on group centroids for the four regimes defined for each of the three linear discriminant functions by data source. The last column of Table 7.9 shows that the group centroid of the third construct variable derived from census data accounts for very little variation (less than 0.1 for all regimes). It is now clear that for both censuses; only the first two construct variables are eligible for analysis.

Table 7.8 Tests for dimensionality for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

The three linear discriminant functions according to data source	Statistical description				
	Λ	X^2	df	P	Variance (%)
1990 Census					
1st linear discriminant function	0.864	59,167.60	18	0.000	85.4
2nd linear discriminant function	0.978	9,043.90	10	0.000	13.8
3rd linear discriminant function	0.999	533.62	4	0.000	0.9
2000 Census					
1st linear discriminant function	0.894	59,517.30	18	0.000	79.3
2nd linear discriminant function	0.976	12,661.35	10	0.000	19.1
3rd linear discriminant function	0.998	998.71	4	0.000	1.6
1992 DHS					
1st linear discriminant function	0.788	1,632.02	30	0.000	63.5
2nd linear discriminant function	0.914	612.45	18	0.000	29.7
3rd linear discriminant function	0.983	115.88	8	0.000	6.7
1996 DHS					
1st linear discriminant function	0.778	1,947.46	30	0.000	78.3
2nd linear discriminant function	0.944	449.93	18	0.000	16.7
3rd linear discriminant function	0.987	104.72	8	0.000	5.0
2001-02 DHS					
1st linear discriminant function	0.809	1,569.83	30	0.000	70.4
2nd linear discriminant function	0.937	481.33	18	0.000	24.7
3rd linear discriminant function	0.989	81.44	8	0.000	4.9

Table 7.9 Linear discriminant functions at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Regime	Linear discrimnant functions		
	First	Second	Third
1990 Census			
Low traditional reproductive regime	-0.483	-0.385	-0.008
Medium traditional reproductive regime	0.769	-0.104	0.013
High traditional reproductive regime_Patrilineal	-0.242	0.077	0.082
High traditional reproductive regime_Matrilineal	-0.070	0.077	-0.023
2000 Census			
Low traditional reproductive regime	-0.436	-0.401	0.002
Medium traditional reproductive regime	0.630	-0.109	0.013
High traditional reproductive regime_Patrilineal	-0.169	0.104	0.095
High traditional reproductive regime_Matrilineal	-0.066	0.071	-0.029
1992 DHS			
Low traditional reproductive regime	-0.304	0.766	-0.058
Medium traditional reproductive regime	0.864	0.071	0.025
High traditional reproductive regime_Patrilineal	-0.261	-0.044	0.310
High traditional reproductive regime_Matrilineal	-0.141	-0.148	-0.073
1996 DHS			
Low traditional reproductive regime	-0.308	0.557	-0.055
Medium traditional reproductive regime	1.057	0.041	-0.007
High traditional reproductive regime_Patrilineal	-0.169	-0.005	0.295
High traditional reproductive regime_Matrilineal	-0.186	-0.121	-0.053
2001-02 DHS			
Low traditional reproductive regime	-0.218	0.606	0.129
Medium traditional reproductive regime	0.956	0.000	0.027
High traditional reproductive regime_Patrilineal	-0.067	0.160	-0.244
High traditional reproductive regime_Matrilineal	-0.178	-0.146	0.030

Figure 7.3 Linear discriminant functions (LDF_1 versus LDF_2) at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

LDF_1 vs LDF_2

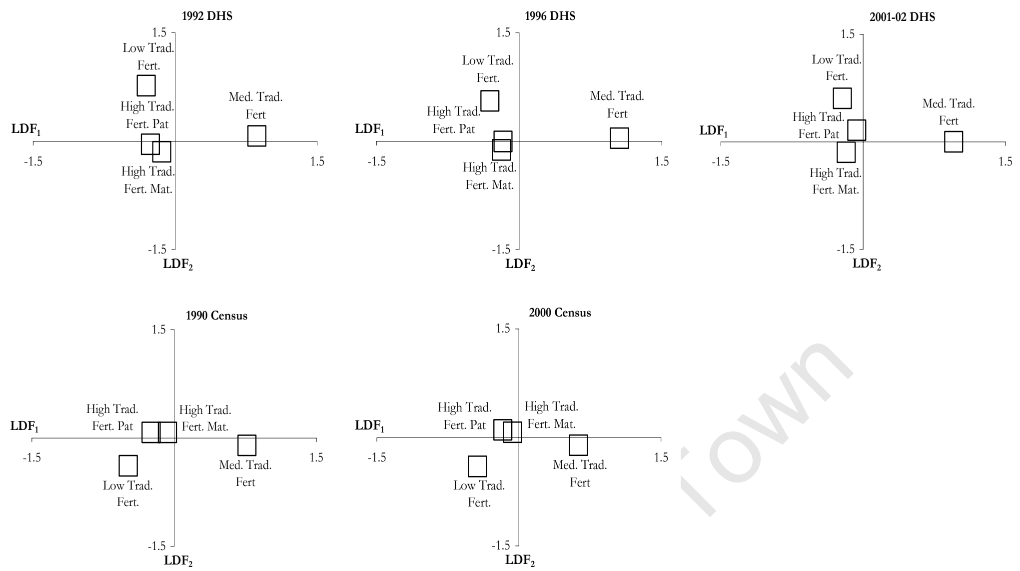


Figure 7.4 Linear discriminant functions (LDF_1 versus LDF_3) at group centroids for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

LDF_1 vs LDF_3

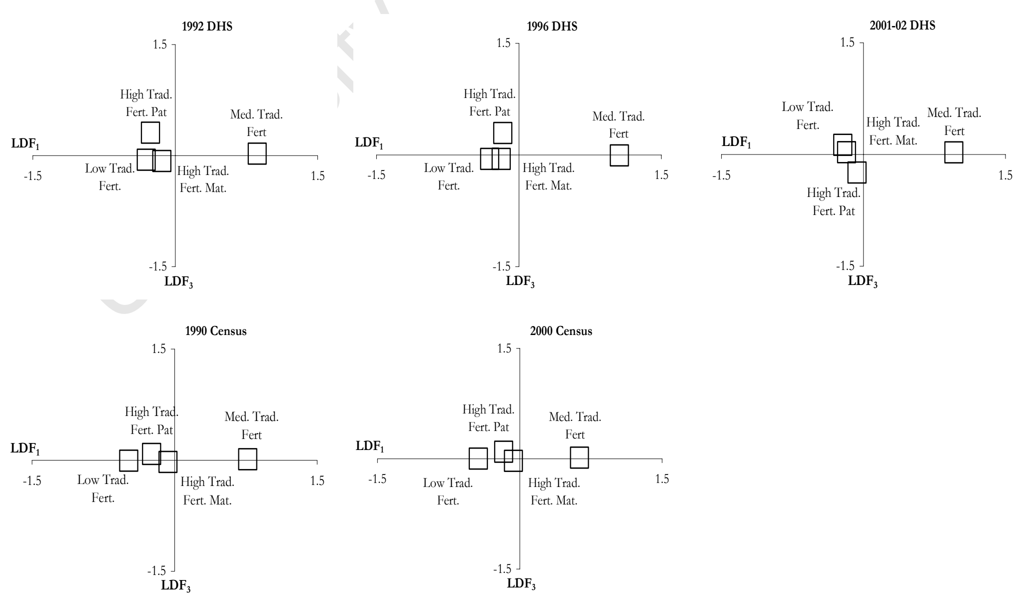


Figure 7.3 shows that, for the DHS, the first latent variable (LDF_1) distinguishes the medium traditional fertility regime from the other three regimes. Meanwhile, for the census, apart from distinguishing the medium traditional fertility

regime, the first latent variable also distinguishes the low traditional reproductive regime from the two high traditional fertility regimes. The second latent variable (LDF_2) distinguishes the low traditional fertility regime from the other three regimes in all data sources. For the DHS sources, the third latent variable (LDF_3) distinguishes the high traditional fertility patrilineal regime from other regimes (Figure 7.4). Figure 7.4 also shows that this variate is not valid for census data sources.

7.4.5.2 Identifying present-day features underlying differences between Zambian traditional reproductive regimes

Table 7.10 and Table 7.11 present the *structure r's* (defined in Section 7.3.5.1) for eligible construct variables to point out features underlying differences between Zambian traditional reproductive regimes. The most important features underlying differences are in boldface. The results show that location and classification of residence are the most important features accounting for differences between traditional reproductive regimes in Zambia.

Table 7.10 Structure *r's* for the four traditional reproductive regimes: Zambia 1990 and 2000 Censuses

Variable	Linear discrimnant function			
	1990 Census		2000 Census	
	First	Second	First	Second
Location	**0.59**	**0.71**	**0.72**	**0.53**
Residence	-0.22	**0.81**	-0.26	**0.77**
Marital status	-0.02	-0.29	-0.09	**-0.41**
Economic activity	-0.01	0.07	0.06	0.13
Head of the household	-0.09	-0.01	-0.10	-0.07
Education	0.06	-0.10	0.07	-0.04

Note: The values in boldface point out the important variables because their coefficients are relatively higher (≥40 per cent) than those for other variables.

Table 7.11 Structure *r's* for the four traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS

Variable	Linear discrimnant function								
	1992 DHS			1996 DHS			2001-02 DHS		
	First	Second	Third	First	Second	Third	First	Second	Third
Location	**0.36**	**0.71**	**-0.38**	**-0.57**	**0.53**	-0.28	**-0.64**	**0.40**	**0.41**
Residence	-0.32	**0.60**	**-0.50**	0.19	**0.45**	**-0.56**	0.13	0.16	**0.73**
Religion	0.31	**-0.58**	**-0.39**	-0.26	**-0.60**	**-0.41**	-0.29	**-0.73**	0.05
Marital status	-0.03	-0.12	0.10	0.03	**-0.41**	0.24	0.03	-0.13	**-0.39**
Type of marriage	0.04	-0.22	-0.06	-0.03	**-0.43**	0.09	-0.02	-0.16	-0.34
Economic activity	-0.14	-0.18	-0.11	0.15	0.03	0.20	0.21	**0.43**	-0.27
Head of the household	-0.12	-0.22	0.16	0.13	-0.11	0.12	0.04	-0.04	-0.29
Ever used contraception	-0.21	0.02	**-0.61**	-0.04	-0.01	**-0.54**	-0.06	0.06	0.26
Education	0.05	0.08	**-0.35**	-0.09	-0.06	-0.14	-0.11	-0.10	**0.38**
Currently using contraception	-0.05	0.05	-0.25	0.01	0.07	-0.33	-0.06	0.06	0.23

Note: The values in boldface point out the important variables because their coefficients are relatively higher (≥35 per cent) than those for other variables.

Specifically, location of residence is what separates the medium traditional regime from the low traditional reproductive regime and the two high traditional reproductive regimes on the first construct variable (Figure 7.3). Meanwhile, location and classification of residence is what differentiates the low traditional reproductive regime from the other reproductive regimes on the second construct. However, for the second construct variable, marital status, religion, type of marriage and economic activity also account for the differences between the low traditional reproductive regime and other reproductive regimes. Lastly, classification of residence, education and contraceptive use are the features that separate women belonging to the high traditional fertility patrilineal regime women from those belonging to other regimes.

7.4.6 Present-day features that make high traditional fertility patrilineal regime women different from women belonging to other regimes

Chapter 6 showed that the high traditional fertility patrilineal regime has undergone a remarkable fertility transition compared with other Zambian regimes. This section compares this regime to the other regimes in order to identify the present-day features underlying its relatively rapid fertility transition. Table 7.12 presents statistical test parameters assessing the significance of group differences between the high traditional fertility patrilineal regime and other regimes. The Wilks lambda (Λi) test statistics (P = 0.000) show that this regime differs significantly from other traditional fertility regimes.

Table 7.13 and Table 7.14 present constructs that identify features underlying differences between the high traditional fertility regime patrilineal regime and other traditional fertility regimes in Zambia. Since these are two-group comparisons, there is only one construct variable for each comparison. The most important features underlying differences are shown in boldface.

Five features differentiate women belonging to the high traditional fertility patrilineal regime from those belonging to the low traditional fertility regime, the most consistent being location and classification of residence and to a certain extent marital status. Only residence, especially location, separates high traditional fertility patrilineal regime women from those belonging to the medium low traditional fertility regime. Although the results show that six features differentiate women belonging to the high traditional fertility patrilineal regime from their matrilineal counterparts, only religion and to a certain extent economic activity and contraceptive use are consistent. Overall, the results show that classification of residence and contraceptive use separates the high traditional fertility patrilineal regime from all other Zambian regimes (last column).

Table 7.12 Parameters of MANOVA test statistics assessing group contrasts between the high traditional fertility regime patrilineal regime and other Zambian traditional fertility regimes: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Parameters	Difference between the high traditional fertility patrilineal regime and:			
	Low trad. fertility	Med. trad. fertility	High trad. fert. Mat.	All other regimes
1990 Census				
Wilks (Λ)	0.983	0.924	0.995	0.983
F (6, 403207)	1137.024	5521.811	319.808	1168.474
P (significance of F)	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.017	0.076	0.005	0.017
Adjusted effect-size estimate (ξ^2_{adj})	0.017	0.076	0.005	0.017
2000 Census				
Wilks (Λ)	0.981	0.948	0.997	0.987
F (6, 531143)	1750.990	4876.597	288.763	1208.849
P (significance of F)	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.019	0.056	0.003	0.013
Adjusted effect-size estimate (ξ^2_{adj})	0.019	0.056	0.003	0.013
1992 DHS				
Wilks (Λ)	0.954	0.904	0.981	0.962
F (10, 6840)	32.630	72.607	13.341	27.062
P (significance of F)	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.046	0.096	0.019	0.038
Adjusted effect-size estimate (ξ^2_{adj})	0.046	0.096	0.019	0.038
1996 DHS				
Wilks (Λ)	0.972	0.896	0.986	0.972
F (10, 7741)	22.095	89.410	11.358	21.931
P (significance of F)	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.028	0.104	0.014	0.028
Adjusted effect-size estimate (ξ^2_{adj})	0.028	0.104	0.014	0.028
2001-02 DHS				
Wilks (Λ)	0.978	0.923	0.979	0.982
F (10, 7387)	16.371	61.866	15.696	13.187
P (significance of F)	0.000	0.000	0.000	0.000
Effect-size estimate (ξ^2)	0.022	0.077	0.021	0.018
Adjusted effect-size estimate (ξ^2_{adj})	0.022	0.077	0.021	0.018

Table 7.13 Structure *r's* for the high traditional fertility patrilineal regime versus the other Zambian traditional reproductive regimes: Zambia 1990 and 2000 Censuses

Variable		Difference between the high traditional fertility patrilineal regime and:			
Name	Description	Low trad. fertility	Med. trad. fertility	High trad. fert. Mat.	All other regimes
1990 Census					
v131_pro	Location	**-0.90**	**0.44**	**0.45**	0.06
v141_res	Residence	**-0.64**	-0.37	-0.28	**-0.66**
v172_mst	Marital status	0.31	0.05	0.13	0.20
v192_eco	Economic activity	-0.15	-0.06	-0.29	-0.16
v104_reh	Head of the household	0.14	-0.05	0.20	0.05
v152_edu	Education	-0.03	0.04	-0.22	-0.01
2000 Census					
v131_pro	Location	**-0.79**	**0.56**	0.36	0.07
v141_res	Residence	**-0.57**	**-0.46**	-0.38	**-0.75**
v172_mst	Marital status	**0.42**	0.03	0.13	0.28
v192_eco	Economic activity	-0.23	-0.03	**-0.42**	-0.22
v104_reh	Head of the household	0.18	-0.04	0.27	0.11
v152_edu	Education	-0.09	0.02	**-0.40**	-0.10

Note: Variables used to identify constructs are in bold.

Table 7.14 Structure *r's* for the high traditional fertility patrilineal regime versus the other Zambian traditional reproductive regimes: 1992, 1996 and 2001-02 Zambia DHS

Variable		Difference between the high traditional fertility patrilineal regime and:			
Name	Description	Low trad. fertility	Med. trad. fertility	High trad. fert. Mat.	All other regimes
1992 DHS					
v131_pro	Location	**-0.82**	0.19	-0.07	-0.31
v141_res	Residence	**-0.74**	**-0.49**	**-0.40**	**-0.78**
v161_rel	Religion	0.35	0.26	**-0.41**	0.25
v172_mst	Marital status	0.15	0.01	0.06	0.09
v173_mst	Type of marriage	0.18	0.05	-0.10	0.10
v192_eco	Economic activity	0.13	-0.14	-0.19	-0.07
v104_reh	Head of the household	0.27	-0.05	0.06	0.11
v231_con	Ever used contraception	-0.26	-0.35	**-0.62**	**-0.50**
v152_edu	Education	-0.22	-0.05	-0.29	-0.21
v232_con	Currently using contraception	-0.15	-0.12	-0.23	-0.20
1996 DHS					
v131_pro	Location	**-0.70**	**0.46**	-0.13	0.04
v141_res	Residence	**-0.63**	-0.34	-0.38	**-0.64**
v161_rel	Religion	0.23	0.17	**-0.59**	0.10
v172_mst	Marital status	**0.47**	0.05	0.10	0.27
v173_mst	Type of marriage	**0.40**	0.07	-0.05	0.22
v192_eco	Economic activity	0.11	-0.10	0.20	0.02
v104_reh	Head of the household	0.18	-0.09	0.08	0.02
v231_con	Ever used contraception	-0.28	-0.09	**-0.52**	-0.32
v152_edu	Education	-0.04	0.05	-0.15	-0.01
v232_con	Currently using contraception	-0.23	-0.09	-0.29	-0.25
2001-02 DHS					
v131_pro	Location	**0.71**	**-0.57**	0.14	-0.10
v141_res	Residence	**0.53**	0.29	0.32	**0.64**
v161_rel	Religion	**-0.44**	-0.16	**0.63**	-0.14
v172_mst	Marital status	-0.35	-0.05	-0.17	-0.28
v173_mst	Type of marriage	-0.32	-0.08	-0.10	-0.27
v192_eco	Economic activity	0.10	0.06	**-0.54**	-0.08
v104_reh	Head of the household	-0.22	-0.03	-0.16	-0.19
v231_con	Ever used contraception	0.22	0.00	0.14	0.16
v152_edu	Education	0.19	0.01	0.34	0.23
v232_con	Currently using contraception	0.20	-0.01	0.12	0.13

Note: Variables used to identify constructs are in bold.

7.4.7 Describing present-day features underlying differences between Zambian traditional reproductive regimes

The results show that location and classification (rural/urban) of residence accounts for the most variation in present-day features underlying reproduction between the low traditional reproductive regime and the medium traditional reproductive regime as well as the two high traditional fertility regimes. Most women belonging to societies that make up the low traditional fertility regime live in rural regions that are not easily accessible by road and rail. However, although most medium traditional regime women live in rural areas, these regions are easily accessible by road and rail (Southern and Central Provinces). Meanwhile, almost equal proportions of women belonging to the high traditional fertility regimes live in both rural and urban areas (Copperbelt and

Lusaka Provinces). This suggests that compared with the low and medium traditional reproductive regimes, fertility is declining more rapidly in the two high traditional fertility regimes because they live in the most urbanised areas in Zambia.

Further, results show that location is what differentiates women belonging to low traditional fertility regime from other regimes on the second construct variable. Being the most rural, this explains their sluggish fertility decline. Besides, there is a possibility that traditional features underlying traditional fertility are still the most prominent governor of fertility in this regime. Their marital status, religion, type of marriage and economic activity differs from other traditional reproductive regimes in Zambia. These women are mostly single and those married are in monogamous unions.

The results also show that classification of residence, education and contraceptive use are the features that distinguish women belonging to the high traditional fertility patrilineal regime from those belonging to other regimes. Most high traditional fertility patrilineal regime women are educated, live in urban areas, are Protestant faith believers and report having used contraception before. This probably explains why fertility is declining the most among women belonging to this regime. Besides, it seems their religion and contraceptive use is what sets them apart from their matrilineal counterparts. Compared to their matrilineal counterparts, this suggests that fertility is declining rapidly among women belonging to the patrilineal regime because they are more urbanised, educated and likely to be using contraception.

7.5 Summary and conclusions

Chapter 5 defined Zambian traditional reproductive regimes based on anthropological information in Murdock's Ethnographic Atlas. Using data from the 1990 and 2000 Censuses as well as the 1992, 1996 and 2001-2002 DHSs, Chapter 6 showed that fertility levels and trends differ between traditional fertility regimes. This chapter set out explain why fertility is converging between the Zambian traditional societies. It examined the present-day determinants of fertility captured by the censuses and DHSs using multivariate analysis of variance and descriptive discriminant analysis. The results show that present-day determinants of fertility differ significantly between the traditional reproductive regimes. Further, women belonging to the high traditional fertility patrilineal regime differ significantly from those belonging to other traditional reproductive regimes.

First, exposure to and embracing of modernisation features is different between the four traditional reproductive regimes. Notable proportions of women belonging to the two high traditional fertility regimes live in the most urbanised regions of Zambia. Second, results show that more women belonging to the two high traditional fertility regimes (especially the patrilineal regime) are more educated and more likely to be working outside the home for pay or profit.

Third and more importantly, significantly larger proportions of women belonging to the patrilineal societies are more likely to be using modern birth control. Therefore, compared with women belonging to the other regimes, this further suggests why fertility is declining more rapidly among women belonging to the high traditional fertility patrilineal regime.

Compared with their patrilineal counterparts, it is difficult to explain why use of contraception is not as prominent among women belonging to the high traditional fertility matrilineal regime. First, they share similar proportions of present-day determinants of fertility. Second, anthropological accounts show that women that belong to matrilineal societies have a say in their reproduction. Therefore, compared with their patrilineal counterparts, we expected higher use of contraception among these women.

Overall, these results show that urbanisation promotes a shift from fertility that is influenced by traditional attributes to that influenced by modern features. Intuitively, urbanisation provides for education, increased participation of women in the labour force and increased survival of children. These attributes promote changes in marital patterns and perception of reproductive choices including use of contraception. However, Zambian ethnic societies (especially patrilineal versus matrilineal regimes) subjected to similar social change—since they have approximately equal proportions living in urban areas—are responding at a difference pace to the present-day determinants of fertility. Therefore, present-day determinants of fertility are not eroding the traditional governors of fertility in different preindustrial societies at the same pace

8 FEATURES UNDERLYING ETHNIC FERTILITY DIFFERENTIALS IN ZAMBIA: THESIS SUMMARY AND CONCLUSIONS

This thesis set out to explain why subnational fertility differs in Zambia. The main hypothesis was that subnational fertility differs in Zambia chiefly because there are variations in ethnic fertility governance. The research focused on ethnic fertility differentials because the literature shows that the other possible sources of subnational differentials—sterility, infecundity or infertility—may not be that obvious. Besides, sterility, infecundity or infertility only affects the two western provinces of Zambia and requires more data than is available to address such a research problem. The other possible source of subnational differentials is regional variations in fertility data errors. However, the research controlled this problem inherently through robust fertility estimations of each ethnic cluster regardless of the region where individuals are settled. To identify features underlying ethnic fertility differentials in Zambia, the thesis performed seven investigations, namely:

- to record an understanding of subnational fertility differentials from 1950 to 2002 and then developing research questions based on this knowledge;
- to compute accurate national fertility estimates from the 1990 and 2000 Censuses fertility data after correcting them for errors and selecting suitable techniques for adjusting under-reported fertility;
- to derive fertility trends as far back as possible using birth histories collected in the 1992, 1996 and 2001-02 Demographic and Health Surveys (DHS);
- to understand the migration histories and kinship lineages of ethnic societies found in Zambia;
- to derive clusters of ethnic societies (traditional reproductive regimes) that have similar multivariate traditional features underlying reproduction using data in Murdock's Ethnographic Atlas;
- to evaluate fertility differentials between traditional reproductive regimes after computing robust fertility estimates and trends for each traditional reproductive regime using data from the 1990 and 2000 Censuses as well as the 1992, 1996 and 2001-02 DHS;
- to identify modern features underlying recent fertility trends in each traditional reproductive regime.

Chapter 3 provided the thesis (Chapter 6) with methods and procedures for computing reliable fertility estimates and trends for each traditional reproductive regime. Apart from describing the census and DHS data sources, the chapter achieved three objectives. First, it developed general logical statements used for correcting fertility data errors in censuses. Second, it discussed and selected suitable techniques for adjusting under-reported fertility in censuses. Finally, the chapter explained how to get past fertility trends from retrospective maternity histories collected by the DHS.

A major contribution of Chapter 3 is that it provides 'independent' national fertility estimates derived from census data. Chapter 2 shows that estimates of Zambian fertility from census data by researchers independent of Zambian government officials were prominent in the 1960s through to the mid 1980s than in the last twenty-two years (1985-2007). It seems there is no published literature outside the work of the Zambian Central Statistical Office after Hill's (1985) work based on the 1969 and 1974 Census data that has critically explored Zambian national and regional fertility. The work that does exist comprises mostly of data collection and description reports (such as the reports on censuses and the Demographic and Health Surveys). The vacuum in published research literature on fertility, in the recent past, could be due to lack of technical capacity, interest and finances.

In Chapters 4 and 5, the thesis derives traditional reproductive regimes to compare and explain pretransitional fertility differentials in Zambia. Chapter 6 evaluates fertility differentials between Zambian traditional reproductive regimes. Chapter 7 evaluates why fertility is converging between traditional reproductive regimes. It identifies the relevant present-day features influencing fertility transitions of each traditional reproductive regime. Chapter 7 shows the potential of using reproductive regimes derived in Chapter 5 to assess fertility transitions noted in Chapter 6. The following paragraphs discuss the contributions of these four chapters in detail.

The overall major contribution of this research is its vigorous analytical approach of evaluating simultaneously features underlying human behaviour—interacting in a complex environment—and how these influence demographic outcomes. First of all, the thesis recognises the complex interrelations between these features. It also emphasises that among these features no single cause or group of causes can determine fertility in pre-industrial societies. This is because there are "… several alternative weightings, each of which is consistent (within the limited precision that characterises this mode of analysis) with the observed fertility patterns" (McNicoll 1980: 443). Therefore, only a simultaneous evaluation can untangle differences or similarities between societies and thus features underlying fertility in traditional societies.

The thesis then displays how analysts can use multidimensional cluster analysis to explore, circumspectly, variations in multidimensional demographic environments. In sum, by creating multidimensional clusters using several attributes, the thesis has provided a principal procedure needed to identify features—in a multivariate environment—underlying a demographic outcome under study. The thesis also extends the procedures of blending numerical and non-numerical data beyond that usually applied in anthropological demography. This blending is a further departure "… from the first generation of microdemography, with its exclusive preference for qualitative (and even ethnographic) methodologies and long-term residence in communities" (Agyei-Mensah and Casterline 2003: 2).

The approach shows that, although it is far from perfect; it has the potential to result in an efficient procedure of evaluating pretransitional fertility. It could be the answer to Norman Ryder's observation that "the work of identifying the properties of collectivities … to which the individual owes allegiance … that may be relevant to the understanding of reproductive differences remains to be done" (Ryder 1986: 348). More recently, Kertzer and Fricke (1997) as well as Roth (2004) state that such a comprehensive framework is far-fetched and requires cooperation from various disciplines and perspectives. This multidimensional approach is applicable to evaluations of similar research problems that are not necessarily demographic or traditional. However, researchers should only include attributes that are important or have purposes in the phenomena under study. Without this caution, it would be difficult to explain the results.

Apart from a vigorous analytical approach, this research has enriched our understanding of pretransitional fertility. A simpler approach would not have clarified some features discovered through the application of a multidimensional approach. Considering migration histories or regions of settlement or kinship lineage would have provided similar ethnic groupings as well as overall similarities and differences. However, beyond the general and fundamental differences, the multidimensional approach has provided for a detailed analysis and comparison of the four Zambian traditional reproductive regimes. It has highlighted important cultural features underlying fertility differentials between different Zambian traditional societies (the following paragraphs discuss these in detail). Further, the use of multivariate cluster analysis has shown how cultural features interlink within and between groups. As a result, while some Zambian societies lacked information on some features, information on available features was enough to group them correctly.

In conclusion, creating multivariate regimes is a practical and effective way of evaluating multifaceted demographic events. It is also a convenient starting point for building a more comprehensive theory of predicting demographic outcomes of groups of individuals. If the results accurately show that this is what a rational society would do under given circumstances, then there is a need to evaluate compliance of individuals to group behaviours. Rational choice assumes that all individuals in each society are equally eligible to and take part in collective arrangements (Elster 2007). However, this thesis did not evaluate this important assumption because of lack of data. Despite this seemingly critical shortfall, the approach is closer to being able to join structure and agency together. In multidimensional evaluations of group norms, an individual will share in at least one collective norm.

In addition, this thesis provides a better explanation than those put forward by past studies reviewed in Chapter 2. Two basic features contributed to its explanatory power. First, it used advanced analytical procedures that closely match the complexity of the problem it has untangled. Second, our approach does not assert the supremacy of any single feature or group of features underlying fertility in any traditional societies.

Specifically, the marshalling together of historical accounts of ethnic societies found in Zambia from isolated accounts on each of them is another fundamental contribution of this thesis—best summarised by Agyei-Mensah and Casterline's (2003: 3) statement that "…an explanatory framework that places social organisation on the centre stage must be enlarged to incorporate the potentially powerful influence of community history". By design, the thesis reviewed histories of Zambian societies to supplement and evaluate the data in Murdock's Ethnographic Atlas. However, the different phases of building ethnic clusters using qualitative information shows that migration histories—that is, 'secondary' origin—that occurred between the twelfth and nineteenth Century are closely tied to the four kinship lineages found among Zambian ethnic societies. This narration is important because it deals with four different groups of societies with different demographic behaviours shaped in the past but still transforming differently. Therefore, translating historical accounts into kinship lineages shows the benefit of stretching into history when understanding results derived from quantitative manipulations.

Three contributions of this thesis come from evaluations of pretransitional fertility (Chapter 5 and 6). First, fertility in pretransitional societies is not universally high and wide variations exist. The results show that fertility differentials existed between Zambian ethnic societies. Fertility was lower among non-unilineal kinship societies (Balotseland societies) compared with unilineal societies (the Kola matrilineal societies and Eastern Bantu patrilineal societies). This finding conforms to Mason's (1997) observation that fertility is lower in unilineal kinship societies. We infer from this finding that ethnic fertility differentials contribute significantly to subnational fertility differentials in Zambia. Past studies by Mitchell (1965), the CSO (1975), Ohadike and Tesfaghiorghis (1975) and Hill (1985) also reached a similar conclusion. However, this is more definite owing to the robust approach the thesis applied.

Second and more importantly, unlike past studies, this research has highlighted the main traditional components that account for ethnic fertility differentials in Zambia. It shows that social and community features are important arrangements for controlling sexual and marital relations—hence reproduction—in pre-industrial societies. However, the impact of these arrangements on pretransitional reproduction is inversely related to traditional economic and political organisation. As traditional economic and political organisation advances, societies alter their social and community features to support lower fertility (Caldwell 1982). This could be because individuals in such societies do not need to coexist in large communities for survival purposes since families have enough to support themselves. Broadly, this finding supports an important proposition (family nucleation) of the Intergenerational Wealth Flows theory described in Chapter 2.

In addition, relatively more economically and politically organised pretransitional societies are able to control courtship and sexual relations effectively thus resulting in desired pretransitional fertility. From the preceding paragraph, this is most likely lower pretransitional fertility. This is because assumed or actual benefit will determine whether an individual will desire to participate in collective action. Elster (1989: 22) states that "when faced with several courses of action, people usually do what they believe is likely to have the best overall outcome".

Third and related to the second, the thesis would not have effectively evaluated pretransitional fertility if it did not include traditional economic and political arrangements. Past studies—including those on Zambia—analysing pretransitional fertility usually leave out this seemingly important component. Given the extent to which population theorists have emphasised multidimensionality as the cause of pretransitional fertility variations, it is a serious shortfall not to evaluate traditional economic and political arrangements. They have emphasised social and community arrangements as well as governance of courtship and sexual relations because they are the most theoretically developed (Lesthaeghe 1989b). These features are the least tractable and are the most grounded collective manipulable intentions even though they do not yield clear predictions. However, compared with traditional economic and political arrangements, their evaluations are not in any sense methodologically superior.

An evaluation of transitional fertility (Chapters 6 and 7) shows that fertility levels are converging between ethnic societies in Zambia. Obviously, convergences of demographic outcomes, traditions and individual behaviours are expected as demonstrated by the fertility transitions of the present-day low fertility countries (McNicoll 1994). Specifically, fertility is declining among women living in urban areas in all regimes. Similarly, overall fertility is falling more rapidly in regimes with large proportions of women who are living in the most urbanised regions of Zambia. However, there is an exception. Despite having large proportions of women living in the most urbanised regions, fertility among women belonging to the high traditional fertility matrilineal regime is falling at almost the same rate as regimes with large proportions of women living in the most rural regions.

There are two contributions from these findings. First, they support the urbanisation proposition of the modernisation theories described in Chapter 2. Urbanisation promotes fertility control leading to rapid fertility declines because of higher educational attainment, lower child mortality and accessibility to modern contraception. Other studies—for example, Kirk and Pillet (1998)—and Zambian fertility reports mainly written by its Central Statistical Office reached similar conclusions.

Second, results show that women belonging to the two high traditional reproductive regimes have similar socio-economic characteristics. However, fertility decline among women belonging to the matrilineal regime is slower than their patrilineal counterparts and almost equal to the other regimes. This result shows that urbanisation does not always coincide with similar fertility decline in every society. Therefore, it does not always follow that women living in the most urbanised areas will have the most advanced fertility transition (Kirk and Pillet 1998). This shows that fertility will decline at different paces because resilience, of traditional arrangements, to urbanisation and modernisation varies between ethnic societies (Caldwell, Caldwell and Orubuloye 1992). On Zambian fertility, Ohadike and Tesfaghiorghis (1975) had also reached a similar conclusion and observe that:

> "Fundamentally, valued institutions and behaviour patterns persist with the people unless new social, economic and ideological super-structures are created to transform the foundations of the old ways…variations strongly suggest the occurrence of social, economic and demographic changes to which people have been reacting with varying degrees of success and accommodation" (Ohadike and Tesfaghiorghis 1975: 52).

Therefore, Caldwell, Caldwell and Orubuloye's (1992) argument that historical and pre-industrial traditions have present-day fertility-outcome implications in sub-Saharan Africa applies. However, it also shows that modernisation in Zambia has not reached a level that breaks resilience of traditional reproductive behaviours for most Zambian ethnic societies. As Caldwell and Caldwell (2003) argue, low levels of economic development translate into a slow transition from the unintended traditional fertility control to controlled fertility using modern contraception.

However, modernisation theories do not explain the rapid fertility decline among rural women belonging to the patrilineal regime. The overall fertility of this regime was declining at a rate more than the national rate by 73 percentage points (Table 3.12 and Table 6.10). Similarly, fertility among rural women belonging to this regime was declining more rapidly than the national rural rate by 150 percentage points. In contrast, the rate of overall and rural fertility declines among women belonging to other regimes is below, in one instance equal to, the national rate.

We expected a delayed fertility transition in this regime because, in Zambia, it is the most vulnerable regime to traditional governors of fertility. First, this regime had the highest pretransitional fertility in Zambia. Second, compared with other regimes (Figure 2.1 and Figure 5.5); the rural location of this regime is more distant from the urban regions. Therefore, its rural fertility transition goes beyond the long-standing belief that rapid fertility decline occurs in urban areas and "… only penetrates rural areas when these areas are developed" (Caldwell and Caldwell 2003: 195).

It is most likely that fertility among rural women belonging to the patrilineal regime declined more rapidly because innovations of fertility control diffused among these women. Therefore, their fertility transition is “adaptive” rather than driven (Lesthaeghe 1980). This thesis, however, did not evaluate the nature of cultural adaptations because such investigations need recent ethnographic data. Information provided by recent ethnographic investigations would have highlighted the features that have created the need to reduce fertility and the traditions that these societies have dropped or adjusted to reduce fertility. Put differently, what innovations are these societies adopting to demote features that support high fertility? To what extent and how have these women changed their fertility behaviours? How do these adjustments differ from those for women belonging to other regimes?

Without recent ethnographic data, explanations provided by social interaction (ideational and diffusion) frameworks can highlight the nature of such fertility transitions. Therefore, using the social interaction frameworks and other related literature, we provide three explanations to why rural fertility is declining more rapidly among women belonging to this regime. First, since this regime had the highest pretransitional fertility compared with other Zambian regimes, it is likely that even the modest mortality declines increased the number of surviving children. This could have outstripped the capacity of post-natal fertility controls and increased the cost of raising children for families belonging to this regime.

Second, probably support from extended family relatives living in urban areas could have dwindled. Therefore, women belonging to the patrilineal regime were reducing their fertility to cope with the economic strain of childbearing and rearing. Colonial administrative records show that, because of distance, rural to urban migrations of individuals belonging to this regime were permanent rather than secular (Watson 1958). This means that larger economic strain due to an increase in the number of surviving children coupled with reduced help from relatives in urban areas made high fertility among rural women belonging to this regime undesirable.

Third, as Caldwell (1982) argues, high fertility in traditional societies is not desirable among parents. Therefore, information that child survival had improved and therefore high fertility had become a burden could have spread among women belonging to the patrilineal regime. In response, these women could have received information on the need to control fertility positively because their high fertility had become a burden. This is because their status in these societies was the lowest compared with women belonging to other regimes. Given this predicament, they were reducing their family sizes to emancipate themselves from male subordination and traditional norms that promote high fertility. As soon as the opportunity arose, they promoted secularisation—personal development, lifestyle change and freedom of choice—and therefore fertility control. It is likely that rigid social and community arrangements centred on communal livelihood promoted the rapid diffusion of fertility control innovations.

Following up further on the results in Chapter 3, the evaluation of transitional fertility for Zambian traditional fertility regimes suggests that fertility decline in Zambia is modest because it is declining rapidly among a small proportion of women who had the highest fertility in the country. It is likely that if fertility for women belonging to all regimes were declining at the pace of patrilineal regime women, Zambian fertility transition would have been at a more advanced stage.

It is most likely that the delayed onset of a sustainable fertility transition in Zambia is because the country lacks a history of social and economic development beyond that which accompanied the mining industry in the late 1800s. Had this development continued undisturbed beyond the 1970s, Zambia might have registered significant mortality and fertility declines. As Caldwell and Caldwell (2003) suggest, such declines result from increasing standards of living, improved infant survival and changes in lifestyle. However, an increase in oil prices (Zambia's main import) in 1973 and a decline in copper prices (Zambia's main export) in 1974 disturbed Zambia's developmental progress (Government of the Republic of Zambia 1989). Structural adjustment programmes adopted to correct the economic problems slowed down employment creation while incomes stagnated and the costs of health and education shot up. The AIDS epidemic that halted mortality declines of most sub-Saharan African countries in the 1980s (Caldwell and Caldwell 2003) could have also affected Zambia.

While high Zambian fertility could be ascribed to the low levels of development, it is also a case of poor family planning strategy. Judging by the low proportions of women using contraception (Chapter 7), the family planning programme in Zambia has room for improvement. There is evidence that more Zambian women who would wish to control fertility are not using contraception (Biddlecom and Kaona 2003). One can also extend this observation to the STD and HIV/AIDS programmes. Most individuals are still indulging in unprotected sex despite knowing that such behaviour is a health risk and can result in unwanted births. The government should probably target vices (STDs and HIV/AIDS) which have economic connotations to promote prevention of conceptions that arise from premarital and extramarital sex.

Supplies of protection and contraception should also target adolescents and men regardless of marital status.

The thesis points to seven areas that may have strengthened evaluations of pretransitional and transitional fertility in Zambia. The first is that it has provided a macroanalytical answer to a macroanalytical question—that is, "why has fertility declined among rural women belonging to the patrilineal regime and not among those belonging to other regimes?" However, there is a need to continue with a microanalytical inquiry. This means further explorations on features underlying a rapid fertility decline among these women. These explorations may provide suggestions on how countries can promote fertility decline in rural areas without urbanisation. This is a cost-effective way of transcending traditions that hold fertility at high levels. Knowledge generated from such explorations is important to institutions, like the UNFPA, whose organisational goal is to encourage fertility decline in developing countries.

Second, this research has provided proof that regional fertility variations are a reflection of ethnic fertility differentials in Zambia. However, the results do not explain the observed low fertility among traditional societies found in the North-western Province. Since societies in this region as well as those found in the Central, Eastern, Luapula and Northern Provinces fall under the high traditional fertility matrilineal regime (Figure 2.2), we expected their fertility to be higher. However, as Figure 2.3 suggests, sterility and infertility affects societies in the North-western Province and therefore its fertility—Hill (1985) had reached a similar conclusion as well. This thesis did not examine this issue—as well as ethnic and regional differentials in HIV prevalence and its links to fertility—because of lack of data.

There is therefore a need for future research to explore sterility and infertility among women belonging to ethnic societies of the North-western Province and its effect on fertility. There is also a need to examine whether mortality, especially infant and child mortality, is different between traditional reproductive regimes. If mortality differences exist, are they similar to fertility differentials? Overall, could the slow fertility decline among women belonging to other regimes be a lagged response to mortality decline? It will inspire us if future research efforts are built on these shortfalls.

Third, ethnographies are central to the construction of quantitative multidimensional traditional regimes. Therefore, the research would have benefited if information in Murdock's Ethnographic Atlas were more complete. There is a need to remake an Ethnographic Atlas using newer technology and innovations. This means recoding anthropological information using materials that Murdock used as well as more recent but pre-industrial anthropological information on each ethnic society in Zambia. This process should also include Zambian societies that are not in Murdock's Ethnographic Atlas. The reconstruction should also reconsider attributes that anthropologists dismissed as superstitious because sometimes some of these beliefs affect people's behaviours.

Fourth, like the DHS, recent ethnologies should be collected periodically every ten years to evaluate the impact of modernisation on traditional arrangements. Rather than the approach used in Chapter 7, researchers can use this information to record directly how changes in traditions are affecting demographic outcomes. Ethnographers should also note compliance to collective behaviour of individuals belonging to each ethnic group. They should also find out what motivates individuals—belonging to certain societies and not others—to comply with collective actions including sanctions imposed for failure to participate and benefits of compliance.

Fifth, the materials discussing most of the Zambian societies comprehensively are not available. Therefore, discussing characteristics of traditional regimes, qualitatively, was perhaps the weakest point of evaluating pretransitional fertility. One-way of getting round this problem is to create an annotated bibliography for each ethnic society on all attributes identified as important governors of fertility in traditional societies. In future, researchers could use this bibliography to explain and compare such features between societies within and between clusters.

Sixth, there is a need for the Zambian Central Statistical Office to improve its data storage and management as well as report archiving. For example, evaluating pretransitional fertility in Zambia would have been more definite if we had computed fertility estimates and trends for periods before the 1980s. Although extrapolating fertility trends back in time shows that fertility differentials existed, the trends had converged by 1980. However, data to perform these calculations are not available.

Similarly, the library of the Zambian Central Statistical Office lacks several important documents. Some of these documents are available in several libraries outside the country. There is a possibility that the 1963 Zambian Census and earlier demographic reports on Zambia could be in Harare. The forerunner to the Zambian Central Statistical Office—the Central African Statistical Office (CASO)—was based in Salisbury (now Harare). It is most likely that the CASO had conducted the 1963 Census because earlier they had conducted the 1950-1951 Demographic Sample Survey. For documents at their disposal, their library catalogue does not simplify access of these reports. Similarly, there are no clear guidelines on data management and accessibility.

Lastly, this thesis used LOICView, a web-based cluster analysis software, to derive traditional reproductive regimes. While there is nothing wrong with this software, it would make a difference if this software were incorporated in a more commonly used statistical software. Like LOICView, the platform should integrate all modules required to derive clusters on one platform and should have a feature for handling missing data.

This thesis adds to our knowledge in several ways. It has provided another approach of organising and integrating anthropological features into fertility analysis. Usually researchers use qualitative information to explain results from a quantitative analysis. The thesis used qualitative information to account for features underlying demographic outcomes before applying quantitative methods to test its predictions.

The thesis also shows that a multivariate quantitative analysis of anthropological attributes can produce accurate results. Since a multivariate approach evaluates simultaneously several features that define a group of people, it may suppress some limitations—such as poor coding of ethnographic data—that are common in ethnographical and ethnological studies. This means, in a multivariate approach, correct coding of some features offsets errors arising from inaccurate coding of other variables. This also applies to 'agency' within a structured society. While individuals can decide to act outside group norms, it is unlikely that they will shed off all group norms. They will uphold some norms while adjusting or abandoning others. Therefore, a multivariate approach recognises anthropological concerns that structure and agency are dependent on each other.

Although the thesis does not answer all the questions, the results have grounding in some theories whose hypotheses could form the basis for more detailed studies. For instance, future research can follow-up explanations of Zambian pretransitional fertility provided by Caldwell's intergenerational wealth-flows theory and those for transitional fertility provided by modernisation and social interaction theories. In a way, the thesis also provided a platform of showing that using more than one theory provides for better explanations of fertility transitions.

Lastly, the thesis has provided results that are important to development and programme planners. For example, variations in traditional governance of sex means that applying uniform interventions designed to mitigate HIV and AIDS may be inadequate in some societies and cultures.

REFERENCES

Aborampah, Osei-Mensah. 1990. "Comments on Ohadike, Patrick O. 1990. "Social and organisational variables affecting Central African demography"," in Fetter, Bruce (ed). *Demography From Scanty Evidence: Central Africa in the Colonial Era.* Colorado: Lynne Rienner Publishers, pp. 268-270.

Afifi, A. A. and Virginia Clark. 1984. *Computer-aided Multivariate Analysis.* California: Lifetime Learning Publications.

Agyei-Mensah, Samuel and John B. Casterline. 2003. "Reproduction and social context in sub-Saharan Africa: An Introduction," in Agyei-Mensah, Samuel and John B. Casterline (eds). *Reproduction and Social Context in sub-Saharan Africa: A Collection of Micro-Demographic Studies.* Connecticut: Greenwood Press, pp. 1-5.

Anderson, Benedict. 1983. *Imagined Communities: Reflections on the Origin and Spread of Nationalism.* London: Verso Editions.

Anker, Richard and James C. Knowles. 1982. *Fertility Determinants in Developing Countries: A Case Study of Kenya.* Belgium: Ordina Editions.

Arriaga, Eduardo E. 1994. *Population Analysis with Microcomputers: Presentation of Techniques.* Washington: Bureau of the Census, USAID and UNFPA.

Backer, E. 1995. *Computer-assisted Reasoning in Cluster Analysis.* Englewood Cliffs: Prentice Hall.

Barnes, J A. 1967. *Politics in a Changing Society: A Political History of the Fort Jameson Ngoni.* Manchester: Manchester University Press.

Barnes, J. A. 1968. "The Fort Jameson Ngoni," in Colson, Elizabeth and Max Gluckman (eds). *Seven Tribes of Central Africa.* Manchester: Manchester University Press, pp. 194-252.

Basu, Alaka Malwade. 2002. "Why does education lead to lower fertility", *World Development* **30**(10):1779-1790.

Becker, Gary S. 1960. "An economic analysis of fertility," Paper presented at Demographic and economic change in developed countries: A conference of the Unversities-National Bureau Committee for Economic Research. Princeton. Princeton University Press. 209-231.

Becker, Stan. 1993. "The determinants of adolescent fertility with special reference to biological variables," in Gray, Ronald, Henri Leridon and Alfred Spira (eds). *Biomedical and Demographic Determinants of Reproduction.* New York: Oxford University Press, pp. 21-49.

Biddlecom, Ann E. and Frederick A. D. Kaona. 2003. "The nature of unmet need for contraception in Ndola, Zambia," in Agyei-Mensah, Samuel and John B. Casterline (eds). *Reproduction and Social Context in sub-Saharan Africa: A Collection of Micro-Demographic Studies*. Connecticut: Greenwood Press, pp. 127-145.

Bogue, Donald J. 1993. "Empirical interrelationships among standard fertility measures," in Bogue, Donald J., Eduardo E. Arriaga and Douglas L. Anderton (eds). *Readings in Population Research Methodology: Fertility Research.* Vol. 3. New York: United Nations Population Fund, pp. 11/51 - 11/53.

Bongaarts, John. 1978. "A framework for analysing the proximate determinants of fertility", *Population and Development Review* **4**(1):105-132.

Bongaarts, John. 1993. "The relative contributions of biological and behavioural factors in determining natural fertility: A demographer's perspective," in Gray, Ronald, Henri Leridon and Alfred Spira (eds). *Biomedical and Demographic Determinants of Reproduction*. New York: Oxford University Press, pp. 9-18.

Bongaarts, John, Odile Frank and Ron Lesthaeghe. 1984. "The proximate determinants of fertility in sub-Saharan Africa", *Population and Development Review* **10**(3):511-537.

Booth, Heather. 1984. "Transforming Gompertz's function for fertility analysis: The development of a standard for the Relational Gompertz function", *Population Studies* **38**(3):495-506.

Booth, Heather. 1994. *The Estimation of Levels and Trends in Age at First Birth and Age at First Marriage in the Pacific Islands.* Working Papers in Demography No. 45. Canberra: Research School of Social Sciences, The Australian National University.

Boserup, Ester. 1985. "Economic and demographic interrelationships in sub-Saharan Africa", *Population and Development Review* **11**(3):383-397.

Brass, William. 1974. "Perspectives in population prediction: Illustrated by the statistics of England and Wales", *Journal of the Royal Statistical Society* **Series A (General) 137**(4):532-583.

Brass, William. 1981. The use of Gompertz Relational Model to estimate fertility. In *International Union for Scientific Study of Population Manila*, IUSSP (International Union for Scientific Study of Population), **3**, pp. 345-361, Manila.

Brelsford, W. V. 1956. *The Tribes of Northern Rhodesia.* Lusaka: Government Printers.

Brelsford, W. V. 1965. *The Tribes of Zambia.* Lusaka: Government Printers.

Broude, Gwen J. 1975. "Norms of premarital sexual behavior: A cross-cultural study", *Ethnos* **3**(3):381-402.

Brown, Michael T. and Lori R. Wicker. 2000. "Discriminant analysis," in Tinsley, Howard E. A. and Steven D. Brown (eds). *Handbook of Applied Multivariate Statistics and Mathematical Modelling.* San Diego: Academic Press, pp. 209-235.

Bryan, Tomas. 2004. "Basic sources of statistics," in Siegel, Jacob S. and David A. Swanson (eds). *The Methods and Materials of Demography*. London: Elsevier Academic Press, pp. 9-42.

Burbank, Victoria K. 1987. "Premarital sex norms: cultural interpretations in an Australian Aboriginal community", *Ethnos* **15**(2):226-234.

Caldwell, John C. 1976. "Towards a restatement of Demographic Transition Theory", *Population and Development Review* **2**(3/4):321-366.

Caldwell, John C. 1982. *The Theory of Fertility Decline*. London: Academic Press.

Caldwell, John C. and Pat Caldwell. 1987. "The cultural context of high fertility in sub-Saharan Africa", *Population and Development Review* **13**(3):409-437.

Caldwell, John C. and Pat Caldwell. 2003. "New light on the sub-Saharan African fertility transition: Conclusion," in Agyei-Mensah, Samuel and John B. Casterline (eds). *Reproduction and Social Context in sub-Saharan Africa: A Collection of Micro-Demographic Studies*. Connecticut: Greenwood Press, pp. 187-199.

Caldwell, John C., Pat Caldwell and I. O. Orubuloye. 1992. "The family and sexual networking in sub-Saharan Africa: historical regional differences and present-day implications", *Population Studies* **46**(3):385-410.

Caldwell, John C., Pat Caldwell and Pat Quiggin. 1989. "The social context of AIDS in sub-Saharan Africa", *Population and Development Review* **15**(2):185-234.

Caldwell, John C., I. O. Orubuloye and Pat Caldwell. 1992. "Fertility decline in Africa: A new type of transition", *Population and Development Review* **18**(2):211-242.

Central Statistical Office [Zambia]. 1973. *Census of Population and Housing 1969, Final Report Vol I*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1974. *Census of Population and Housing 1969, Demographic Analysis Vol III*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1975. *Inter-regional Variations in Fertility in Zambia*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1985a. *1980 Population and Housing Census of Zambia: Analytical Report Volume III: Major Findings and Conclusions*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1985b. *1980 Population and Housing Census of Zambia: Analytical Report Volume IV: Fertility and Mortality Levels and Trends*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1990. *1990 Census of Population, Housing and Agriculture: Preliminary Report*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1995a. *1990 Census of Population, Housing and Agriculture: Post Enumeration Survey*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 1995b. *Zambia Census of Population, Housing and Agriculture, 1990 Analytical Report Vol 10*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 2003a. *2000 Census of Population and Housing: Migration and Urbanization Report*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia]. 2003b. *2000 Census of Population and Housing: Zambia Analytical Report, Volume 10*. Lusaka: Central Statistical Office [Zambia].

Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro. 1997. *Zambia Demographic and Health Survey 1996*. Calverton, Maryland, USA: ORC Macro International Inc.

Central Statistical Office [Zambia], Central Board of Health [Zambia] and ORC Macro. 2003. *Zambia Demographic and Health Survey 2001-2002*. Calverton, Maryland, USA: ORC Macro International Inc.

Clark, Desmond J. 1950. "A note on the pre-Bantu inhabitants of Northern Rhodesia and Nyasaland", *The Northern Rhodesia Journal* **1**(2):42-52.

Cleland, John. 1985. "Marital fertility decline in developing countries: Theories and the evidence," in Cleland, John and John Hobcraft (eds). *Reproductive Change in Developing Countries: Insights from the World Fertility Survey*. Oxford: Oxford University Press, pp. 223-252.

Cleland, John. 1996. "Demographic data collection in less developed countries 1946-1996", *Population Studies* **50**(3):433-450.

Cleland, John and Christopher Wilson. 1987. "Demand theories of the fertility transition: An iconoclastic view", *Population Studies* **41**(1):5-30.

Coale, Ansley J. and Frank Lorimer. 1968. "Summary of estimates of fertility and mortality," in Brass, William, Ansley J. Coale, Paul Demeny*, et al.* (eds). *The Demography of Tropical Africa.* New Jersey: Princeton University Press, pp. 151-186.

Coast, Ernestina E. 2003. "An evaluation of demographers' use of ethnographies", *Population Studies* **57**(3):337-346.

Coast, Ernestina E., Katherine R. Hampshire and Sara C. Randall. 2007. "Disciplining anthropological demography", *Demographic Research* **16**(16):493-518.

Cohen, Abner. 1996. "The lessons of ethnicity," in Sollors, Werner (ed). *Theories of Ethnicity: A Classical Reader.* New York: New York University Press, pp. 370-384.

Cohen, Barney. 1993. "Fertility levels, differentials, and trends," in Foote, Karen A., Kenneth H. Hill and Linda G. Martin (eds). *Demographic Change in sub-Saharan Africa*. Washington: National Research Council: National Academic Press, pp. 8-65.

Cohen, Barney. 1998. "The emerging fertility transition in sub-Saharan Africa", *World Development* **26**(8):1431-1461.

Colson, Elizabeth. 1958. *Marriage and the Family among the Plateau Tonga of Northern Rhodesia.* Manchester: Manchester University Press.

Colson, Elizabeth. 1960. *Social Organisation of the Gwembe Tonga.* Manchester: Manchester University Press.

Colson, Elizabeth. 1968a. "The Plateau Tonga," in Colson, Elizabeth and Max Gluckman (eds). *Seven Tribes of Central Africa.* Manchester: Manchester University Press, pp. 94-162.

Colson, Elizabeth. 1968b. "Reviewed work: The Tribes of Zambia by W. V. Brelsford", *Man, New Series* **3**(4):676-677.

Corinaldi, George V. 1966. "Zambia: The natural background," in Fagan, Brian M. (ed). *A Short History of Zambia (from the earliest times until A.D 1900).* Nairobi: Oxford University Press, pp. 12-29.

Cunnison, Ian. 1959. *The Luapula Peoples of Northern Rhodesia: Customs and History in Tribal Politics.* Manchester: Manchester University Press.

Davis, Kingsley. 1945. "The world demographic transition", *Annals of the American Academy of Polictical and Social Science* **237**(World Population in Transition):1-11.

Davis, Kingsley and Judith Blake. 1956. "Social structure and fertility: An analytic framework", *Economic development and cultural change* **4**(3):211-235.

Diangamo, David S. and Kumbutso Dzekedzeke. 2001. *The 2000 Census in Zambia*. New York: United Nations Statistics Division.

Doke, Clement M. 1931. *The Lambas of Northern Rhodesia: A Study of their Customs and Beliefs.* London: George G. Harrap and Company Ltd.

Easterlin, Richard A. 1975. "An economic framework for fertility analysis", *Studies in Family Planning* **6**(3):54-63.

Easterlin, Richard A. 1978. "The economics and sociology of fertility: A synthesis," in Tilly, Charles (ed). *Historical Studies of Changing Fertility.* Princeton: Princeton University Press, pp. 57-133.

Easterlin, Richard A. and Eillen M. Crimmins. 1985. *The Fertility Revolution: A Supply-Demand Analysis.* Chicago: The University of Chicago Press.

El-Badry, M. A. 1961. "Failure of enumerators to make entries of zero: errors in recording childlessness cases in population censuses", *Journal of the American Statistical Association* **56**(296):909-924.

Eloundou-Enyegue, P. M., C. S. Stokes and G. T. Cornwell. 2000. "Are there crisis-led fertility declines? Evidence from central Cameroon", *Population Research and Policy Review* **19**(1):47-72.

Elster, Jon. 1989. "Collective action," in *Nuts and Bolts for the Social Sciences*. Cambridge: Cambridge University Press, pp. 124-134.

Elster, Jon. 2007. "Rational choice," in *Explaining Social Behaviour: More Nuts and Bolts for the Social Sciences*. Cambridge: Cambridge University Press, pp. 191-213.

Everitt, Brian S., Sabine Landau and Morven Leese. 2001. *Cluster Analysis.* London: Arnold.

Fagan, Brian M. and D. W. Phillipson. 1966. "Studying the past," in Fagan, Brian M. (ed). *A Short History of Zambia (from the earliest times until A.D 1900).* Nairobi: Oxford University Press, pp. 1-11.

Farooq, Ghazi M. and Deborah S. DeGraff. 1988. *Fertility and Development: An Introduction to Theory, Empirical Research and Policy Issues.* Background Papers for Training in Population, Human Resources and Development Planning - Paper No. 7. Geneva: World Employment Programme, International Labour Organisation.

Faust, Kimberly A. 2004. "Marriage, divorce and family," in Siegel, Jacob S. and David A. Swanson (eds). *The Methods and Materials of Demography*. London: Elsevier Academic Press, pp. 191-210.

Feeney, Griffith. 1998. *The Vincent-El Badry method.* http://www.gfeeney.com/tnotes/1998-vincent-el-badry/1998-vincent-el-badry.html. Accessed: 1 December 2004.

Feeney, Griffith. 1999. *A new interpretation of Brass' P/F Ratio Method applicable when fertility is declining.* http/www.gfeeney.com/notes/pfnote/pfnote.htm. Accessed: 7th December 2004.

Foerster, Friedrich and Gerhard Stemmler. 1990. "When can we trust the *F*-Approximation of the Box-Test?" *Psychometrika* **55**(4):727-728.

Fortes, M. and E. E. Evans-Pritchard. 1940. "Introduction," in Fortes, M. and E. E. Evans-Pritchard (eds). *African Political Systems.* London: Oxford University Press, pp. 1-23.

Fricke, Tom. 1997. "Cultural theory and demographic process: Towards a thicker demography," in Kertzer, David I. and Tom Fricke (eds). *Anthropological Demography: Towards a New Synthesis.* Chicago: University of Chicago Press, pp. 248-277.

Gailey, Harry A. 1971. *The History of Africa in Maps.* Chicago: Denoyer-Geppert.

Garenne, Michel. 2008. *Fertility Changes in Sub-Saharan Africa*. DHS Comparative Reports No. 18. Calverton, Maryland, USA: Macro International Inc.

Garenne, Michel and Veronique Joseph. 2002. "The timing of the fertility transition in sub-Saharan Africa", *World Development* **30**(10):1835-1845.

Georgiadis, Katerina. 2007. "Anthropological demography in Europe: Methodological lessons from a comparative ethnographic study in Athens and London", *Demographic Research* **17**(1):1-22.

Gluckman, Max. 1950. "Kinship and marriage among the Lozi of Northern Rhodesia and the Zulu of Natal," in Radcliffe-Brown, A. R. and Daryll Forde (eds). *African Systems of Kinship and Marriage*. London: Oxford University Press, pp. 166-206.

Gluckman, Max. 1968. "The Lozi of Barotseland in North-western Rhodesia," in Colson, Elizabeth and Max Gluckman (eds). *Seven Tribes of Central Africa*. Manchester: Manchester University Press, pp. 1-93.

Goodenough, Ward H. 1964. "Introduction," in Goodenough, Ward H. (ed). *Explorations in Cultural Anthropology*. New York: McGraw-Hill Book Company, pp. 1-24.

Goody, Jack. 1976. *Production and Reproduction: A Comparative Study of the Domestic Domain*. Cambridge: Cambridge University Press.

Gordon, G. Raymond Jr. (ed.). 2005. *Ethnologue: Languages of the World*. http://www.ethnologue.com/country_index.asp?place=Africa. Accessed: 20th April 2006.

Government of the Republic of Zambia. 1989. *New Economic Recovery Programme: Fourth National Development Plan 1983-1993, Volume I*. Lusaka: Office of the President, National Commission for Development Planning.

Gray, J. Patrick. 1999a. "A corrected Ethnographic Atlas", *World Cultures* **10**(1):24-85.

Gray, J. Patrick. 1999b. "Ethnographic Atlas codebook", *World Cultures* **10**(1):86-136.

Greenhalgh, Susan. 1995. "Anthropology theorises reproduction: integrating practice, polical economic, and feminist perspective," in Greenhalgh, Susan (ed). *Situating Fertility: Anthropology and Demographic Inquiry*. Cambridge: Cambridge University Press, pp. 3-28.

Hair, Joseph F., William C. Black, Barry J. Babin *et al.* 2006a. "Introduction," in *Multivariate Data Analysis*. New Jersey: Pearson Prentice Hall, pp. 1-34.

Hair, Joseph F., William C. Black, Barry J. Babin *et al.* 2006b. "Multiple discriminant analysis and logistic regression," in *Multivariate Data Analysis*. New Jersey: Pearson Prentice Hall, pp. 269-382.

Hair, Joseph F., William C. Black, Barry J. Babin *et al.* 2006c. "Multivariate analysis of variance," in *Multivariate Data Analysis*. New Jersey: Pearson Prentice Hall, pp. 383-458.

Hammel, E. A. 1990. "A theory of culture for demography", *Population and Development Review* **16**(3):455-485.

Hammel, E. A. 1995. "Economics 1, culture 0: Fertility change and differences in the northwest Balkans, 1700-1900," in Greenhalgh, Susan (ed). *Situating Fertility: Anthropology and Demographic Inquiry*. Cambridge: Cambridge University Press, pp. 225-258.

Hand, David, Heikki Mannila and Padhraic Smyth. 2001. *Principles of Data Mining.* Cambridge: Massachusetts Institute of Technology Press.

Harrington, Charles. 1968. "Sexual differentiation in socialisation and some male genital mutilations", *American Anthropologist* **70**(5):951-956.

Hayes, Adrian C. 1994. *The Role of Culture in Demographic Analysis: A Preliminary Investigation*. Working Papers in Demography No 46. Canberra: Research School of Social Sciences, The Australian National University.

Heady, Patrick. 2007. "What can anthropological methods contribute to demography - and how?" *Demographic Research* **16**(18):555-558.

Hill, Allan G. 1997. ""Truth lies in the eye of the beholder": The nature of evidence in demography and anthropology," in Kertzer, David I. and Tom Fricke (eds). *Anthropological Demography: Towards a New Synthesis*. Chicago: University of Chicago Press, pp. 223-247.

Hill, Althea. 1985. *The Demography of Zambia*. Population Health and Nutrition - Technical Note 85-9. Washington: Population, Health and Nutrition Department, the World Bank.

Hill, Althea. 1990. "Population conditions in mainland sub-Saharan Africa," in Ascadi, George T. F., Gwendolyn Johnson-Acsadi and Rodolfo A. Bulatoa (eds). *Population Growth and Reproduction in Sub-Saharan Africa: The World Bank*. Washington, D. C.: The World Bank, pp. 3-27.

Hirschman, Charles. 1994. "Why fertility changes", *Annual Review of Sociology* **20**:203-233.

Hirschman, Charles. 2004. "The origin and demise of the concept of race", *Population and Development Review* **30**(4):385-415.

Hobbs, Frank. 2004. "Age and sex composition," in Siegel, Jacob S. and David A. Swanson (eds). *The Methods and Materials of Demography*. London: Elsevier Academic Press, pp. 125-173.

Hoem, Jan M. and Margit Strandberg. 2004. "Childbearing patterns for Swedish mothers of twins, 1961-1999", *Demographic Research* **11**(15):420-455.

Holden, Clare Janaki and Ruth Mace. 2003. "Spread of cattle led to the loss of matrilineal descent in Africa: A coevolutionary analysis", *The Royal Society* **270**(1532):2425-2433.

Huberty, Carl J. 2000. "Judgement in quantitative research", *In Focus* **10**(1):5-10.

Huberty, Carl J. 2002. "Discriminant analysis," in Meij, J. M. (ed). *Dealing with the data flood; mining data, text and multimedia*. The Hague, Netherlands: Study Centre for Technology Trend, pp. 585-600.

Huberty, Carl J. and Laureen L. Lowman. 1998. "Discriminant analysis in higher education," in Smart, John C. (ed). *Higher Education: Handbook of Theory and Research*. Vol. XIII. New York: Agathon Press, pp. 181-234.

Huberty, Carl J. and Mohamed. 2003. "Some problems in reporting use of discriminant analysis", *The Journal of Experimental Education* **71**(2):177-191.

Huberty, Carl J. and Stephen Olejnik. 2006. *Applied MANOVA and Discriminant Analysis*. New York: Wiley and Sons Inc.

Huberty, Carl J. and Martha D. Petoskey. 2000. "Multivariate analysis of variance and covariance," in Tinsley, Howard E. A. and Steven D. Brown (eds). *Handbook of Applied Multivariate Statistics and Mathematical Modelling*. San Diego: Academic Press, pp. 183-208.

Hull, Richard W. 1980. *Modern Africa; Change and Continuity*. London: Prentice-Hall International Inc.

Jaspan, M. A. 1953. *The Ila-Tonga Peoples of North-western Rhodesia*. London: International African Institute.

Jenkins, Richard. 1997. *Rethinking Ethnicity: Arguments and Explorations*. London: SAGA Publications.

John, A. Meredith. 1993. "Statistical evidence of links between maternal nutrition and postpartum infertility," in Gray, Ronald, Henri Leridon and Alfred Spira (eds). *Biomedical and Demographic Determinants of Reproduction*. New York: Oxford University Press, pp. 372-382.

Johnson-Hanks, Jennifer. 2007. "What kind of theory for anthropological demography?" *Demographic Research* **16**(1):1-26.

Kapambwe, Lumbwe. 2004. "The role of music in the marriage ceremonies of the Bemba speaking of Northern Zambia." Unpublished masters dissertation, Cape Town: University of Cape Town.

Kashoki, Mubanga E. and Micheal W. Mann. 1978. "A general sketch of the Bantu languages in Zambia," in Ohannessian, Sirarpi and Mubanga E. Kashoki (eds). *Language in Zambia*. London: International African Institute, pp. 9-46.

Kaufman, Carol and Deborah James. 2003. "The reproductive consequences of shifting ethnic identity in South Africa," in Obermeyer, C. Makhlouf (ed). *Cultural Perspectives on Reproductive Health*. Oxford University Press, pp. 193-220.

Kennedy, Peter. 2003. *A Guide to Econometrics*. Cambridge: The MIT Press.

Kertzer, David I. 1995. "Political-economic and cultural explainations of demographic behaviour," in Greenhalgh, Susan (ed). *Situating Fertility: Anthropology and Demographic Inquiry*. Cambridge: Cambridge University Press, pp. 29-52.

Kertzer, David I. and Tom Fricke. 1997. "Towards an anthropological demography," in Kertzer, David I. and Tom Fricke (eds). *Anthropological Demography: Towards a New Synthesis*. Chicago: University of Chicago Press, pp. 1-35.

Keselman, H. J., Carl J. Huberty, Lisa M. Lix *et al.* 1998. "Statistical practices of educational researchers: An analysis of their ANOVA, MANOVA, and ANCOVA analyses", *Review of Educational Research* **68**(3):350-386.

Khaltourina, Daria, Andrey Korotayev and William Divale. 2002. "A corrected version of the Standard Cross-Cultural Sample Database", *World Cultures* **13**(1):62-98.

Kirk, Dudley. 1996. "Demographic transition theory", *Population Studies* **50**(3):361-387.

Kirk, Dudley and Bernard Pillet. 1998. "Fertility levels, trends, and differentials in sub-Saharan Africa in the 1980s and 1990s", *Studies in Family Planning* **29**(1):1-22.

Knodel, John and Etienne van de Walle. 1979. "Lessons from the past: Policy implications of historical fertility studies", *Population and Development Review* **5**(2):217-245.

Kreager, Philip. 1997. "Population and identity," in Kertzer, David I. and Tom Fricke (eds). *Anthropological Demography: Towards a New Synthesis*. Chicago: University of Chicago Press, pp. 139-174.

Kuczynski, R. R. 1949. *Demographic Survey of the British Colonial Empire*. London: Oxford University Press.

Kuper, Adam. 1999. *Culture: The Anthropologist's Account*. Cambridge: Harvard University Press.

Lesthaeghe, Ron. 1980. "On the social control of human reproduction", *Population and Development Review* **6**(4):527-548.

Lesthaeghe, Ron. 1983. "A century of demographic and cultural change in Western Europe: An exploration of underlying dimensions", *Population and Development Review* **9**(3):411-435.

Lesthaeghe, Ron. 1989a. "Introduction," in Lesthaeghe, Ron (ed). *Reproduction and Social Organisation in sub-Saharan Africa*. Berkeley: University of California Press, pp. 1-12.

Lesthaeghe, Ron. 1989b. "Production and reproduction in sub-Saharan Africa: an overview of organising principles," in Lesthaeghe, Ron (ed). *Reproduction and Social Organisation in sub-Saharan Africa*. Berkeley: University of California Press, pp. 13-59.

Lesthaeghe, Ron and Frank Eelens. 1989. "The components of sub-Saharan reproductive regimes and their social and cultural determinants: empirical evidence," in Lesthaeghe, Ron (ed). *Reproduction and Social Organisation in sub-Saharan Africa*. Berkeley: University of California Press, pp. 60-121.

Lesthaeghe, Ron, Patrick Ohadike, James Kocher *et al*. 1981. "Child-spacing and fertility in sub-Saharan Africa: An overview of issues," in Page, Hilary and Ron Lesthaeghe (eds). *Child-spacing in Tropical Africa: Traditions and Change*. London: Academic Press Inc, pp. 3-23.

Lesthaeghe, Ron, Patrick O. Ohadike, James Kocher *et al*. 1981. "Child-spacing and fertility in sub-Saharan Africa: an overview of issues," in Page, Hilary J. and Ron Lesthaeghe (eds). *Child-spacing in Tropical Africa: Traditions and Change*. London: Academic Press Inc, pp. 3-23.

Lesthaeghe, Ron and Johan Surkyn. 1988. "Cultural dynamics and economic theories of fertility change", *Population and Development Review* **14**(1):1-45.

Lesthaeghe, Ron and Chris Wilson. 1986. "Modes of production, secularisation and the pace of the fertility decline in Western Europe, 1870-1930," in Coale, Ansley J. and Susan Cotts Watkins (eds). *The Decline of Fertility in Europe*. New Jersey: Princeton University Press, pp. 261-292.

Levinson, David and Martin J. Malone. 1980. *Towards Explaining Human Culture: A Critical Review of the Findings of Worldwide Cross-Cultural Research*. New Haven: Human Relations Area Files Press.

Lloyd, Cynthia B., Carol E. Kaufman and Paul Hewett. 2000. "The spread of primary schooling in sub-Saharan Africa: Implications for fertility change", *Population and Development Review* **26**(3):483-515.

Lucas, David. 1992. "Fertility and Family Planning in Southern and Central Africa", *Studies in Family Planning* **23**(3):145-158.

Mabogunje, A. L. 1981. "The policy implications of changes in child-spacing practices in tropical Africa," in Page, Hilary and Ron Lesthaeghe (eds). *Child-spacing in Tropical Africa: Traditions and Change*. London: Academic Press Inc, pp. 303-316.

Maho, Jouni Filip. 2007. *A referential classification of the Bantu languages: Keeping Malcolm Guthries's system updated*. http://goto.glocalnet.net/mahopapers/NUGL2.pdf. Accessed: 13th December 2007.

Mainga, Mutumba. 1966. "The Lozi Kingdom," in Fagan, Brian M. (ed). *A Short History of Zambia (from the earliest times until A.D 1900)*. Nairobi: Oxford University Press, pp. 121-127.

Mainga, Mutumba. 1973. *Bulozi Under the Luyana Kings: Political Evolution and State Formation in Pre-colonial Zambia.* London: Longman.

Malthus, Thomas Robert. 1798. *An Essay on the Principle of Population.* London: Macmillan & Company on behalf of the Royal Economic Society.

Malthus, Thomas Robert. 1826. *An Essay on the Principle of Population.* http://www.econlib.org/library/Malthus/malPlong1.html. Accessed: 7 March 2006.

Martin, Teresa Castro and Larry L. Bumpass. 1989. "Recent trends in marital disruption", *Demography* **26**(1):37-51.

Mason, Karen Oppenheim. 1997. "Explaining fertility transitions", *Demography* **34**(4):443-454.

Maxwell, Bruce A. and Robert W. Buddemeier. 2002. "Coastal typology development with heterogeneous data sets", *Regional Environmental Change* **3**(1-3):77-87.

Maxwell, Bruce A., Frederic L. Pryor and Casey Smith. 2002. "Cluster analysis in cross-cultural research", *World Cultures* **13**(1):22-38.

McNicoll, Geoffrey. 1980. "Institutional determinants of fertility", *Population and Development Review* **6**(3):441-462.

McNicoll, Geoffrey. 1994. "Institutional analysis of fertility," in Lindahl-Kiessling, Kerstin and Hans Landberg (eds). *Population, Economic Development, and the Environment.* New York: Oxford University Press, pp. 199-230.

Mitchell, Clyde J. 1956. "The tribes in the towns," in Brelsford, W. V. (ed). *The Tribes of Northern Rhodesia.* Lusaka: Government Printers, pp. 109-121.

Mitchell, Clyde J. 1965. "Differential fertility amongst urban Africans in Zambia", *Rhodes-Livingstone* (**XXXVII**):1-25.

Moultrie, Tom A. and Ian M. Timæus. 2002. *An analysis of the 1996 census and 1998 demographic and health survey: trends in South African fertility between 1970 and 1998.* Cape Town: Burden of Disease Research Unit, Medical Research Council.

Mozaffar, Shaheen and James R. Scarritt. 2002. "Constructivism, rationalism and the construction of a data set on ethnopolitical groups and cleavage patterns in Africa," Paper presented at 98th Annual Meeting of the American Political Science Association, August 29 - September 1, 2002. Boston. 1-44.

Muntali, Alister C. and Eliya M. Zulu. 2007. "The timing and role of initiation rites in preparing young people for adolescence and responsible sexual and reproductive behaviour in Malawi", *African Journal of Reproductive Health* **11**(3):150-167.

Murdock, George P. and Douglas R. White. 1969. *Standard Cross-Cultural Sample.* http://eclectic.ss.uci.edu/~drwhite/pub/SCCS1969.pdf. Accessed: 19th April 2006.

Murdock, George Peter. 1967a. *Ethnographic Atlas.* Pittsburgh: University of Pittsburgh.

Murdock, George Peter. 1967b. "Ethnographic atlas: a summary", *Ethnology* **6**(2):109-234.

Murdock, George Peter. 1967c. "Postpartum sex taboo", *Paideuma* **13**:143-147.

Musambachime, Mwelwa C. 1990. "Factors affecting census reliability in colonial Zambia, 1900-1930," in Fetter, Bruce (ed). *Demography From Scanty Evidence: Central Africa in the Colonial Era.* Colorado: Lynne Rienner Publishers, pp. 61-75.

Myburgh, C. A. L. 1956. "A brief comparison of the fertility and mortality rates of Africans in various countries", *The Central African Journal of Medicine* **2**(4):155-159.

Naylor, Larry L. 1996. *Culture and Change.* London: Bergin and Gavey.

Norušis, Marija J. 1993. *SPSS for Windows: Base System User's Guide Release 6.0.* Chicago: SPSS.

Notestein, Frank W. 1945. "Population: The long view," in Schultz, Theodore William (ed). *Food for the World.* Chicago: University of Chicago Press, pp. 36-57.

Ohadike, Patrick O. 1969. *Some demographic measurements for Africans in Zambia.* Communication No. 5. Lusaka: Institute for Social Research, University of Zambia.

Ohadike, Patrick O. 1990. "Social and organisational variables affecting Central African demography," in Fetter, Bruce (ed). *Demography From Scanty Evidence: Central Africa in the Colonial Era.* Colorado: Lynne Rienner Publishers, pp. 245-267.

Ohadike, Patrick O. and Habtemariam Tesfaghiorghis. 1975. *The Population of Zambia.* Lusaka: Institute for Social Research, University of Zambia.

Papstein, Robert (ed). 1994. *The History and Cultural Life of the Mbunda Speaking Peoples.* Lusaka: Cheke Cultural Writers Association,

Parsons, Talcott. 1966. *Societies: Evolutionary and Comparative Perspectives.* New Jersey: Prentice-Hall.

Pebley, Anne R., Sandra L. Huffman, A. K. M. Alauddin Chowdhury *et al.* 1985. "Intra-uterine mortality and maternal nutritional status in rural Bangladesh", *Population Studies* **39**(3):425-440.

Petersen, William. 1979. "Malthus and the intellectuals", *Population and Development Review* **5**(3):469-477.

Phiri, D. D. 2000. *History of the Tumbuka.* Blantyre: Dzuku Publishing Company Limited.

Poole, E. H. Lane. 1949. *Native Tribes of the Eastern Province of Northern Rhodesia: Notes on their Migrations and History.* Lusaka: Northern Rhodesia Government Printers.

Posner, Daniel N. 2003. "The colonial origins of ethnic cleavages: The case of linguistic divisions in Zambia", *Comparative Politics* **35**(2):127-146.

Potts, Deborah. 2005. "Counter-urbanisation on the Zambian Copperbelt? Interpretations and implications", *Urban Studies* **42**(4):583-609.

Potts, Deborah and Marks Shula. 2001. "Fertility in Southern Africa: the quiet revolution", *Journal of Southern African Studies* **27**(2):189-205.

Pryor, Frederic L. 2003. "Economic systems of foragers", *Cross-cultural Research* **37**(4):393-426.

Pryor, Frederic L. 2005a. "Market economic systems", *Journal of Comparative Economics* **33**(1):25-46.

Pryor, Frederic L. 2005b. "Rethinking economic systems: a study of agricultural societies", *Cross-cultural Research* **39**(3):252-292.

Pullum, Thomas W. 2004. "Natality measures based on censuses and surveys," in Siegel, Jacob S and David A. Swanson (eds). *The Methods and Materials of Demography*. London: Elsevier Academic Press, pp. 407-428.

Radcliffe-Brown, A. R. 1940. "Preface," in Fortes, M. and E. E. Evans-Pritchard (eds). *African Political Systems*. London: Oxford University Press, pp. xi-xxiii.

Radcliffe-Brown, A. R. 1950. "Introduction," in Radcliffe-Brown, A. R. and Daryll Forde (eds). *African Systems of Kinship and Marriage*. London: Oxford University Press, pp. 1-85.

Richards, Audrey I. 1940. "The political system of the Bemba tribe of North-eastern Rhodesia," in Fortes, M. and E. E. Evans-Pritchard (eds). *African Political Systems*. London: Oxford University Press, pp. 83-120.

Richards, Audrey I. 1968. "The Bemba of North-eastern Rhodesia," in Colson, Elizabeth and Max Gluckman (eds). *Seven Tribes of Central Africa*. Manchester: Manchester University Press, pp. 164-193.

Riley, Ann P., Julia L. Samuelson and Sandra L. Huffman. 1993. "The relationship of age at menarche and fertility in undernourished adolescents," in Gray, Ronald, Henri Leridon and Alfred Spira (eds). *Biomedical and Demographic Determinants of Reproduction*. New York: Oxford University Press, pp. 50-64.

Rissanen, Jorma. 2001. "Information, complexity and the MDL principle," in Punzo, Lionello F. (ed). *Cycles, Growth and Structural Change: Theories and Empirical Evidence*. London: Routledge, pp. 339-350.

Roberts, Andrew. 1966. "Migrations from the Congo," in Fagan, Brian M. (ed). *A Short History of Zambia (from the earliest times until A.D 1900)*. Nairobi: Oxford University Press, pp. 101-120.

Roberts, Andrew. 1976. *A History of Zambia*. London: Heinemann.

Roberts, Andrew D. 1973. *A History of the Bemba: Political Growth and Change in North-eastern Zambia before 1900*. London: Longman.

Roth, Eric Abella. 2004. *Culture, Biology and Anthropological Demography*. Cambridge: Cambridge University Press.

Rutstein, Shea Oscar and Guillermo Rojas. 2003. *Guide to DHS Statistics*. Calverton, Maryland: ORC Macro.

Ruzicka, L. T. 1976. "Age at marriage and timing of the first birth", *Population Studies* **30**(3):527-538.

Ryder, N. B. 1964. "The process of demographic translation", *Demography* **1**(1):74-82.

Ryder, Norman B. 1986. "Reviewed work(s): Reproductive change in developing countries: Insights from the World Fertility Surveys by John Cleland and John Hobcraft", *Population and Development Review* **12**(2):341-349.

Sabater, Cristina Rueda, Pedro C. Alvarez Esteban, Agustín Mayo Iscar *et al.* 2004. "Clustering to reduce regional heterogeneity: a Spanish case-study", *Journal of Population Research* **21**(1):73-93.

Sall, John, Lee Creighton and Ann Lehman. 2005. *A Guide to Statistics and Data Analysis Using JMP IN Software*. Southbank: SAS Institute Inc.

Sardanis, Andrew. 2003. *Africa: Another Side of the Coin; Northern Rhodesia's Final Years and Zambia's Nationhood*. London: I.B. Trauris.

Satterthwaite, F. E. 1946. "An approximate distribution of estimates of variance components", *Biometrics Bulletin* **2**(6):110-114.

Saucier, Jean-Francois. 1972. "Correlates of the long postpartum taboo: A cross-cultural study", *Current Anthropology* **13**(2):238-258.

Schoenmaeckers, R., I. H. Shah, R. Lesthaeghe *et al.* 1981. "The child-spacing tradition and the postpartum taboo in tropical Africa: anthropological evidence," in Page, Hilary and Ron Lesthaeghe (eds). *Child-spacing in Tropical Africa: Traditions and Change*. London: Academic Press Inc, pp. 25-71.

Schultz, Paul T. 1969. "An economic model of family planning and fertility", *The Journal of Political Economy* **77**(2):153-180.

Schultz, Theodore W. 1973. "The value of children: An economic perspective", *The Journal of Political Economy* **81**(2 Part 2: New Economic Approaches to Fertility):S2-S13.

Setel, Philip. 1995. "The effects of HIV and AIDS on fertility in East and Central Africa", *Health Transition Review* **5**(Supplement):179-189.

Shapiro, David. 1996. "Fertility decline in Kinshasa", *Population Studies* **50**(1):89-103.

Sheikh, Mohammad Hafiz. 1975. *An Introduction to the Demography of Zambia*. Lusaka: Central Statistical Office.

Smith, Casey A. 2002. *Design of a web-based clustering tool for data-driven typology*. http://narya.engin.swarthmore.edu/disco/DISCO.pdf. Accessed: 15th June 2006.

Smith, Edwin W. and Andrew Murray Dale. 1920. *The Ila-speaking peoples of Northern Rhodesia*. London: Macmillan and company.

Sollors, Werner (ed). 1996. *Theories of Ethnicity: A Classical Reader*. New York: New York University Press,

Sørensen, Jesper B. 2002. "The use and misuse of the coefficient of variation in organisational demography research", *Sociological Methods Research* **30**(4):475-491.

Spatz, Barbara A., Dennis L. Thombs, T. Jean Byrne *et al.* 2003. "Use of the theory of planned behaviour to explain HRT decisions", *American Journal of Health Behaviour* **27**(4):445-455.

Spring, Anita. 1976. "An indigenous therapeutic style and its consequences for natality: The Luvale of Zambia," in Marshall, John F. and Steven Polgar (eds). *Culture, Natality and Family Planning*. North Carolina: Carolina Population Center, pp. 99-125.

SPSS Inc. 1999. *SPSS Base 10 Applications Guide*. Chicago: SPSS.

SPSS Inc. 2005. *SPSS Base 14 Applications*. Chicago: SPSS.

StataCorp. 2003. *Stata Statistical Software: Release 8.0 - Cluster Analysis*. College Station, Texas: Stata Corporation.

StatSoft. 2003. *Principal Components and Factor Analysis*. www.statsoft.com/textbook/stfacan.html. Accessed: 2nd March 2006.

Stone, Jeffrey C. 1990. "Recollections of the annual population count in the late colonial Zambia," in Fetter, Bruce (ed). *Demography From Scanty Evidence: Central Africa in the Colonial Era*. Colorado: Lynne Rienner Publishers, pp. 77-79.

Szreter, Simon. 1993. "The idea of Demographic Transition Theory and the study of fertility change: a critical intellectual history", *Population and Development Review* **19**(4):659-701.

The World Bank. 2003. *World Development Report 1997: Sustainable Development in a Dynamic World; Transforming Institutions, Growth and Quality of Life*. Washington: Oxford University Press.

Thompson, Warren S. 1929. "Population", *The American Journal of Sociology* **34**(6):959-975.

Townsend, Nicholas. 1997. "Reproduction in anthropology and demography," in Kertzer, David I. and Tom Fricke (eds). *Anthropological Demography: Towards a New Synthesis*. Chicago: University of Chicago Press, pp. 96-114.

Trent, K. and A. W. Hoskin. 1999. "Structural determinants of the abortion rate: A cross-societal analysis", *Social Biology* **46**(1-2):62-81.

Turner, Victor W. 1952. *The Lozi Peoples of North-western Rhodesia*. London: International African Institute.

Turner, Victor W. 1962. "Three symbols of passage in Ndembu circumcision," in Gluckman, Max (ed). *Essays on the Rituals of Social Relations*. Manchester: Manchester University Press, pp. 124-173.

Turner, Victor W. 1979. *The Forest of Symbols: Aspect of Ndembu Ritual.* New York: Cornell University Press.

United Nations. 1979. *Demographic Yearbook: Historical Supplement - Special Issue.* New York: United Nations Department of International Economic and Social Affairs - Statistical Office.

United Nations. 1983a. "Estimation of fertility based on information about children ever born," in *Manual X: Indirect Techniques for Demographic Estimation*. New York: United Nations Department of International Economic and Social Affairs, pp. 27-58.

United Nations. 1983b. "Estimation of fertility by reverse-survival methods," in *Manual X: Indirect Techniques for Demographic Estimation*. New York: United Nations Department of International Economic and Social Affairs, pp. 178-195.

United Nations. 1997. *Demographic Yearbook: Historical Supplement - Special Issue.* New York: United Nations Department of International Economic and Social Affairs - Statistical Office.

United Nations. 2007. *World population and housing census programme.* http://unstats.un.org/unsd/demographic/sources/census/censusdates.htm. Accessed: 7th November 2007.

University of Zambia, Central Statistical Office [Zambia] and Macro International Inc. 1993. *Zambia Demographic and Health Survey 1992*. Calverton, Maryland, USA: Macro International Inc.

van de Kaa, Dirk J. 1996. "Anchored narratives: the story and findings of half a century of research into the determinants of fertility", *Population Studies* **50**(3):389-432.

Virmani, K. K. 1989. *Zambia: The Dawn of Freedom.* Delhi: Kalinga Publications.

Walsh, Martin T. and Imani N. Swilla. 2001. "Linguistics in the Corridor: A review of research on the Bantu languages of South-west Tanzania, North-east Zambia, and North Malawi", *Journal of Asian and African Studies* **61**:275-302.

Warner, Lloyd W. and Paul S. Lunt. 1996. "Ethnicity," in Sollors, Werner (ed). *Theories of Ethnicity: A Classical Reader*. New York: New York University Press, pp. 13-14.

Watson, William. 1958. *Tribal Cohesion in a Money Economy: A Study of the Mambwe People of Northern Rhodesia.* Manchester: Manchester University Press.

Weinreb, Alexander A. 2001. "First politics, then culture: accounting for ethnic differences in demographic behaviour in Kenya", *Population and Development Review* **27**(3):437-467.

White, C. M. N. 1953. "Notes on the circumcision rites of the Balovale tribes", *African Studies* **12**(2):43-56.

White, C. M. N. 1957. "Clan, chieftainship, and slavery in Luvale political organization", *Journal of the International African Institute* **27**(1):59-75.

White, C. M. N. 1962. "Tradition and change in Luvale marriage", *Rhodes-Livingstone Journal* (**XXXIV**):1-39.

Whiting, John W. M. 1964. "Effects of climate on certain cultural practices," in Goodenough, Ward H. (ed). *Explorations in Cultural Anthropology*. New York: McGraw-Hill Book Company, pp. 511-544.

Willis, Robert J. 1994. "Economic analysis of fertility: Micro-foundations and aggregate implications," in Lindahl-Kiessling, Kerstin and Hans Landberg (eds). *Population, Economic Development, and the Environment*. New York: Oxford University Press, pp. 139-172.

Wusu, Onipede and Uche C. Isiugo-Abanihe. 2006. "Interconnections among changing family structure, childbearing and fertility behaviour among the Ogu, Southwestern Nigeria: a qualitative study", *Demographic Research* **14**(8):139-156.

Yimamu, Enemanachew. 1990. "Problems of selectiong a plausible fertility measure for Addis Ababa (based on the 1984 Census data)", *International Statistical Review* **58**(3):191-200.

Zaba, Basia. 1981. *Use of the Relational Gompertz Model in analysing fertility data collected in retrospective surveys*. Centre for Population Studies Research Paper 81-2. London: Centre for Population Studies, London School of Hygiene & Tropical Medicine.

Zimmer, Basil G. and Calvin Goldscheider. 1966. "A further look at Catholic fertility", *Demography* **3**(2):462-469.

Zulu, Eliya Msiyaphazi. 2001. "Ethnic variations in observance and rationale for postpartum sexual abstinence in Malawi", *Demography* **38**(4):467-479.

Zulu, Eliya Msiyaphazi and Ezekiel Kalipeni. 2003. "Changes in reproductive ideology and its control from natural to limited fertility regimes in Malawi," in Agyei-Mensah, Samuel and John B. Casterline (eds). *Reproduction and Social Context in sub-Saharan Africa: A Collection of Micro-Demographic Studies*. Connecticut: Greenwood Press, pp. 109-125.

APPENDICES

Appendix 2.1.a: National and provincial fertility estimates for Zambia from 1950 to 1980

Estimates derived from the 1950-1951 Demographic Sample Survey

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
GFR	182.0	158.0	162.0	171.0	na	na	257.0	na	184.0	136.0
TFR 1	5.7	5.0	5.1	5.4	na	na	8.0	na	5.8	4.3
TFR 2	7.9	6.9	7.1	7.5	na	na	11.2	na	8.0	6.0

Source: Central Statistical Office (1975)

Notes: 1. TFR 1: Converted from observed births per adult woman using the Bogue (1993) regression parameters
2. TFR 2: Converted from the national crude birth rate (56.8 births per 1000 population) using the Bogue (1993) regression parameters
3. Copperbelt was then called Western province and encompassed contemporary Luapula and North Western provinces
4. Western province was called Barotse province and Central province encompassed the contemporary Lusaka province
5. Statistics exclude a very small proportion of Africans living on non-African farms

Estimates derived from the 1963 Census

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
CWR	873.0	915.0	990.0	839.0	946.0	na	915.0	938.0	925.0	669.0
TFR 1	6.7	7.0	7.7	6.4	7.3	na	7.0	7.2	7.1	5.0
TFR 2	7.1	7.5	8.1	6.8	7.8	na	7.5	7.7	7.6	5.3

Source: Central Statistical Office (1975)

Notes 1. TFR 1: Converted from child-woman ratios using the Bogue (1993) regression parameters
2. TFR 2: Converted from crude birth rate using the Bogue (1993) regression parameters
3. Ratios based on children aged 0-4 and women aged 15-45.5 years
4. Central province encompassed the contemporary Lusaka province

Estimates derived from the 1969 Census data

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
Observed	4.0	4.8	5.4	3.2	5.2	na	6.1	3.0	4.2	1.9
Method 1	8.7	9.1	9.4	11.2	8.7	na	9.8	7.7	9.3	7.5
Method 2	7.4	7.6	8.5	8.5	6.8	na	8.3	6.1	7.8	5.2
Method 3	7.1	-	-	-	-	-	-	-	-	-

Source: Central Statistical Office (1973, 1985)

Notes: 1. The observed fertility estimates are obtained from the 1980 Census report because they were not presented by province in the 1973 Census Report.
2. Central province encompassed the contemporary Lusaka province.
3. Method 1: The CSO used the Brass and Coale (1968) method of estimating total fertility based on the age pattern of current fertility of all women of reproductive age and the level of the mean number of children ever born to young women.
4. Method 2: The CSO used the Brass and Coale (1968) method of estimating total fertility based on reported first births and the proportion of women who are mothers.
5. Method 3: The CSO used the Brass P/F method based on corrected timescale error and age distribution
6. The Central Statistical Office cautioned against comparing fertility estimates of other provinces with Eastern Province.

Estimates derived from the 1980 Census data

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
Observed	5.7	6.9	6.2	5.0	5.8	5.7	6.0	4.7	5.4	4.1
Method 1	8.4	8.3	9.2	7.1	9.3	8.4	8.4	8.9	9.1	6.6
Method 2	9.1	7.6	8.8	7.8	8.0		8.6	7.6	8.6	6.9
Method 3	9.7	9.7	9.6	8.9	9.9	9.8	9.7	8.6	9.9	7.8
Method 4	6.8	7.2	7.3	6.7	7.0	7.0	7.1	6.3	7.5	5.4
Method 5	7.6	7.3	7.7	7.0	7.1	7.7	7.6	6.9		5.9
Method 6	7.4	6.9	7.6	6.9	8.4	7.3	8.4	7.9	7.4	6.0
Method 7	7.4	-	-	-	-	-	-	-	-	-
Method 8	7.4	7.5	7.9	6.9	8.0	7.2	7.7	6.4	7.9	5.7
Method 9	7.2	7.5	7.9	6.9	8.0	7.5	7.7	6.5	7.1	5.7

Source: Central Statistical Office (1985)

Notes:
1. Method 1: Arriaga method: based on age specific fertility rates obtained from children ever born by age of mother
2. Method 2: Arriaga method: based on comparing ASFR obtained from above method with reported age pattern of fertility
3. Method 3: Brass P/F method: based on the age pattern of natural fertilityfertility
4. Method 4: Brass P/F method: based on marriage duration
5. Method 5: Brass P/F method: based on marriage duration and the age pattern of natural fertility
6. Method 6: United Nations (1967: 31-34): based on (P3)2/P2.
7. Method 7: Stable method: based on C(15) and average mortality level q(2), q(3) and q(5) for both sexes
8. Method 8: Relational Gompertz model: based on mean parities of young women aged (15-19), (20-24, and (25-29)
9. Method 9: Relational Gompertz model: based on the Gompertz relational model with average age pattern of fertility schedules from three models: The standard marital fertility rates schedule, Relational Gompertz model and the Coale-Trussel model fertility schedules
10. The Central Statistical office selected estimates computed from Method 9 as representative of Zambian fertility in 1980.

Appendix 2.1.b: National and provincial fertility estimates for Zambia from 1990 to 2002

Estimates derived from the 1990 Census

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
	6.7	6.3	6.6	6.9	7.2	6.0	7.5	6.9	7.0	6.2

Source: Central Statistical Office (1995)
Notes: 1. Reported observed total fertility for Zambia is 6.3
2. Method: Relational Gompertz model

Estimates derived from the 1992, 1996 and 2001-02 DHS

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
Method 1	6.5	6.8	6.2	6.8	7.4	5.5	7.4	6.0	7.1	6.0
Method 2	6.4	6.8	6.0	6.8	7.2	5.4	8.0	5.8	7.0	5.8

Source: The 1992 DHS report and Dzekedzeke and Nyangu (1994)
Notes: 1. Method 1: based on three-year duration and merged Central and Eastern/Luapula and Northern/Nwestern and Western Provinces, respecti
2. Method 2: based on four-year duration

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
	6.1	6.3	5.6	7.1	6.8	4.9	7.2	6.2	6.2	5.5

Source: The 1996 DHS report

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
	5.9	6.2	4.5	6.8	7.3	4.3	6.9	6.8	6.1	6.4

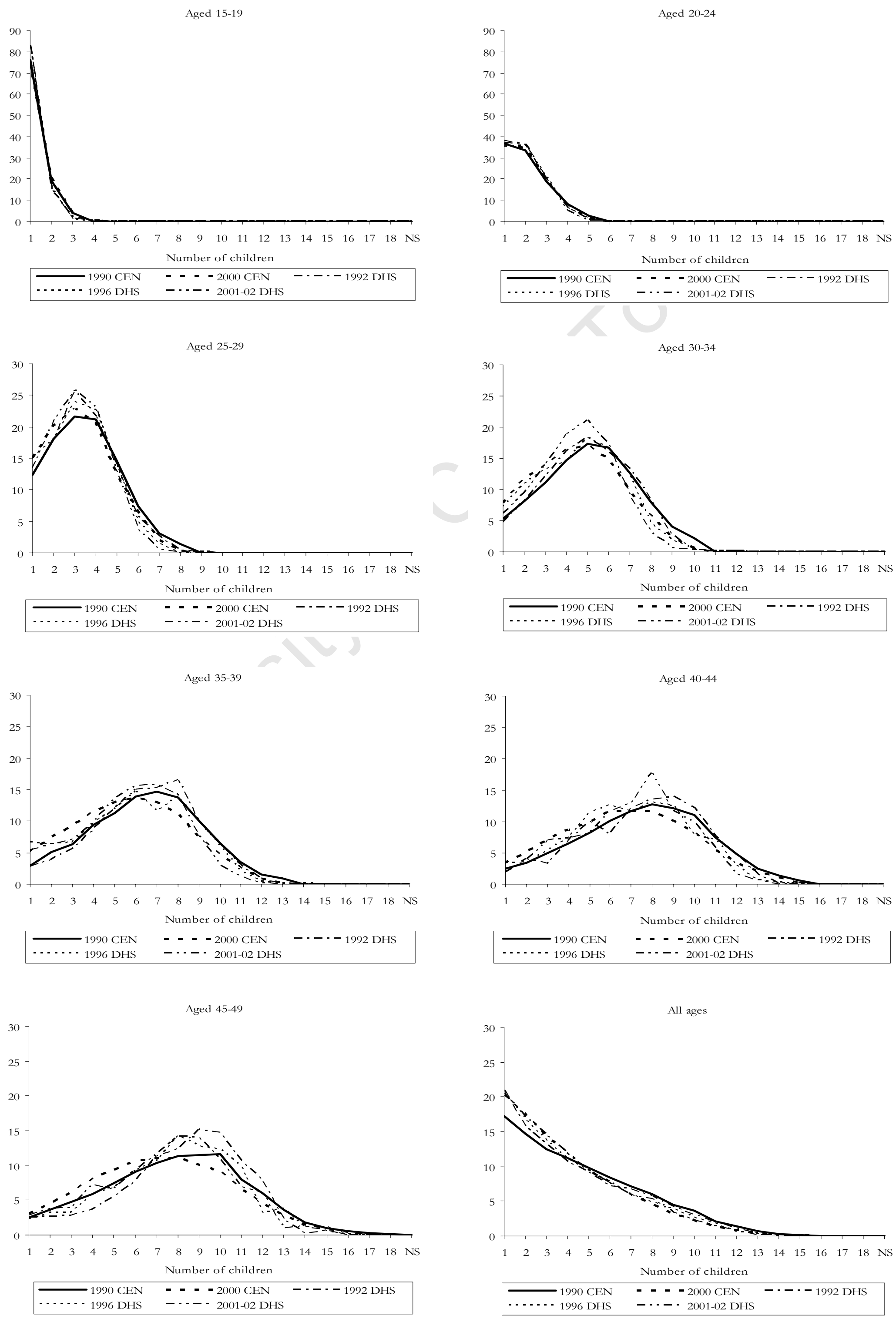
Source: The 2001-02 DHS report

Estimates derived from the 2000 Census

	Zambia	*Central*	*Copperbelt*	*Eastern*	*Luapula*	*Lusaka*	*Northern*	*NWestern*	*Southern*	*Western*
Method 1	6.0	6.2	5.2	6.6	7.0	4.6	6.9	6.3	6.3	5.8
Method 2	6.0	6.1	5.2	6.7	7.1	4.6	7.0	6.6	6.3	5.9

Source: Central Statistical Office (2003)
1. Method 1: Relational Gompertz method of estimating total fertility based on ASFR and CEB of age groups 20-34
2. Method 2: Trussel Brass P/F Ratio method of estimating total fertility based on (P2/F2: P3/F3 P4/F4)

Appendix 3.1.a: Per cent distribution of women aged 15-49 according to parity after application of consistency recoding to the 1990 Census data and removing non-parous women and those whose parity is not stated: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS



Appendix 3.2.a: Proportions of births born last year (BLTM/BLY) by children ever born (CEB) according to age group – before recoding "not stated" BLTM/BLY as "0" births: Zambia 1990 and 2000 Censuses; 1992 Zambia DHS

	DHS 1992					Census 2000						Census 1990								
CEB	BLY					BLY						BLY								
	0	1	2	3	Total	0	1	2	3	4	Total	0	1	2	3	4	5	6	NS	Total
15-19																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	46.5	53.5	0.0	0.0	100.0	60.5	39.5	0.0	0.0	0.0	100.0	0.5	52.5	0.0	0.0	0.0	0.0	0.0	47.0	100.0
2	32.6	66.1	1.4	0.0	100.0	57.4	38.9	3.7	0.0	0.0	100.0	0.4	49.1	5.2	0.0	0.0	0.0	0.0	45.4	100.0
3	30.5	69.5	0.0	0.0	100.0	59.9	34.4	4.1	1.6	0.0	100.0	0.8	41.6	5.4	1.8	0.0	0.0	0.0	50.4	100.0
NS												0.2	8.3	0.7	0.1	0.0	0.0	0.0	90.6	100.0
20-24																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	75.8	24.2	0.0	0.0	100.0	78.4	21.6	0.0	0.0	0.0	100.0	0.4	31.2	0.0	0.0	0.0	0.0	0.0	68.4	100.0
2	56.3	43.2	0.5	0.0	100.0	70.0	27.6	2.4	0.0	0.0	100.0	0.5	36.5	2.8	0.0	0.0	0.0	0.0	60.2	100.0
3	49.8	48.7	1.5	0.0	100.0	64.0	33.3	1.5	1.3	0.0	100.0	0.4	41.6	3.0	1.0	0.0	0.0	0.0	54.1	100.0
4	44.0	51.9	4.1	0.0	100.0	63.1	33.8	1.7	0.4	1.0	100.0	0.4	40.9	3.5	0.4	0.4	0.0	0.0	54.5	100.0
5	19.7	70.6	9.7	0.0	100.0	62.7	34.9	2.0	0.3	0.1	100.0	0.5	38.8	3.7	0.2	0.1	0.3	0.0	56.5	100.0
6	0.0	81.1	18.9	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0									
NS												0.2	21.5	2.3	0.2	0.1	0.0	0.0	75.7	100.0
25-29																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	86.8	13.2	0.0	0.0	100.0	88.9	11.1	0.0	0.0	0.0	100.0	0.3	16.9	0.0	0.0	0.0	0.0	0.0	82.8	100.0
2	80.9	19.1	0.0	0.0	100.0	83.8	14.9	1.3	0.0	0.0	100.0	0.4	20.6	1.3	0.0	0.0	0.0	0.0	77.7	100.0
3	69.2	30.4	0.4	0.0	100.0	77.4	21.0	0.7	0.9	0.0	100.0	0.4	26.0	1.4	0.4	0.0	0.0	0.0	71.7	100.0
4	67.9	32.1	0.0	0.0	100.0	71.0	27.1	1.1	0.2	0.6	100.0	0.4	32.7	2.0	0.2	0.2	0.0	0.0	64.5	100.0
5	57.5	41.1	0.7	0.7	100.0	67.1	31.4	1.3	0.2	0.1	100.0	0.5	36.8	2.8	0.2	0.1	0.4	0.0	59.4	100.0
6	47.8	47.5	4.7	0.0	100.0	64.4	33.6	1.6	0.3	0.2	100.0	0.4	37.4	3.3	0.2	0.2	0.0	0.3	58.2	100.0
7	35.3	52.9	11.8	0.0	100.0	66.0	31.5	2.0	0.2	0.3	100.0	0.6	37.6	3.6	0.2	0.1	0.1	0.0	57.9	100.0
8	49.6	50.4	0.0	0.0	100.0	68.7	28.5	2.5	0.4	0.0	100.0	0.4	34.3	3.2	0.6	0.4	0.0	0.0	61.1	100.0
9	0.0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0									
NS												0.4	15.3	1.9	0.3	0.0	0.1	0.0	82.0	100.0
30-34																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	98.4	1.6	0.0	0.0	100.0	92.6	7.4	0.0	0.0	0.0	100.0	0.1	9.8	0.0	0.0	0.0	0.0	0.0	90.1	100.0
2	90.3	9.7	0.0	0.0	100.0	90.7	8.5	0.8	0.0	0.0	100.0	0.3	10.6	1.2	0.0	0.0	0.0	0.0	87.8	100.0
3	88.3	11.7	0.0	0.0	100.0	86.7	12.4	0.4	0.5	0.0	100.0	0.3	14.5	0.8	0.1	0.0	0.0	0.0	84.3	100.0
4	85.9	13.1	1.1	0.0	100.0	83.6	15.3	0.5	0.1	0.4	100.0	0.2	19.4	1.3	0.1	0.2	0.0	0.0	78.8	100.0
5	71.1	27.6	1.4	0.0	100.0	77.9	21.4	0.6	0.0	0.1	100.0	0.4	23.5	1.7	0.1	0.1	0.2	0.0	74.2	100.0
6	69.0	30.5	0.5	0.0	100.0	74.6	24.0	1.1	0.2	0.1	100.0	0.3	27.9	1.9	0.1	0.1	0.0	0.1	69.5	100.0
7	57.1	42.0	0.9	0.0	100.0	72.1	26.4	1.3	0.2	0.1	100.0	0.6	31.5	2.0	0.2	0.1	0.0	0.0	65.5	100.0
8	47.6	50.9	1.5	0.0	100.0	70.1	27.6	2.1	0.2	0.1	100.0	0.5	33.7	2.4	0.5	0.1	0.1	0.0	62.6	100.0
9	45.9	44.5	9.6	0.0	100.0	72.3	25.3	2.0	0.2	0.1	100.0	0.5	31.5	3.0	0.3	0.1	0.1	0.0	64.5	100.0
10	50.0	50.0	0.0	0.0	100.0	68.7	28.7	2.1	0.5	0.0	100.0	0.3	30.6	2.9	0.3	0.0	0.1	0.1	65.7	100.0
11	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.2	19.7	2.3	0.2	0.2	0.0	0.0	77.2	100.0
12	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0									
NS												12.8	20.2	1.4	0.1	0.1	0.0	0.0	65.3	100.0
35-39																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	95.8	4.2	0.0	0.0	0.0	100.0	0.1	5.6	0.0	0.0	0.0	0.0	0.0	94.3	100.0
2	86.8	13.2	0.0	0.0	100.0	94.8	4.7	0.5	0.0	0.0	100.0	0.1	4.7	0.7	0.0	0.0	0.0	0.0	94.5	100.0
3	93.9	6.1	0.0	0.0	100.0	94.1	5.5	0.2	0.3	0.0	100.0	0.1	7.7	0.5	0.3	0.0	0.0	0.0	91.3	100.0
4	94.1	5.9	0.0	0.0	100.0	90.9	8.4	0.3	0.0	0.4	100.0	0.2	10.4	0.6	0.0	0.1	0.0	0.0	88.6	100.0
5	82.0	18.0	0.0	0.0	100.0	88.4	11.0	0.5	0.1	0.0	100.0	0.3	11.5	0.8	0.1	0.1	0.1	0.0	87.1	100.0
6	80.6	19.5	0.0	0.0	100.0	85.6	13.8	0.4	0.2	0.0	100.0	0.1	16.7	1.4	0.0	0.0	0.0	0.0	81.8	100.0
7	77.9	21.0	1.1	0.0	100.0	81.6	17.5	0.9	0.1	0.0	100.0	0.3	20.8	1.2	0.1	0.0	0.0	0.0	77.5	100.0
8	76.2	23.8	0.0	0.0	100.0	78.1	20.6	1.2	0.1	0.1	100.0	0.5	22.6	1.7	0.2	0.1	0.0	0.0	74.8	100.0
9	56.4	43.6	0.0	0.0	100.0	76.8	21.6	1.3	0.2	0.0	100.0	0.2	26.7	2.3	0.2	0.1	0.0	0.0	70.5	100.0
10	72.6	24.6	2.8	0.0	100.0	75.2	23.0	1.7	0.0	0.0	100.0	0.3	28.0	2.3	0.1	0.0	0.0	0.1	69.0	100.0
11	32.5	67.5	0.0	0.0	100.0	75.3	22.9	1.6	0.2	0.0	100.0	0.4	27.3	3.1	0.5	0.1	0.3	0.0	68.4	100.0
12	56.9	43.1	0.0	0.0	100.0	78.1	20.3	1.6	0.0	0.0	100.0	0.6	28.6	2.8	0.0	0.0	0.0	0.0	68.0	100.0
13	100.0	0.0	0.0	0.0	100.0	79.1	20.9	0.0	0.0	0.0	100.0	0.0	23.5	4.3	0.0	0.0	0.0	0.0	72.2	100.0
NS												0.4	10.9	1.2	0.0	0.0	0.1	0.1	87.2	100.0
40-44																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	98.0	2.0	0.0	0.0	0.0	100.0	0.1	3.5	0.0	0.0	0.0	0.0	0.0	96.4	100.0
2	100.0	0.0	0.0	0.0	100.0	97.9	1.8	0.3	0.0	0.0	100.0	0.1	2.2	0.0	0.0	0.0	0.0	0.0	97.7	100.0
3	100.0	0.0	0.0	0.0	100.0	97.8	2.0	0.0	0.2	0.0	100.0	0.2	3.8	0.1	0.1	0.0	0.0	0.0	95.8	100.0
4	93.7	6.4	0.0	0.0	100.0	97.0	2.7	0.1	0.0	0.2	100.0	0.2	4.5	0.3	0.0	0.1	0.0	0.0	94.7	100.0
5	95.1	4.9	0.0	0.0	100.0	95.8	4.0	0.1	0.1	0.0	100.0	0.2	6.6	0.4	0.0	0.0	0.2	0.0	92.6	100.0
6	88.8	11.2	0.0	0.0	100.0	94.4	5.3	0.2	0.1	0.0	100.0	0.4	7.4	0.5	0.0	0.1	0.0	0.0	91.6	100.0
7	88.8	11.3	0.0	0.0	100.0	93.0	6.7	0.3	0.0	0.0	100.0	0.3	8.6	0.8	0.0	0.0	0.0	0.0	90.3	100.0
8	89.6	10.4	0.0	0.0	100.0	91.5	8.1	0.3	0.1	0.0	100.0	0.5	10.6	0.7	0.0	0.0	0.0	0.0	88.2	100.0
9	90.9	8.2	1.0	0.0	100.0	90.6	9.1	0.3	0.1	0.0	100.0	0.1	12.9	0.6	0.2	0.0	0.0	0.0	86.1	100.0
10	80.8	19.2	0.0	0.0	100.0	88.9	10.4	0.6	0.1	0.0	100.0	0.4	14.1	1.2	0.1	0.0	0.0	0.0	84.2	100.0
11	66.4	31.8	1.8	0.0	100.0	87.5	11.5	0.8	0.1	0.1	100.0	0.2	15.9	1.4	0.0	0.0	0.0	0.0	82.4	100.0
12	72.8	27.2	0.0	0.0	100.0	86.1	13.2	0.4	0.2	0.1	100.0	0.3	16.9	1.3	0.2	0.1	0.2	0.1	80.9	100.0
13	72.4	27.6	0.0	0.0	100.0	86.1	13.5	0.4	0.0	0.0	100.0	0.4	13.3	1.3	0.1	0.0	0.0	0.0	84.9	100.0
14	100.0	0.0	0.0	0.0	100.0	88.7	10.3	0.7	0.3	0.0	100.0	0.5	12.7	2.5	0.0	0.0	0.0	0.0	84.3	100.0
15	0.0	0.0	0.0	0.0	0.0	88.9	11.1	0.0	0.0	0.0	100.0	0.0	20.7	2.5	0.0	0.0	0.0	0.0	76.8	100.0
16	0.0	0.0	0.0	0.0	0.0	95.8	4.2	0.0	0.0	0.0	100.0									
NS												0.1	6.1	0.6	0.2	0.1	0.0	0.0	92.9	100.0
45-49																				
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	98.4	1.6	0.0	0.0	0.0	100.0	0.0	2.8	0.0	0.0	0.0	0.0	0.0	97.2	100.0
2	100.0	0.0	0.0	0.0	100.0	98.8	1.2	0.0	0.0	0.0	100.0	0.1	1.7	0.2	0.0	0.0	0.0	0.0	98.0	100.0
3	100.0	0.0	0.0	0.0	100.0	97.7	2.0	0.2	0.2	0.0	100.0	0.2	1.8	0.1	0.0	0.0	0.0	0.0	98.0	100.0
4	100.0	0.0	0.0	0.0	100.0	98.3	1.5	0.1	0.0	0.1	100.0	0.2	2.5	0.3	0.0	0.1	0.0	0.0	96.9	100.0
5	100.0	0.0	0.0	0.0	100.0	98.3	1.5	0.2	0.0	0.0	100.0	0.3	3.4	0.2	0.0	0.0	0.0	0.0	96.1	100.0
6	100.0	0.0	0.0	0.0	100.0	97.7	2.1	0.2	0.0	0.0	100.0	0.4	3.2	0.3	0.0	0.0	0.0	0.0	96.1	100.0
7	100.0	0.0	0.0	0.0	100.0	97.3	2.4	0.3	0.0	0.0	100.0	0.2	3.7	0.3	0.1	0.0	0.0	0.0	95.6	100.0
8	100.0	0.0	0.0	0.0	100.0	97.1	2.6	0.2	0.0	0.0	100.0	0.3	4.7	0.4	0.0	0.0	0.0	0.0	94.6	100.0
9	98.0	2.0	0.0	0.0	100.0	96.6	3.2	0.2	0.0	0.0	100.0	0.1	4.9	0.4	0.0	0.0	0.0	0.0	94.5	100.0
10	94.7	5.3	0.0	0.0	100.0	96.4	3.4	0.2	0.0	0.0	100.0	0.2	5.6	0.3	0.0	0.0	0.0	0.0	93.8	100.0
11	97.3	2.7	0.0	0.0	100.0	95.3	4.3	0.4	0.0	0.0	100.0	0.3	5.8	0.4	0.1	0.0	0.0	0.0	93.4	100.0
12	88.9	11.1	0.0	0.0	100.0	95.3	4.5	0.2	0.1	0.0	100.0	0.2	5.2	0.7	0.0	0.1	0.0	0.0	93.8	100.0
13	100.0	0.0	0.0	0.0	100.0	94.8	5.0	0.1	0.0	0.0	100.0	0.1	7.7	0.6	0.0	0.0	0.0	0.0	91.6	100.0
14	100.0	0.0	0.0	0.0	100.0	95.8	4.0	0.2	0.0	0.0	100.0	0.4	7.2	0.0	0.0	0.0	0.0	0.0	92.4	100.0
15	0.0	0.0	0.0	0.0	0.0	94.6	5.4	0.0	0.0	0.0	100.0	0.4	11.0	0.4	0.0	0.0	0.0	0.0	88.2	100.0
16	100.0	0.0	0.0	0.0	100.0	95.1	4.2	0.7	0.0	0.0	100.0	0.7	7.7	0.0	0.0	0.0	0.0	0.0	91.6	100.0
17	0.0	0.0	0.0	0.0	0.0	94.2	5.8	0.0	0.0	0.0	100.0	1.2	9.6	0.0	0.0	0.0	0.0	0.0	89.2	100.0
18	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	0.0	17.1	0.0	0.0	0.0	0.0	0.0	82.9	100.0
NS												0.1	2.5	0.0	0.1	0.0	0.0	0.0	97.3	100.0

Appendix 3.2.b: Proportions of births born last year (BLTM/BLY) by children ever born (CEB) according to age group – after recoding “not stated” BLTM/BLY as “0” births: Zambia 1990 and 2000 Censuses; 1992 Zambia DHS

	DHS 1992					Census 2000						Census 1990							
CEB	BLY					BLY						BLY							
	0	1	2	3	Total	0	1	2	3	4	Total	0	1	2	3	4	5	6	Total
15-19																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	46.5	53.5	0.0	0.0	100.0	60.5	39.5	0.0	0.0	0.0	100.0	47.5	52.5	0.0	0.0	0.0	0.0	0.0	100.0
2	32.6	66.1	1.4	0.0	100.0	57.4	38.9	3.7	0.0	0.0	100.0	45.7	49.1	5.2	0.0	0.0	0.0	0.0	100.0
3	30.5	69.5	0.0	0.0	100.0	59.9	34.4	4.1	1.6	0.0	100.0	51.2	41.6	5.4	1.8	0.0	0.0	0.0	100.0
NS												90.8	8.3	0.7	0.1	0.0	0.0	0.0	100.0
20-24																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	75.8	24.2	0.0	0.0	100.0	78.4	21.6	0.0	0.0	0.0	100.0	68.8	31.2	0.0	0.0	0.0	0.0	0.0	100.0
2	56.3	43.2	0.5	0.0	100.0	70.0	27.6	2.4	0.0	0.0	100.0	60.7	36.5	2.8	0.0	0.0	0.0	0.0	100.0
3	49.8	48.7	1.5	0.0	100.0	64.0	33.3	1.5	1.3	0.0	100.0	54.5	41.6	3.0	1.0	0.0	0.0	0.0	100.0
4	44.0	51.9	4.1	0.0	100.0	63.1	33.8	1.7	0.4	1.0	100.0	54.8	40.9	3.5	0.4	0.4	0.0	0.0	100.0
5	19.7	70.6	9.7	0.0	100.0	62.7	34.9	2.0	0.3	0.1	100.0	57.0	38.8	3.7	0.2	0.1	0.3	0.0	100.0
6	0.0	81.1	18.9	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0								
NS												75.9	21.5	2.3	0.2	0.1	0.0	0.0	100.0
25-29																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	86.8	13.2	0.0	0.0	100.0	88.9	11.1	0.0	0.0	0.0	100.0	83.1	16.9	0.0	0.0	0.0	0.0	0.0	100.0
2	80.9	19.1	0.0	0.0	100.0	83.8	14.9	1.3	0.0	0.0	100.0	78.1	20.6	1.3	0.0	0.0	0.0	0.0	100.0
3	69.2	30.4	0.4	0.0	100.0	77.4	21.0	0.7	0.9	0.0	100.0	72.1	26.0	1.4	0.4	0.0	0.0	0.0	100.0
4	67.9	32.1	0.0	0.0	100.0	71.0	27.1	1.1	0.2	0.6	100.0	64.9	32.7	2.0	0.2	0.2	0.0	0.0	100.0
5	57.5	41.1	0.7	0.7	100.0	67.1	31.4	1.3	0.2	0.1	100.0	59.8	36.8	2.8	0.2	0.1	0.4	0.0	100.0
6	47.8	47.5	4.7	0.0	100.0	64.4	33.6	1.6	0.3	0.2	100.0	58.6	37.4	3.3	0.2	0.2	0.0	0.3	100.0
7	35.3	52.9	11.8	0.0	100.0	66.0	31.5	2.0	0.2	0.3	100.0	58.5	37.6	3.6	0.2	0.1	0.1	0.0	100.0
8	49.6	50.4	0.0	0.0	100.0	68.7	28.5	2.5	0.4	0.0	100.0	61.5	34.3	3.2	0.6	0.4	0.0	0.0	100.0
9	0.0	100.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0								
NS												82.3	15.3	1.9	0.3	0.0	0.1	0.0	100.0
30-34																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	98.4	1.6	0.0	0.0	100.0	92.6	7.4	0.0	0.0	0.0	100.0	90.2	9.8	0.0	0.0	0.0	0.0	0.0	100.0
2	90.3	9.7	0.0	0.0	100.0	90.7	8.5	0.8	0.0	0.0	100.0	88.1	10.6	1.2	0.0	0.0	0.0	0.0	100.0
3	88.3	11.7	0.0	0.0	100.0	86.7	12.4	0.4	0.5	0.0	100.0	84.6	14.5	0.8	0.1	0.0	0.0	0.0	100.0
4	85.9	13.1	1.1	0.0	100.0	83.6	15.3	0.5	0.1	0.4	100.0	79.1	19.4	1.3	0.1	0.2	0.0	0.0	100.0
5	71.1	27.6	1.4	0.0	100.0	77.9	21.4	0.6	0.0	0.1	100.0	74.5	23.5	1.7	0.1	0.1	0.2	0.0	100.0
6	69.0	30.5	0.5	0.0	100.0	74.6	24.0	1.1	0.2	0.1	100.0	69.9	27.9	1.9	0.1	0.1	0.0	0.1	100.0
7	57.1	42.0	0.9	0.0	100.0	72.1	26.4	1.3	0.2	0.1	100.0	66.1	31.5	2.0	0.2	0.1	0.0	0.0	100.0
8	47.6	50.9	1.5	0.0	100.0	70.1	27.6	2.1	0.2	0.1	100.0	63.2	33.7	2.4	0.5	0.1	0.1	0.0	100.0
9	45.9	44.5	9.6	0.0	100.0	72.3	25.3	2.0	0.2	0.1	100.0	65.0	31.5	3.0	0.3	0.1	0.1	0.0	100.0
10	50.0	50.0	0.0	0.0	100.0	68.7	28.7	2.1	0.5	0.0	100.0	66.0	30.6	2.9	0.3	0.0	0.1	0.1	100.0
11	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	77.4	19.7	2.3	0.2	0.2	0.0	0.0	100.0
12	100.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0								
NS												78.1	20.2	1.4	0.1	0.1	0.0	0.0	100.0
35-39																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	95.8	4.2	0.0	0.0	0.0	100.0	94.4	5.6	0.0	0.0	0.0	0.0	0.0	100.0
2	86.8	13.2	0.0	0.0	100.0	94.8	4.7	0.5	0.0	0.0	100.0	94.6	4.7	0.7	0.0	0.0	0.0	0.0	100.0
3	93.9	6.1	0.0	0.0	100.0	94.1	5.5	0.2	0.3	0.0	100.0	91.5	7.7	0.5	0.3	0.0	0.0	0.0	100.0
4	94.1	5.9	0.0	0.0	100.0	90.9	8.4	0.3	0.0	0.4	100.0	88.8	10.4	0.6	0.0	0.1	0.0	0.0	100.0
5	82.0	18.0	0.0	0.0	100.0	88.4	11.0	0.5	0.1	0.0	100.0	87.4	11.5	0.8	0.1	0.1	0.1	0.0	100.0
6	80.6	19.5	0.0	0.0	100.0	85.6	13.8	0.4	0.2	0.0	100.0	81.9	16.7	1.4	0.0	0.0	0.0	0.0	100.0
7	77.9	21.0	1.1	0.0	100.0	81.6	17.5	0.9	0.1	0.0	100.0	77.8	20.8	1.2	0.1	0.0	0.0	0.0	100.0
8	76.2	23.8	0.0	0.0	100.0	78.1	20.6	1.2	0.1	0.1	100.0	75.3	22.6	1.7	0.2	0.1	0.0	0.0	100.0
9	56.4	43.6	0.0	0.0	100.0	76.8	21.6	1.3	0.2	0.0	100.0	70.7	26.7	2.3	0.2	0.1	0.0	0.0	100.0
10	72.6	24.6	2.8	0.0	100.0	75.2	23.0	1.7	0.0	0.0	100.0	69.4	28.0	2.3	0.1	0.0	0.0	0.1	100.0
11	32.5	67.5	0.0	0.0	100.0	75.3	22.9	1.6	0.2	0.0	100.0	68.8	27.3	3.1	0.5	0.1	0.3	0.0	100.0
12	56.9	43.1	0.0	0.0	100.0	78.1	20.3	1.6	0.0	0.0	100.0	68.6	28.6	2.8	0.0	0.0	0.0	0.0	100.0
13	100.0	0.0	0.0	0.0	100.0	79.1	20.9	0.0	0.0	0.0	100.0	72.2	23.5	4.3	0.0	0.0	0.0	0.0	100.0
NS												87.7	10.9	1.2	0.0	0.0	0.1	0.1	100.0
40-44																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	98.0	2.0	0.0	0.0	0.0	100.0	96.5	3.5	0.0	0.0	0.0	0.0	0.0	100.0
2	100.0	0.0	0.0	0.0	100.0	97.9	1.8	0.3	0.0	0.0	100.0	97.8	2.2	0.0	0.0	0.0	0.0	0.0	100.0
3	100.0	0.0	0.0	0.0	100.0	97.8	2.0	0.0	0.2	0.0	100.0	96.0	3.8	0.1	0.1	0.0	0.0	0.0	100.0
4	93.7	6.4	0.0	0.0	100.0	97.0	2.7	0.1	0.0	0.2	100.0	95.0	4.5	0.3	0.0	0.1	0.0	0.0	100.0
5	95.1	4.9	0.0	0.0	100.0	95.8	4.0	0.1	0.1	0.0	100.0	92.8	6.6	0.4	0.0	0.0	0.2	0.0	100.0
6	88.8	11.2	0.0	0.0	100.0	94.4	5.3	0.2	0.1	0.0	100.0	92.0	7.4	0.5	0.0	0.1	0.0	0.0	100.0
7	88.8	11.3	0.0	0.0	100.0	93.0	6.7	0.3	0.0	0.0	100.0	90.5	8.6	0.8	0.0	0.0	0.0	0.0	100.0
8	89.6	10.4	0.0	0.0	100.0	91.5	8.1	0.3	0.1	0.0	100.0	88.6	10.6	0.7	0.0	0.0	0.0	0.0	100.0
9	90.9	8.2	1.0	0.0	100.0	90.6	9.1	0.3	0.1	0.0	100.0	86.2	12.9	0.6	0.2	0.0	0.0	0.0	100.0
10	80.8	19.2	0.0	0.0	100.0	88.9	10.4	0.6	0.1	0.0	100.0	84.5	14.1	1.2	0.1	0.0	0.0	0.0	100.0
11	66.4	31.8	1.8	0.0	100.0	87.5	11.5	0.8	0.1	0.1	100.0	82.7	15.9	1.4	0.0	0.0	0.0	0.0	100.0
12	72.8	27.2	0.0	0.0	100.0	86.1	13.2	0.4	0.2	0.1	100.0	81.2	16.9	1.3	0.2	0.1	0.2	0.1	100.0
13	72.4	27.6	0.0	0.0	100.0	86.1	13.5	0.4	0.0	0.0	100.0	85.3	13.3	1.3	0.1	0.0	0.0	0.0	100.0
14	100.0	0.0	0.0	0.0	100.0	88.7	10.3	0.7	0.3	0.0	100.0	84.7	12.7	2.5	0.0	0.0	0.0	0.0	100.0
15	0.0	0.0	0.0	0.0	0.0	88.9	11.1	0.0	0.0	0.0	100.0	76.8	20.7	2.5	0.0	0.0	0.0	0.0	100.0
16	0.0	0.0	0.0	0.0	0.0	95.8	4.2	0.0	0.0	0.0	100.0								
NS												93.0	6.1	0.6	0.2	0.1	0.0	0.0	100.0
45-49																			
0	100.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	100.0	100.0	0.0	0.0	0.0	0.0	0.0	0.0	100.0
1	100.0	0.0	0.0	0.0	100.0	98.4	1.6	0.0	0.0	0.0	100.0	97.2	2.8	0.0	0.0	0.0	0.0	0.0	100.0
2	100.0	0.0	0.0	0.0	100.0	98.8	1.2	0.0	0.0	0.0	100.0	98.1	1.7	0.2	0.0	0.0	0.0	0.0	100.0
3	100.0	0.0	0.0	0.0	100.0	97.7	2.0	0.2	0.2	0.0	100.0	98.2	1.8	0.1	0.0	0.0	0.0	0.0	100.0
4	100.0	0.0	0.0	0.0	100.0	98.3	1.5	0.1	0.0	0.1	100.0	97.1	2.5	0.3	0.0	0.1	0.0	0.0	100.0
5	100.0	0.0	0.0	0.0	100.0	98.3	1.5	0.2	0.0	0.0	100.0	96.4	3.4	0.2	0.0	0.0	0.0	0.0	100.0
6	100.0	0.0	0.0	0.0	100.0	97.7	2.1	0.2	0.0	0.0	100.0	96.4	3.2	0.3	0.0	0.0	0.0	0.0	100.0
7	100.0	0.0	0.0	0.0	100.0	97.3	2.4	0.3	0.0	0.0	100.0	95.9	3.7	0.3	0.1	0.0	0.0	0.0	100.0
8	100.0	0.0	0.0	0.0	100.0	97.1	2.6	0.2	0.0	0.0	100.0	94.8	4.7	0.4	0.0	0.0	0.0	0.0	100.0
9	98.0	2.0	0.0	0.0	100.0	96.6	3.2	0.2	0.0	0.0	100.0	94.6	4.9	0.4	0.0	0.0	0.0	0.0	100.0
10	94.7	5.3	0.0	0.0	100.0	96.4	3.4	0.2	0.0	0.0	100.0	94.1	5.6	0.3	0.0	0.0	0.0	0.0	100.0
11	97.3	2.7	0.0	0.0	100.0	95.3	4.3	0.4	0.0	0.0	100.0	93.7	5.8	0.4	0.1	0.0	0.0	0.0	100.0
12	88.9	11.1	0.0	0.0	100.0	95.3	4.5	0.2	0.1	0.0	100.0	94.0	5.2	0.7	0.0	0.1	0.0	0.0	100.0
13	100.0	0.0	0.0	0.0	100.0	94.8	5.0	0.1	0.0	0.0	100.0	91.7	7.7	0.6	0.0	0.0	0.0	0.0	100.0
14	100.0	0.0	0.0	0.0	100.0	95.8	4.0	0.2	0.0	0.0	100.0	92.8	7.2	0.0	0.0	0.0	0.0	0.0	100.0
15	0.0	0.0	0.0	0.0	0.0	94.6	5.4	0.0	0.0	0.0	100.0	88.6	11.0	0.4	0.0	0.0	0.0	0.0	100.0
16	100.0	0.0	0.0	0.0	100.0	95.1	4.2	0.7	0.0	0.0	100.0	92.3	7.7	0.0	0.0	0.0	0.0	0.0	100.0
17	0.0	0.0	0.0	0.0	0.0	94.2	5.8	0.0	0.0	0.0	100.0	90.4	9.6	0.0	0.0	0.0	0.0	0.0	100.0
18	0.0	0.0	0.0	0.0	0.0	100.0	0.0	0.0	0.0	0.0	100.0	82.9	17.1	0.0	0.0	0.0	0.0	0.0	100.0
NS												97.4	2.5	0.0	0.1	0.0	0.0	0.0	100.0

Appendix 3.3.a: Per cent distribution of women reporting the number of births born last year (BLTM/BLY) by children ever born (CEB): Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Children ever	Number of children born last year													
	0		1		2		3		4		5		6	
	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent
1990 Census														
0	167,250	46.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
1	29,750	8.3	14,610	22.8	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
2	26,656	7.5	10,659	16.6	867	23.4	0	0.0	0	0.0	0	0.0	0	0.0
3	23,010	6.4	8,458	13.2	556	15.0	174	47.7	0	0.0	0	0.0	0	0.0
4	21,177	5.9	7,258	11.3	498	13.4	45	12.3	63	48.8	0	0.0	0	0.0
5	18,876	5.3	6,030	9.4	452	12.2	27	7.4	16	12.4	56	70.0	0	0.0
6	16,467	4.6	4,726	7.4	360	9.7	18	4.9	18	14.0	4	5.0	26	66.7
7	14,217	4.0	3,876	6.0	273	7.4	25	6.8	9	7.0	5	6.3	2	5.1
8	12,255	3.4	3,074	4.8	231	6.2	35	9.6	12	9.3	4	5.0	4	10.3
9	9,411	2.6	2,096	3.3	170	4.6	18	4.9	5	3.9	3	3.8	1	2.6
10	7,606	2.1	1,526	2.4	125	3.4	10	2.7	3	2.3	1	1.3	4	10.3
11	4,534	1.3	805	1.3	75	2.0	9	2.5	1	0.8	3	3.8	0	0.0
12	2,961	0.8	482	0.8	45	1.2	3	0.8	2	1.6	3	3.8	1	2.6
13	1,681	0.5	238	0.4	27	0.7	1	0.3	0	0.0	0	0.0	0	0.0
14	779	0.2	87	0.1	11	0.3	0	0.0	0	0.0	0	0.0	0	0.0
15	366	0.1	68	0.1	6	0.2	0	0.0	0	0.0	0	0.0	0	0.0
16	132	0.0	161	0.3	17	0.5	0	0.0	0	0.0	1	1.3	1	2.6
17	75	0.0	8	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
18	34	0.0	7	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0	0.0
Total	357,237	100	64,169	100	3,713	100	365	100	129	100	80	100	39	100
2000 Census														
0	177,477	37.4	0	0.0	0	0.0	0	0.0	0	0.0				
1	57,939	12.2	17,758	24.1	0	0.0	0	0.0	0	0.0				
2	50,724	10.7	13,750	18.7	1,220	38.7	0	0.0	0	0.0				
3	41,585	8.8	11,096	15.1	478	15.2	444	67.0	0	0.0				
4	35,028	7.4	8,791	11.9	373	11.8	74	11.2	241	78.8				
5	27,949	5.9	6,821	9.3	266	8.4	33	5.0	17	5.6				
6	23,458	4.9	5,220	7.1	224	7.1	45	6.8	22	7.2				
7	18,066	3.8	3,627	4.9	185	5.9	23	3.5	13	4.2				
8	14,381	3.0	2,690	3.6	168	5.3	15	2.3	8	2.6				
9	10,379	2.2	1,650	2.2	96	3.0	13	2.0	2	0.7				
10	7,442	1.6	1,088	1.5	73	2.3	7	1.1	1	0.3				
11	4,640	1.0	627	0.9	45	1.4	5	0.8	1	0.3				
12	2,791	0.6	340	0.5	16	0.5	3	0.5	1	0.3				
13	1,466	0.3	157	0.2	4	0.1	0	0.0	0	0.0				
14	783	0.2	60	0.1	4	0.1	1	0.2	0	0.0				
15	329	0.1	26	0.0	0	0.0	0	0.0	0	0.0				
16	156	0.0	7	0.0	1	0.0	0	0.0	0	0.0				
17	49	0.0	3	0.0	0	0.0	0	0.0	0	0.0				
18	11	0.0	0	0.0	0	0.0	0	0.0	0	0.0				
Total	474,653	100	73,711	100	3,153	100	663	100	306	100				
1992 DHS														
0	1,897	34.3	0	0.0	0	0.0	0	0.0						
1	724	13.1	361	24.2	0	0.0	0	0.0						
2	530	9.6	278	18.7	3	10.3	0	0.0						
3	461	8.3	215	14.4	4	13.9	0	0.0						
4	411	7.4	137	9.2	4	14.1	0	0.0						
5	335	6.0	130	8.7	4	13.8	1	100.0						
6	267	4.8	97	6.5	4	12.6	0	0.0						
7	250	4.5	91	6.1	5	17.3	0	0.0						
8	224	4.0	71	4.8	1	3.4	0	0.0						
9	165	3.0	46	3.1	3	9.0	0	0.0						
10	132	2.4	26	1.7	1	3.5	0	0.0						
11	72	1.3	27	1.8	1	2.2	0	0.0						
12	47	0.9	12	0.8	0	0.0	0	0.0						
13	16	0.3	2	0.1	0	0.0	0	0.0						
14	2	0.0	0	0.0	0	0.0	0	0.0						
15	2	0.0	0	0.0	0	0.0	0	0.0						
16	0	0.0	0	0.0	0	0.0	0	0.0						
17	0	0.0	0	0.0	0	0.0	0	0.0						
18	0	0.0	0	0.0	0	0.0	0	0.0						
Total	5,535	100	1,493	100	32	100	1	100						
1996 DHS														
0	2,082	32.1	0	0.0	0	0.0	0	0.0						
1	930	14.3	313	20.7	0	0.0	0	0.0						
2	696	10.7	296	19.6	4	14.0	0	0.0						
3	594	9.2	215	14.2	9	29.1	0	0.0						
4	460	7.1	193	12.8	5	18.4	0	0.0						
5	405	6.2	152	10.1	4	13.9	0	0.0						
6	352	5.4	105	7.0	1	4.5	1	100.0						
7	263	4.1	82	5.4	2	7.3	0	0.0						
8	235	3.6	59	3.9	0	0.0	0	0.0						
9	185	2.9	41	2.7	3	10.4	0	0.0						
10	128	2.0	26	1.8	0	0.0	0	0.0						
11	84	1.3	19	1.3	1	2.4	0	0.0						
12	31	0.5	6	0.4	0	0.0	0	0.0						
13	21	0.3	1	0.0	0	0.0	0	0.0						
14	8	0.1	0	0.0	0	0.0	0	0.0						
15	3	0.0	2	0.1	0	0.0	0	0.0						
16	1	0.0	0	0.0	0	0.0	0	0.0						
17	0	0.0	0	0.0	0	0.0	0	0.0						
18	0	0.0	0	0.0	0	0.0	0	0.0						
Total	6,479	100	1,511	100	30	100	1	100						
2001-02 DHS														
0	1,883	30.1	0	0.0	0	0.0	0	0.0						
1	878	14.1	303	21.8	0	0.0	0	0.0						
2	712	11.4	271	19.5	3	12.8	0	0.0						
3	620	9.9	215	15.5	4	19.2	0	0.0						
4	512	8.2	167	12.0	5	22.0	0	0.0						
5	411	6.6	130	9.3	3	13.9	0	0.0						
6	325	5.2	110	7.9	0	0.0	0	0.0						
7	263	4.2	71	5.1	2	9.6	1	100.0						
8	247	4.0	60	4.3	1	6.0	0	0.0						
9	165	2.6	30	2.1	1	3.0	0	0.0						
10	113	1.8	19	1.3	1	4.8	0	0.0						
11	65	1.0	11	0.8	1	3.0	0	0.0						
12	35	0.6	4	0.3	0	0.0	0	0.0						
13	7	0.1	1	0.0	1	5.5	0	0.0						
14	6	0.1	0	0.0	0	0.0	0	0.0						
15	4	0.1	0	0.0	0	0.0	0	0.0						
16	1	0.0	0	0.0	0	0.0	0	0.0						
17	0	0.0	0	0.0	0	0.0	0	0.0						
18	0	0.0	0	0.0	0	0.0	0	0.0						
Total	6,246	100	1,391	100	21	100	1	100						

Appendix 5.1.a: The codebook for Murdock's Ethnographic Atlas and frequency distributions for the Zambian traditional societies

The following tables show codes for 55 selected variables of Murdock's Ethnographic Atlas. The column number of each variable as it appears in the Atlas is in parenthesis. Accompanying the codes is the distribution of the 21 Zambian traditional societies across the various categories.

1. Traditional economic and political factors

1.1 Subsistence economy (Column 7)

Each of the five variables under this attribute is measuring the relative dependence of a society on each of the major subsistence activities in traditional societies.

Subsistence economy

Description (per cent dependence)	Code	Number of societies				
		Gathering	Hunting	Fishing	Ani. Husb.	Agriculture
No data	-9999	-	-	-	-	-
00 - 05	1	15	1	4	5	-
06 - 15	2	6	12	8	12	-
16 - 25	3	-	6	6	3	-
26 - 35	4	-	2	3	1	-
36 - 45	5	-	-	-	-	2
46 - 55	6	-	-	-	-	6
56 - 65	7	-	-	-	-	8
66 - 75	8	-	-	-	-	4
76 - 85	9	-	-	-	-	1
86 - 100	10	-	-	-	-	-

Note: *Zambian traditional societies reported to have been dependent on:*

Gathering…										
00-05 per cent:..	Chokwe	Iwa	Kaonde	Kunda	Lala	Lamba	Luchazi	Lunda	Luvale	Mambwe
	Ndembu	Ngoni	Shila	Tonga	Tumbuka					
06-15 per cent:..	Bemba	Chewa	Ila	Lozi	Luba	Nyanja				
Hunting…										
00-05 per cent:..	Ila									
06-15 per cent:..	Bemba	Iwa	Kunda	Lala	Luchazi	Lunda	Luvale	Mambwe	Ngoni	Nyanja
	Shila	Tonga								
16-25 per cent:..	Chewa	Lamba	Lozi	Luba	Ndembu	Tumbuka				
26-35 per cent:..	Chokwe	Kaonde								
Fishing…										
00-05 per cent:..	Ila	Iwa	Mambwe	Tumbuka						
06-15 per cent:..	Bemba	Chewa	Chokwe	Kunda	Lozi	Luchazi	Ndembu	Tonga		
16-25 per cent:..	Kaonde	Lala	Lamba	Luba	Ngoni	Nyanja				
26-35 per cent:..	Luvale	Lunda	Shila							
Animal husbandry…										
00-05 per cent:..	Bemba	Kaonde	Kunda	Lamba	Luvale					
06-15 per cent:..	Chewa	Chokwe	Iwa	Lala	Luba	Luchazi	Lunda	Ndembu	Ngoni	Nyanja
	Shila	Tumbuka								
16-25 per cent:..	Lozi	Mambwe	Tonga							
26-35 per cent:..	Ila									
Agriculture…										
36-45 per cent:..	Lozi	Luba								
46-55 per cent:..	Chewa	Chokwe	Kaonde	Lunda	Nyanja	Shila				
56-65 per cent:..	Ila	Kunda	Lala	Lamba	Luvale	Ndembu	Ngoni	Tonga		
66-75 per cent:..	Bemba	Luchazi	Mambwe	Tumbuka						
76-85 per cent:..	Iwa									

Frequency distributions show that all societies depended heavily on agriculture (more than 36 per cent) rather than gathering (less than 15 per cent). The Iwa, Bemba, Luchazi, Mambwe, and Tumbuka traditional societies depended more on agriculture (greater than 66 per cent) than other traditional societies. Compared with other Zambian societies, the Ila, Lozi, Mambwe and Tonga societies depended more on animal husbandry—an indication that their traditional economies were advanced.

1.2 Type and intensity of agriculture (Column 28)

Murdock coded information on type and intensity of agriculture in each traditional society using two variables—the intensity of cultivation and the principal crop produced.

Intensity of cultivation

Description	Code	Number of societies
No data	-9999	1
No agriculture	1	-
Casual agriculture	2	-
Extensive or shifting agriculture	3	19
Horticulture	4	-
Intensive agriculture	5	1
Intensive irrigated agriculture	6	-

Note: *Zambian traditional societies reported to have been practising:*

No information:... Shila

Extensive or shifting agriculture:.......................... Bemba Chewa Chokwe Ila Iwa Kaonde Kunda Lala Lamba Luba Luchazi Lunda Luvale Mambwe Ndembu Ngoni Nyanja Tonga Tumbuka

Intensive agriculture:.. Lozi

The table shows that apart from the Lozi, all traditional societies in Zambia cultivated their land extensively. Extensive or shifting cultivation involves farming a sizeable piece of land for two years before moving to another field and then moving back to the original field after a long fallow period (Murdock 1967a). The Lozi society practised intensive cultivation on permanent fields and land was fertilised using either compost or animal manure or crop rotation. Compared to other societies, the Lozi society had an advanced traditional economic system in this aspect.

Major crop type

Description	Code	Number of societies
No data	-9999	1
None or none specified	1	-
Tree fruits	2	-
Roots or tubers	3	3
Vegetables	4	-
Cereal grains	5	17
Non-food crops only e.g. cotton or tobacco	6	-

Note: *Zambian traditional societies reported to have been producing:*

No information:... Shila

Roots or tubers:... Chokwe Luba Lunda

Cereal grains:.. Bemba Chewa Ila Iwa Kaonde Kunda Lala Lamba Lozi Luchazi Luvale Mambwe Ndembu Ngoni Nyanja Tonga Tumbuka

Probably due to climate in their region of settlement, the Chokwe, Luba and Lunda are the only traditional societies reported to have been farming roots and tubers. Therefore, compared with other societies, the traditional economy of three societies was less advanced in this particular feature.

1.3 Type of animal husbandry (column 39)

Information on the reported main type of animal rearing and if at all societies employed these animals for cultivation and if they got milk from them summarises the type of animal farming that was present in each traditional society.

Most traditional societies in Zambia reared sheep and/or goats. The Kaonde and Lamba did not rear any large domestic animals. [None of the traditional societies in Zambia used domesticated animals to plough. Not adding any information, this variable is eliminated the data set]. Six traditional societies obtained milk from domesticated bovine animals—most likely cattle. Therefore, in this aspect of animal agriculture, the traditional economies of Chewa, Ila, Lozi, Mambwe, Ngoni and Tonga were advanced compared to other traditional societies.

Predominant type of animal husbandry

Description	Code	Number of societies
No data	-9999	1
Absence of large domestic animals	1	2
Sheep and/or goats only	2	12
Pigs are the only large domestic animals	3	-
Camels, alpacas, or llamas	4	-
Equine animals (horses, donkeys)	5	-
Deer (reindeer)	6	-
Bovine animals (cattle, water buffalo)	7	6

Note: *Zambian traditional societies reported to have:*
No information:... Shila
Not reared large domestic animals:...................... Kaonde Lamba
Reared sheep and/or goats only:......................... Bemba Chokwe Iwa Kunda Lala Luba Luchazi Lunda Luvale Ndembu Nyanja Tumbuka
Reared bovine animals (cattle, water buffalo):........ Chewa Ila Lozi Mambwe Ngoni Tonga

Plough cultivation

Description	Code	Number of societies
No data	-9999	1
Absent (no plough animals)	1	20
Not aboriginal but established at contact	2	-
Aboriginal prior to contact	3	-

Note: *Zambian traditional societies reported to have:*
No information:... Shila

Milking of domestic animals

Description	Code	Number of societies
No data	-9999	1
Little or no milking	1	14
Milked more often than sporadically	2	6

Note: *Zambian traditional societies reported to have:*
No information:... Shila
Not obtained milk from domestic animals:............. Bemba Chokwe Iwa Kaonde Kunda Lala Lamba Luba Luchazi Lunda Luvale Ndembu Nyanja Tumbuka
Obtained milk from domestic animals:.................. Chewa Ila Lozi Mambwe Ngoni Tonga

1.4 Mean size of local communities (column 31)

Mean size of local communities

Description	Code	Number of societies
No data	-9999	9
Fewer than 50	1	1
50-99	2	3
100-199	3	5
200-399	4	2
400-1000	5	1
1,000 without any town of more than 5,000	6	-
Towns of 5,000-50,000 (one or more)	7	-
Cities of more than 50,000 (one or more)	8	-

Note: *Zambian traditional societies reported to have a population mean size of:*
No information:... Chokwe Kaonde Lamba Luba Luchazi Luvale Nyanja Shila Tumbuka
Fewer than 50 people:...................................... Ndembu
50-99 people:... Kunda Lala Lozi
100-199 people:... Bemba Chewa Iwa Mambwe Ngoni
200-399 people:... Ila Tonga
400-1000 people:... Lunda

The mean local community size of the Ila, Tonga and Lunda traditional societies is reported to have been between 200 to 1000 people. [However, it is not possible to conclude much from this variable because most traditional societies are missing information on this aspect resulting in its exclusion from the database.]

1.5 Settlement patterns (column 30)

Settlement patterns

Description	Code	Number of societies
No data	-9999	1
Normadic	1	-
Seminomadic	2	-
Semisendentary	3	2
Compact but impermanent settlements	4	3
Neighbourhoods of dispersed family homesteads	5	1
Separate hamlets forming a single community	6	1
Compact and relatively permanent settlements	7	13
Compact settlements	8	-

Note: *Zambian traditional societies reported to have settlement patterns that are:*

No information:... Shila
Semisendentary:... Ila Lozi
Compact but impermanent:............................... Bemba Luchazi Ndembu
Neighbourhoods of dispersed family homesteads:.. Nyanja
Separate hamlets forming a single community:...... Tonga
Compact and relatively permanent:..................... Chewa Chokwe Iwa Kaonde Kunda Lala Lamba Luba Lunda Luvale Mambwe Ngoni Tumbuka

Most Zambian traditional societies settled in compact and permanent establishments. The Lozi and Ila traditional societies lived in semi-sedentary communities. This is a form of settlement that involves most members of the community moving to other settlements that are considered conducive only during a specific season of the year (Murdock 1967a). The Lozi mark this shifting with a ceremony called Kuomboka (coming out of water) when they move from the flood plains to higher ground during the rainy season (Gluckman 1968). The Bemba, Luchazi and Ndembu had villages whose location shifted regularly every few years. In the aspect of settlement patterns, seven societies were less integrated compared with most societies who lived in compact and permanent establishments.

1.6 Jurisdictional hierarchy (column 32)

Murdock coded the Jurisdictional hierarchy of each society by specifying the number of hierarchy levels within a community and compared with other communities.

Jurisdictional hierarchy of local community

Description	Code	Number of societies
No data	-9999	1
Two levels (theoretical minimum, e.g., family and band)	1	-
Three levels	2	8
Four levels (e.g., beyond independent nuclear families)	3	12

Note: *Zambian traditional societies whose local community jurisdictional hierarchy was reported to have been at:*

No information:... Shila
Three levels:... Chokwe Iwa Lala Lamba Lozi Mambwe Ndembu Ngoni
Four levels:.. Bemba Chewa Ila Kaonde Kunda Luba Luchazi Lunda Luvale Nyanja Tonga Tumbuka

Jurisdictional hierarchy beyond local community

Description	Code	Number of societies
No data	-9999	1
No levels (no political authority beyond community)	1	1
One levels (e.g., petty chiefdoms)	2	7
Two levels (e.g., larger chiefdoms)	3	9
Three levels (e.g., states)	4	3
Four levels (e.g., large states)	5	-

Note: *Zambian traditional societies whose jurisdictional hierarchy beyond the local community was reported to have been at:*

No information:... Shila
No levels:... Tonga
One levels (e.g., petty chiefdoms):...................... Ila Kaonde Lala Luchazi Luvale Mambwe Nyanja
Two levels (e.g., larger chiefdoms):..................... Bemba Chewa Chokwe Iwa Kunda Lamba Lunda Ndembu Shila
Three levels (e.g., states):................................ Lozi Luba Ngoni

Within a local community, the jurisdictional level of most traditional societies in Zambia was at a theoretical maximum of four levels. This implies that traditional Zambian societies were between a complex nuclear family and a state. Murdock (1967b) or Gray's (1999b) do not provide a clear description of level three. However, obviously societies in this category were less organised compared with societies whose jurisdictional hierarchy was at level four.

Beyond the local community, most societies were either larger or petty chiefdoms. The most politically advanced Zambian traditional societies were the Luba, Lozi and Ngoni at three levels (i.e. equivalent to states). The Tonga people did not have jurisdictional hierarchy outside the local community.

1.7 Succession to the office of local headman (column 73)

This variable shows the rules that applied when selecting a successor to the office of the local headman (Murdock 1967b). It is independent of the rules that applied when selecting a successor to a higher political office. The additional variable specifies the rules applied if succession is hereditary.

Succession to the office of local headman

Description	Code	Number of societies
No data	-9999	3
Absence of any such office	1	-
Patrilineal heir	2	4
Matrilineal heir	3	14
Seniority or age, nonhereditary	4	-
Influence, wealth or social status, nonhereditary	5	-
Appointment by higher authority, nonhereditary	6	-
Informal consensus, nonhereditary	7	-
Election or other formal consensus, nonhereditary	8	-

Note: *Zambian traditional societies who are reported to succeed to the office of local headman through:*

No information:	Mambwe	Ngoni	Shila							
The patrilineal heir:	Iwa	Lozi	Luba	Tumbuka						
The matrilineal heir:	Bemba	Chewa	Chokwe	Ila	Kaonde	Kunda	Lala	Lamba	Luchazi	Lunda
	Luvale	Ndembu	Nyanja	Tonga						

Succession to the office of the local headman was hereditary in all Zambian traditional societies and mostly through the matri-line. Only the Iwa, Luba, Lozi and Tumbuka traditional societies succeeded through the patri-line.

Succession to the office of local headman: type of hereditary succession

Description	Code	Number of societies
No data	-9999	3
Absence of any such office	1	-
Hereditary by other patrilineal heir (e.g., brother)	2	2
Hereditary by son (patrilineal)	3	2
Hereditary by other matrilineal heir (e.g., brother)	4	9
Hereditary by a sister's son (matrilineal)	5	5
Nonhereditary	6	-

Note: *Zambian traditional societies according to reported type of hereditary succession the office of local headman:*

No information:	Mambwe	Ngoni	Shila						
Patrilineal heir - other relatives:	Iwa	Luba							
Patrilineal heir - son:	Lozi	Tumbuka							
Matrilineal heir - other relatives:	Bemba	Chewa	Kaonde	Kunda	Lala	Lunda	Ndembu	Nyanja	Tonga
Matrilineal heir - sister's son:	Chokwe	Ila	Lamba	Luchazi	Luvale				

Two traditional societies (Lozi and Tumbuka) that succeeded through the patri-line did so through the son while for the Iwa and Luba it was through any other patrilineal heir other than the son. Of the 14 societies succeeding through the matrilineal heir, nine societies succeeded through some other matrilineal heir other than the son while the rest (Chokwe, Ila, Lamba, Luchazi and Luvale) succeeded through the sister's son. [This variable is a refined version of the previous one and so the former is dropped from the data set because it is repeating the same information but crudely.]

1.8 Class stratification (column 67)

Information on the degree and class division (not based on politics or religion) was coded using two variables—general and endogamy class stratification (Murdock 1967b). Both variables have a primary norm as well as an alternative (secondary) if any. [For the latter variable (not shown), all societies are reported not to have stratified classes based on endogamy and no society is reported to have had a secondary feature of general class division. These three variables are dropped from the analysis because they are not providing any additional information]. The only variable retained is discussed below.

Description	Code	Number of societies	
		Primary	Secondary
No data	-9999	3	3
No secondary type or absence of stratification	0	na	18
Absent among freemen	1	8	-
Dual (hereditary aristocracy)	2	9	-
Elite (based on control of land or other resources)	3	-	-
Wealth distinctions	4	1	-
Complex (social classes)	5	-	-

Note: *Zambian traditional societies according to reported type of class classification (primary):*

No information:.. Mambwe Ndembu Shila (for both types - primary and secondary)
Absent among freemen:.................................. Chewa Kaonde Kunda Lamba Luchazi Luvale Nyanja Tonga
Dual (hereditary aristocracy):........................... Bemba Chokwe Iwa Lala Lozi Luba Lunda Ngoni Tumbuka
Wealth distinctions:...................................... Ila

In eight societies, class division is reported to be absent among the freemen i.e. excluding slaves. Nine societies practiced dual class classification. This is classifying a society into two groups—hereditary aristocracy and a lower-class of ordinary commoners or freemen (Murdock 1967b). The Ila is the only traditional society that practiced class stratification based on wealth. Therefore, the Ila society was advanced in this aspect.

1.9 Slavery (column 71)

Murdock's codes show the type if slavery existed when collecting ethnographic data. It also shows if slavery existed before ethnographic data collection.

Type of slavery

Description	Code	Number of societies
No data	-9999	3
Absence or near absence	1	-
Reported but type not identified	2	6
Incipient or nonhereditary	3	5
Hereditary and socially significant	4	7

Note: *Zambian traditional societies according to reported type of slavery that existed:*

No information:.. Kunda Luchazi Mambwe
Reported but type not identified:...................... Chewa Chokwe Kaonde Lunda Ndembu Tonga
Incipient or nonhereditary:............................. Bemba Iwa Lamba Ngoni Tumbuka
Hereditary and socially significant:.................... Ila Lala Lozi Luba Luvale Nyanja Shila

Former presence of slavery

Description	Code	Number of societies
No data	-9999	3
Formerly absent or exists currently	1	6
Formerly present but not currently	2	12

Note: *Zambian traditional societies according to reported status of slavery:*

No information:.. Kunda Luchazi Mambwe
Formerly absent or exists currently:.................. Chokwe Lamba Lozi Luvale Nyanja Shila
Formerly present but not currently:................... Bemba Chewa Ila Iwa Kaonde Lala Luba Lunda Ndembu Ngoni Tonga Tumbuka

Slavery existed in almost all Zambian traditional societies. Literature did not identify the type of slavery in six Zambian traditional societies. In five societies, it was non-hereditary or incipient i.e. the status was temporary. However, for seven societies (Ila, Lala, Lozi, Luba, Luvale, Nyanja and Shila), it was of modest social significance. During data collection, it was still present among the Chokwe, Lamba, Lozi, Luvale, Nyanja and Shila (Murdock 1967b). This makes the Lozi, Luvale, Nyanja and Shila advanced in this aspect of traditional economic and political features.

2. Social and community attributes

Social and community information is the most complete compared with the other ethnographic information. This is because it was the first main focus of cultural anthropology (Goodenough 1964). Being the first and more detailed to be collected it has the least problems but rather duplicative.

2.1 Lineage kin groups and exogamy (columns 20 and 22)

This information includes kinship exogamy if this was different from the main largest kinship lineage (Murdock 1967b).

Lineage system

Description	Code	Number of societies			
		Patrilineal		Matrilineal	
		Kin groups	Exogamy	Kin groups	Exogamy
No data	-9999	-	-	-	-
Sibs, i.e., lineages in multiple communities	1	3	-	15	-
Phratries, i.e., three or more maximally extended sibs	2	-	-	-	-
Moieties	3	-	-	-	-
Lineages in a single community	4	2	-	-	2
Patrilineal/Matrilineal exogamy, but not kin groups	5	-	-	-	-
None	6	16	-	6	-
Not applicable	9	na	21	na	19

Note: *Zambian traditional societies according to reported type of kinship lineage:*

Patrilineal kin groups…

Sibs, i.e., lineages in multiple communities:………. Iwa Mambwe Tumbuka

Lineages in a single community:…………………….Ila Luba

None:……………………………………………….Bemba Chewa Chokwe Kaonde Kunda Lala Lamba Lozi Luchazi Lunda Luvale Ndembu Ngoni Nyanja Shila Tonga

Matrilineal kin groups…

Sibs, i.e., lineages in multiple communities:………. Bemba Chewa Chokwe Ila Kaonde Kunda Lala Lamba Luchazi Lunda Luvale Ndembu Nyanja Shila Tonga

None:……………………………………………….Iwa Lozi Luba Mambwe Ngoni Tumbuka

Matrilineal exogamy…

Lineages in a single community:…………………….Lunda Ndembu

Not applicable:…………………………………….Bemba Chewa Chokwe Ila Iwa Kaonde Kunda Lala Lamba Lozi Luba Luchazi Luvale Mambwe Ngoni Nyanja Shila Tonga Tumbuka

The table shows that they majority (71.4 per cent) of traditional societies in Zambia traced matrilineal kinships and lived in multiple communities. The Ndembu and Lunda (Luapula) also followed exogamy matrilineal kinship and lived in single communities. The Iwa, Luba, Mambwe and Tumbuka recognised only patrilineal kinship while the Ila traced both kinship lineages. The Lozi and Ngoni had no defined kinship lineage. [There are no patrilineal societies in Zambia that had any prominent exogamy kin groups and hence this variable is dropped from the data set.] Therefore, the Zambian societies that were flexible in recognising kinship lineages were the Lozi and Ngoni while the Iwa, Mambwe and Tumbuka were the most rigid.

2.2 Cognatic kin groups (column 24)

Cognatic kin groups and additional information on types of kindreds and ramages is available for societies that had a secondary cognatic kin group.

As inferred from the presence of unilineal descent and implied by the absence of any reported kindreds or cognatic kin groups—ambilineal, matrilineal or patrilineal—almost all traditional societies in Zambia did not have any particular cognatic kin group (Murdock 1967b). This means that all individuals in a lineage recognised one another based on belonging to the same descent system. The data reveals that the Lozi society had an ancestor oriented ambilineal secondary cognatic kin group (ramages). On the other hand, the Ngoni had a quasi-cognatic lineage (i.e. based on affiliation and not descent). The Lozi and the Bemba were ego-oriented bilateral cognatic kin societies (kindreds). This implies that the Lozi, Bemba and Ngoni were family rather than community organised.

Cognatic kin groups

Description	Code	Number of societies: Primary	Number of societies: Secondary
No data	-9999	-	-
Not applicable/no secondary cognatic groups	0	na	20
Unilineal descent groups	1	18	na
Bilateral descent	2	-	na
Ambilineal descent: lacking true ramages	3	-	na
Exogamous ramages	4	-	na
Ramages: ancestor oriented ambilineal groups	5	1	-
Quasi-lineages: filiation based, not descent	6	1	na
Kindreds: ego-oriented bilateral kin groups	7	1	1

Note: *Zambian traditional societies according to reported type of cognatic kin group:*

Primary...

Unilineal descent groups:................................	Chewa	Chokwe	Ila	Iwa	Kaonde	Kunda	Lala	Lamba	Luba	Luchazi
	Lunda	Luvale	Mambwe	Ndembu	Nyanja	Shila	Tonga	Tumbuka		
Ramages: ancestor oriented ambilineal groups:....	Lozi									
Quasi-lineages: filiation based, not descent:.........	Ngoni									
Kindreds: ego-oriented bilateral kin groups:..........	Bemba									

Secondary...

Not applicable:..	Bemba	Chewa	Chokwe	Ila	Iwa	Kaonde	Kunda	Lala	Lamba	Luba
	Luchazi	Lunda	Luvale	Mambwe	Ndembu	Ngoni	Nyanja	Shila	Tonga	Tumbuka
Kindreds: ego-oriented bilateral kin groups:..........	Lozi									

2.3 Community organisation (column 19)

Information on localised kin groups and prevailing marital structure (endogamy or exogamy) on each Zambian traditional society is available in Murdock's Ethnographic Atlas.

Community organisation

Description	Code	Number of societies
No data	-9999	2
Segmented communities, localized clans, local exogamy	1	-
Segmented communities without local exogamy	2	1
Clan communities, or clan barrios	3	6
Exogamous communities, not clans	4	2
Demes, not segregated into clan barrios	5	-
Agamous communities	6	10

Note: *Zambian traditional societies according to reported community organisation:*

No information:..	Mambwe	Shila								
Segmented communities without local exogamy:...	Chewa									
Clan communities, or clan barrios:......................	Chokwe	Iwa	Lala	Luchazi	Luvale	Ndembu				
Exogamous communities, not clans:...................	Kaonde	Tumbuka								
Agamous communities:....................................	Bemba	Ila	Kunda	Lamba	Lozi	Luba	Lunda	Ngoni	Nyanja	Tonga

The information shows that six communities organised their communities in clans consisting of a single localised exogamous kin group with a possibility of further division into clan barrios. The Kaonde and Tumbuka lived in exogamous communities with clans that were not specific while one society lived in a divided community that had no local exogamy. However, most societies lived in non-organised communities—i.e. non-localised clans without any marked tendency towards either local exogamy or local endogamy. At community level, these societies lived in the simplest (agamous) family structures showing a possibility of strong immediate family bonds.

2.4 Marital residence (column 16)

Marital residence information is divided in marital residence during the first few years of marriage, transfer of marital residence after the first few years and residence during latter years of marriage. The latter two variables are split into primary and alternative marital residence.

Marital residence with kin: first years

Description	Code	Number of societies
No data	-9999	-
Virilocal: with husband's parents	1	-
Ambilocal: either parents	2	-
Uxorilocal: with wife's parents	3	12
Not different from later years	4	9
No establishment of common household	5	-

Note: *Zambian traditional societies according to reported type of marital residence in the first years of marriage:*

Uxorilocal: with wife's parents:........................... Bemba Chewa Kaonde Kunda Lala Lamba Lozi Lunda Mambwe Ndembu Shila Tonga

Not different from later years:............................Chokwe Ila Iwa Luba Luchazi Luvale Ngoni Nyanja Tumbuka

Marital home information shows that couples in most Zambian traditional societies lived in uxorilocal residence in their first few years of marriage—i.e. the husband lived with the wife's immediate family (Murdock 1967b). Unlike strict matrilocal marital residence, this arrangement excludes the wife's extended family from matters of her marriage. In the remaining societies, marital home in the first years of marriage was not different from that experienced in the latter years of marriage therefore making it less complicated.

Transfer of marital residence at marriage: after first years

Description	Code	Number of societies	
		Primary	Alternate
No data	-9999	-	-
Wife to husband's group	1	7	4
Couple to either group or neolocal	2	1	3
Husband to wife's group	3	13	7
No common residence	4	-	-
No alternative form	5	na	7

Note: *Zambian traditional societies according to reported provision for transfer of marital residence after the first years of marriage:*

Primary...

Wife to husband's group:.................................. Chewa Iwa Lozi Luba Mambwe Nyanja Tumbuka

Couple to either group or neolocal:..................... Tonga

Husband to wife's group:................................ Bemba Chokwe Ila Kaonde Kunda Lala Lamba Luchazi Lunda Luvale Ndembu Ngoni Shila

Secondary...

Wife to husband's group:.................................. Bemba Kaonde Luvale Ndembu

Couple to either group or neolocal:..................... Lala Lunda Tonga

Husband to wife's group:................................ Chewa Ila Lamba Lozi Ngoni Nyanja Shila

Not applicable:... Chokwe Iwa Kunda Luba Luchazi Mambwe Tumbuka

In seven traditional societies found in Zambia—mostly those that traced through patrilineal kinship or did not follow any kinship lineage (variable 3.1: lineage kin groups)—the wife had to join the husband's family. In most societies, however, the husband moved to the wife's family after the first few years of marriage. As an alternative, the Bemba, Kaonde, Luvale and Ndembu (matrilineal societies) required the wife to move to the husband's family. The Lala, Lunda (Luapula) and Tonga societies had a neutral alternative arrangement because either the wife or husband could move.

Reports point out that couples in most traditional societies were living in avunculocal marital residence in the latter years of their marriage. In this type, marital residence is with or near the maternal uncle or any other male matrilineal relative of the husband (Murdock 1967b). In three societies (Ila, Lozi and Ngoni), couples lived in virilocal marital residence—this is a patrilocal marital residence but without interference from the husband's extended family in his marriage (Murdock 1967b). Among the Iwa, Luba, Mambwe and Tumbuka, marital residence was strictly patrilocal and strictly matrilocal among the Nyanja society. The Bemba, Kunda and Lamba had a choice of avunculocal or uxorilocal marital residence and the Tonga couples lived in patrilocal marital residence. Some societies had an alternative of virilocal, uxorilocal, avunculocal or neolocal marital residence.

[For both transfer of marital residence after the first few years and residence during latter years of marriage, the alternatives variables are removed from the data set because they are providing information that is conflicting that provided by primary variables.]

Marital residence with kin: after first years

Description	Code	Number of societies	
		Primary	Alternate
No data	-9999	-	-
No alternative form	0	na	7
Patrilocal	1	4	-
Avunculocal	2	9	3
Virilocal	3	3	4
Optionally patrilocal or avunculocal (or virilocal)	4	1	-
Optionally uxorilocal or avunculocal	5	3	-
Ambilocal	6	-	-
Uxorilocal	7	-	4
Matrilocal	8	1	-
Neolocal	9	-	3
No common residence	10	-	-

Note: *Zambian traditional societies according to reported marital residence in the latter years of marriage:*

Primary…

Patrilocal:	Iwa	Luba	Mambwe	Tumbuka					
Avunculocal:	Chewa	Chokwe	Kaonde	Lala	Luchazi	Lunda	Luvale	Ndembu	Shila
Virilocal:	Ila	Lozi	Ngoni						
Optionally patrilocal (or virilocal) or avunculocal:	Tonga								
Optionally uxorilocal or avunculocal:	Bemba	Kunda	Lamba						
Matrilocal:	Nyanja								

Secondary…

No alternate:	Chokwe	Iwa	Kunda	Luba	Luchazi	Mambwe	Tumbuka
Avunculocal:	Ila	Lozi	Nyanja				
Virilocal:	Bemba	Kaonde	Luvale	Ndembu			
Neolocal:	Lala	Lunda	Tonga				
Uxorilocal:	Chewa	Lamba	Ngoni	Shila			

In summary, marital residence for the entire duration of marriage among the Iwa, Luba, Mambwe and Tumbuka (all patrilineal societies) was complicated and most likely community centred rather than family based.

2.5 Inheritance of real property (column 74)

Information on actual rules and distribution of property in traditional societies is available in Murdock's Ethnographic Atlas.

Inheritance rule for real property (land)

Description	Code	Number of societies
No data	-9999	4
Absence of individual property rights or rules	1	1
Other patrilineal heirs (e.g., younger brothers)	2	2
Other matrilineal heirs (e.g., younger brothers)	3	9
Matrilineal (sister's sons)	4	2
Patrilineal (sons)	5	3
Children, with daughters receiving less	6	-
Children, equally for both sexes	7	-

Note: *Zambian traditional societies according to reported Inheritance rule for real property (land):*

No information:	Lamba	Luvale	Mambwe	Ndembu					
Absence of individual property rights or rules:	Ila								
Other patrilineal heirs (e.g., younger brothers):	Iwa	Luba							
Other matrilineal heirs (e.g., younger brothers):	Bemba	Chewa	Kaonde	Kunda	Lala	Lunda	Nyanja	Shila	Tonga
Matrilineal (sister's sons):	Chokwe	Luchazi							
Patrilineal (sons):	Lozi	Ngoni	Tumbuka						

Rules governing property transmission in traditional societies were similar to observed kinship lineage, that is, patrilineal societies inherited property through the male line and matrilineal through the female line. For most societies, the rules were along matrilineal heirs rather than the immediate family. The inheritance rules for the Lozi and Ngoni (no reported kinship lineage) as well as the Tumbuka (patrilineal) were along the patrilineal sons (immediate family). Those for the remaining patrilineal societies (Luba and Iwa) were along other patrilineal heirs. For the Chokwe and Luchazi, the rules were along matrilineal kins (sister's sons). The Ila did not have any rules governing property transmission. It seems societies with less organised kinship lineage (Lozi, Ngoni, Tumbuka, Chokwe, and Luchazi) passed on property within the nuclear family regardless of their kinship lineage.

Inheritance distribution for real property (land)

Description	Code	Number of societies
No data	-9999	7
Absence of inheritance of real property	1	1
Primogeniture (to the senior individual)	2	8
Equal or relatively equal	3	-
Exclusively or predominantly to the one adjudged best	4	5
Ultimogeniture (to the junior individual)	5	-

Note: *Zambian traditional societies according to reported Inheritance distribuiton for real property (land):*

No information:... Chewa Lamba Luchazi Luvale Mambwe Ndembu Ngoni

Absence of inheritance of real property:............... Ila

Primogeniture (to the senior individual):............... Bemba Chokwe Iwa Kaonde Lala Luba Nyanja Tumbuka

Predominantly to the one adjudged best:............. Kunda Lozi Lunda Shila Tonga

Most societies (eight) gave out individual property to senior members of the kinship lineage. In five societies, property was given to individuals adjudicated as the best qualified to inherit property. When individuals give out property at their discretion, it was given to immediate family members especially children. The Kunda, Lozi, Lunda, Tonga and Shila gave out their property to immediate family members. [This variable is however removed from the data set because information is missing on seven of the 21 Zambian traditional societies.]

2.6 Sex delineated participation in provision of subsistence (columns 54 - 62)

Murdock (1967b) coded sex described participation or specialisation on eleven attributes in pre-industrial societies. However, subsistence economies of traditional societies relate to five only. Further, Chapter 4 associates them with attributes underlying traditional reproduction.

Sex delineated participation in subsistence provision

Description	Code	Number of societies				
		Gathering	Hunting	Fishing	Ani. Husb.	Agriculture
No data	-9999	12	5	7	13	5
Males only or almost alone	1	-	16	4	5	-
Males appreciably more	2	-	-	8	2	1
Differentiated but equal participation	3	-	-	1	-	-
Absent or unimportant activity	4	3	-	1	1	-
Equal participation, no marked differentiation	5	-	-	-	-	2
Irrelevance of gender, esp. industrialised production	6	-	-	-	-	-
Females appreciably more	7	2	-	-	-	13
Females only or almost alone	8	4	-	-	-	-

Note: *Zambian traditional societies according reported sex-delineated participation in provision of subsistence:*

Gathering…

No information:... Chokwe Iwa Kaonde Kunda Lala Luchazi Lunda Luvale Mambwe Nyanja Shila Tumbuka

Absent or unimportant activity:.......................... Lamba Ndembu Ngoni

Females appreciably more:.............................. Bemba Lozi

Females only or almost alone:.......................... Chewa Ila Luba Tonga

Hunting…

No information:... Kaonde Kunda Luchazi Mambwe Shila

Males only or almost alone:.............................. Bemba Chewa Chokwe Ila Iwa Lala Lamba Lozi Luba Lunda Luvale Ndembu Ngoni Nyanja Tonga Tumbuka

Fishing…

No information:... Iwa Kaonde Kunda Luchazi Mambwe Shila Tumbuka

Males only or almost alone:.............................. Chewa Ila Lunda Nyanja

Males appreciably more:.................................. Bemba Chokwe Lala Lamba Lozi Luba Ndembu Tonga

Differentiated but equal participation:................. Luvale

Absent or unimportant activity:.......................... Ngoni

Animal husbandry…

No information:... Bemba Chokwe Kaonde Kunda Luba Luchazi Lunda Luvale Mambwe Ndembu Nyanja Shila Tumbuka

Males only or almost alone:.............................. Ila Iwa Lozi Ngoni Tonga

Males appreciably more:.................................. Chewa Lala

Absent or unimportant activity:.......................... Lamba

Agriculture…

No information:... Kaonde Kunda Luchazi Mambwe Shila

Males appreciably more:.................................. Luvale

Equal participation, no marked differentiation:....... Iwa Lamba

Females only or almost alone:........................... Bemba Chewa Chokwe Ila Lala Lozi Luba Lunda Ndembu Ngoni Nyanja Tonga Tumbuka

[Information on fishing, gathering and animal agriculture for more than a third of Zambian traditional societies is missing and therefore these variables are removed from the data set.]

Reports show that only males took part in hunting in all societies with information on this feature. In most societies, more males took part in fishing while only males took part in fishing in five traditional societies of Zambia. Both male and female Luvales took part fishing but this was unimportant among the Ngoni. Reports point out that more females took part in agriculture in most societies. More males took part in agriculture among the Luvale traditional society but equally among the Iwa and Lamba societies.

2.7 Kinship terminology for cousins (column 27)

Information on perception of first cousins in traditional societies is available in Murdock's Ethnographic Atlas.

Kinship terminology for cousin

Description	Code	Number of societies
No data	-9999	3
Crow: FaSiCh equated with Fa or FaSi and/or MoBrCh with Ch or BrCh	1	-
Omaha: MoBrCh equated with MoBr or Mo and/or FaSiCh with SiCh or Ch	2	-
Iroquois: FaSiCh equated with MoBrCh but differentiated from siblings and parallel cousins	3	17
Sudanese: FaSiCh and MoBrCh distinguished alike from siblings, parallel cousins and each other	4	-
Mixed or variant patterns not adequately represented by any of the foregoing groups	5	-
Descriptive or derivative, rather than elementary, terms employed for all cousins	6	-
Eskimo: FaBrCh, FaSiCh, MoBrCh and MoSiCh all equated with each other but diff. from siblings	7	-
Hawaiian: all cousins equated with siblings or called by terms derivative from those for siblings	8	1

Notes: *FaSiCh is Father's sisters' children; MoBrCh is Mother's brothers' children; FaBrCh is Father's brothers' children and MoSiCh is Mother's sisters' children*
FaSi is Father's sisters; BrCh is Brother's children; MoBr is Mother's brothers, and SiCh is Sister's children
Fa is Father; Mo is Mother, and Ch is Children

Zambian traditional societies according to reported terminologies used by kinships to address first cousins:

No information:	Iwa	Luba	Mambwe							
Iroquois:	Bemba	Chewa	Chokwe	Ila	Kaonde	Kunda	Lala	Lamba	Luchazi	Lunda
	Luvale	Ndembu	Ngoni	Nyanja	Shila	Tonga	Tumbuka			
Hawaiian:	Lozi									

Individuals in all Zambian traditional societies, apart from the Lozi, distinguished between cross cousins (father's sisters' children and mother's brothers' children) as well as siblings and parallel cousins (father's brothers' children and mother's sisters' children). However, the Lozi society regarded siblings and all cousins as equal.

2.8 High Gods (column 34)

Murdock (1967b) coded how traditional societies made out God's role in human affairs. This information is important because traditional societies decided based on what pleased God—including reproductive choices.

High Gods

Description	Code	Number of societies
No data	-9999	6
Supportive of human morality	1	-
Active in human affairs but not supportive of morality	2	4
Not active in human affairs	3	9
Absent or not reported	4	2

Note: *Zambian traditional societies according to reported belief in the High Gods:*

No information:	Chokwe	Kaonde	Kunda	Ndembu	Nyanja	Shila			
Active but not supportive of morality:	Bemba	Lunda	Tonga	Tumbuka					
Not active in human affairs:	Ila	Iwa	Lala	Lamba	Lozi	Luba	Luchazi	Luvale	Mambwe
Absent or not reported:	Chewa	Ngoni							

Reports show that most traditional societies in Zambia believed that God is not active in human affairs. However, the four societies believed that God was active in human affairs but not sympathetic of their morality. The Chewa and Ngoni did not believe God existed.

3. Courtship and sexual governance attributes

These attributes are important in this study of factors underlying reproduction in traditional societies because of their direct relationship to sexual unions and matters. However, information on some of these variables is missing for most Zambian societies.

3.1 Norms of premarital sex behaviour of girls (column 78)

Norms of premarital sexual behaviour of girls

Description	Code	Number of societies
No data	-9999	14
Permitted and not subject to sanctions	1	4
Permitted, but not sanctioned unless pregnancy results	2	-
Precluded by early marriages (at or before puberty)	3	3
Not permited, but trial marriages permitted	4	-
Not permitted, but weakly sanctioned	5	-
Insistence on virginity	6	-

Note: *Zambian traditional societies according to reported prescibed norms of premarital sexual behaviour of girls:*

No information:... Chokwe Iwa Kaonde Kunda Lamba Lozi Luchazi Lunda Mambwe Ndembu Ngoni Nyanja Shila Tumbuka

Permitted and not subject to sanctions:................ Ila Lala Luvale Tonga

Precluded by early marriages:........................... Bemba Chewa Luba

Reports show that four traditional societies in Zambia allowed premarital sex among adolescent young women without any reservations. Three societies precluded premarital sex norms by allowing women to marry at young ages. [It is difficult to compare norms of premarital sexual behaviour of young women between Zambian traditional societies because most of them are missing information on this variable and therefore, it is removed from the data set.]

3.2 Male genital mutilations (column 37)

Information on optional non-sporadic male circumcision in traditional societies and the age at which it mostly occurred is available in Murdock's Ethnographic Atlas.

Male genital mutilations

Description	Code	Number of societies
No data	-9999	5
Absent	1	13
Normal age unclear	2	-
After 50 years	3	-
25 to 50 years	4	-
16 to 25 years	5	-
11 to 15 years	6	3
6 to 10 years	7	-
2 to 5 years	8	-
Two months to two years	9	-
Within two months after birth	10	-

Note: *Zambian traditional societies according to reported prescibed male genital mutilations:*

No information:... Chokwe Kunda Lala Ndembu Shila

Absent:... Bemba Chewa Ila Iwa Kaonde Lamba Lozi Luba Mambwe Ngoni Nyanja Tonga Tumbuka

At between 11 to 15 years:................................ Luchazi Lunda Luvale

Reports show that most Zambian traditional societies did not perform male circumcision. Three societies performed circumcision of adolescent males at ages between 11 and 15 years.

3.3 Segregation of adolescent boys (column 38)

Information on the degree and mode of segregating adolescent boys in traditional societies is available in Murdock's Ethnographic Atlas.

Segregation of adolescent boys

Description	Code	Number of societies
No data	-9999	12
Absent	1	-
Partial	2	3
With relatives outside nuclear family (compl. Seg.)	3	5
With non-relatives (complete segregation)	4	-
With peers (complete segregation)	5	1

Note: *Zambian traditional societies according to the reported extent of segregating adolescent males:*

No information:	Iwa	Kaonde	Kunda	Lala	Lamba	Lozi	Luba	Lunda	Mambwe	Nyanja
	Shila	Tumbuka								
Partial:	Chewa	Ila	Tonga							
Complete seg. with extented family relatives:	Bemba	Chokwe	Luchazi	Luvale	Ndembu					
Complete seg. with fellow peers:	Ngoni									

Reports show that three societies performed partial segregation of adolescent males. Partial segregation entails an adolescent male child living or eating with its natal family but sleeping elsewhere (Murdock 1967b). Six societies isolated their adolescent male children from their immediate families by moving them to relatives outside the nuclear family or to their peers. [This variable is removed from the data set because of missing information].

3.4 Cousin marriage (column 25)

Murdock (1967b) coded information on the rules and practises governing possible marriages between first and second cousins in traditional societies using four variables namely type as well as subtype of cousin marriages allowed and preferred.

Reports show that most Zambian traditional societies allowed cross cousins (father's sisters' children and mother's brothers' children) marriages but not between parallel cousins (for example, father's brothers' children and mother's sisters' children). The Lozi traditional society did not allow any form of cousin marriages. Compared with other societies the Lozi, Lala and Ila had strict cousin marriage controls.

Type of cousin marriages allowed

Description	Code	Number of societies
No data	-9999	1
Quadrilateral: any first cousin allowed	1	-
Trilateral: any first cousin not ortho-cousin or lineage mate	2	-
Duolateral: either FaBrDa or FaSiDa	3	-
Duolateral: either MoBrDa or MoSiDa	4	-
Duolateral: either FaBrDa or MoBrDa	5	-
Duolateral: either FaSiDa or MoSiDa	6	-
Duolateral: either MoBrDa or FaSiDa	7	16
Patrilateral cross-cousin: FaSiDa only	8	1
Matrilateral cross-cousin: MoBrDa only	9	1
Nonlateral evidence only for first cousins	10	1
Nonlateral: no first cousins, all second cousins	11	-
Nonlateral: no first cousins, some second cousins	12	-
Nonlateral: no first or second cousins	13	1

Note: *Zambian traditional societies according reported type of cousin marriages allowed:*

No information:	Mambwe									
Duolateral: either MoBrDa or FaSiDa:	Bemba	Chewa	Chokwe	Iwa	Kaonde	Kunda	Lamba	Luchazi	Lunda	Luvale
	Ndembu	Ngoni	Nyanja	Shila	Tonga	Tumbuka				
Patrilateral cross-cousin: FaSiDa only:	Ila									
Matrilateral cross-cousin: MoBrDa only:	Lala									
Nonlateral evidence only for first cousins:	Luba									
Nonlateral all first and second cousins barred:	Lozi									

Type of cousin marriages preferred

Description	Code	Number of societies
No data	-9999	1
Quadrilateral, symmetrical preference	1	-
Quadrilateral, FaSiDa preferred	2	-
Quadrilateral, matrilateral preference	3	-
Trilateral with bilateral preference	4	-
Trilateral with patrilateral preference	5	-
Trilateral with matrilateral preference	6	-
Duolateral, symmetrical preference	7	9
Duolateral, patrilateral preference	8	-
Duolateral, matrilateral preference	9	3
Duolateral, with maternal cousins only, MoBrDa	10	-
Patrilateral cross-cousin with FaSiDa only	11	1
Matrilateral cross-cousin with MoBrDa only	12	-
Nonlateral, all second cousins permitted	13	-
Nonlateral, only some second cousins permitted	14	-
No preferred cousin marriages	15	7

Note: *Zambian traditional societies according reported type of cousin marriages preferred:*

No information:... Mambwe

Duolateral, symmetrical preference:.................... Bemba Chewa Iwa Kunda Lunda Luvule Ndembu Nyanja Tumbuka

Duolateral, matrilateral preference:..................... Chokwe Kaonde Lamba

Patrilateral cross-cousin with FaSiDa only:........... Ila

No preferred cousin marriages:.......................... Lala Lozi Luba Luchazi Ngoni Shila Tonga

Sub-type of cousin marriages allowed

Description	Code	Number of societies
No data	-9999	1
All four cousins	1	-
Three of four cousins	2	-
Two of four cousins	3	-
One of four cousins	4	18
No first cousins, all second cousins	5	-
First and some second cousins excluded	6	-
No first, unknown for second	7	1
No first or second cousins	8	1

Note: *Zambian traditional societies according reported sub-type of cousin marriages allowed:*

No information:... Mambwe

One of four cousins:.. Bemba Chewa Chokwe Ila Iwa Kaonde Kunda Lala Lamba Luchazi Lunda Luvule Ndembu Ngoni Nyanja Shila Tonga Tumbuka

No first, unknown for second:............................ Luba

No first or second cousins:................................ Lozi

Sub-type of cousin marriages preferred

Description	Code	Number of societies
No data	-9999	1
Symmetrical preference	1	9
FaBrDa preferred	2	-
FaSiDa preferred	3	1
MoBrDa preferred	4	3
A second-cousin preferred	5	-
No preferred cousin marriage	6	7

Note: *Zambian traditional societies according reported sub-type of cousin marriages preferred:*

No information:... Mambwe

Symmetrical preference:................................... Bemba Chewa Iwa Kunda Lunda Luvule Ndembu Nyanja Tumbuka

FaSiDa preferred:.. Ila

MoBrDa preferred:... Chokwe Kaonde Lamba

No preferred cousin marriages:.......................... Lala Lozi Luba Luchazi Ngoni Shila Tonga

Several Zambian traditional societies distinguished between cousin marriages preferred and cousin marriages allowed. Reports show that nine societies wanted symmetrical duolateral marriages—i.e. between any cross cousins. Symmetrical duolateral refers to a marriage with the daughter of a person's mother's brother or father's sister while the matrilineal duolateral refers to cross-cousin marriages to the daughter of ones mother's brother only (Murdock 1967b). Three Zambian societies restricted such marriages to maternal cross cousins only (matrilineal duolateral). The Ila people are the only society that aspired for cross-cousin marriage with the daughter of one's father's sister. One-third of societies did not prefer any form of cousin marriage i.e. the societies that had stricter controls on sexual and martial unions.

[For both the subtype of cousin marriage allowed and preferred, the distribution is the same as the main type of marriage allowed and preferred. The two sub type variables are removed from the data set for providing duplicative information.]

3.5 Mode of marriage (column 12)

Murdock (1967b) coded both the primary and alternate modes of marriage in traditional societies.

Mode of marriage

Description	Code	Number of societies	
		Primary	Alternate
No data	-9999	-	-
Bride price or wealth, to bride's family	1	6	-
Bride service, to bride's family	2	8	4
Token bride price	3	7	5
Absence of consideration	4	-	-
Sister or female relative exchanged for bride	5	-	-
Gift exchange, reciprocal	6	-	-
Dowry, to bride from her family	7	-	-
No alternate mode	8	NA	12

Note: *Zambian traditional societies according reported traditional mode of marriage:*
Primary…
Bride Price or wealth, to bride's family:................ Ila Iwa Luba Mambwe Tonga Tumbuka
Bride Service, to bride's family:.......................... Bemba Chewa Kunda Lala Lamba Lunda Nyanja Shila
Token bride price:.. Chokwe Kaonde Lozi Luchazi Luvale Ndembu Ngoni
Secondary…
Bride Service, to bride's family:.......................... Iwa Kaonde Mambwe Lozi
Token bride price:.. Bemba Chewa Lamba Lunda Shila
Not applicable:... Chokwe Ila Kunda Lala Luba Luchazi Luvale Ndembu Ngoni Nyanja Tonga Tumbuka

In six societies, a groom could marry only after he or his family had transferred or accepted to transfer livestock or money to the intended bride's family. In most societies (eight), a groom could only get a wife after he had had provided a service usually in form of labour to the bride's family. In the remaining societies, the groom got a wife after he had made small symbolic payments to the intended bride's family. Nine societies had an alternative method of marriage—through token price (five societies) and through bride service to bride's family (four societies).

3.6 Family organisation (column 14)

Murdock (1967b) used domestic organisation and marital composition to code information on family organisation in traditional societies.

Domestic organisation

Description	Code	Number of societies
No data	-9999	-
Independent polyandrous families	1	-
Independent nuclear family, monogamous	2	-
Independent nuclear family, occasional polygyny	3	5
Polygynous: unusual co-wives pattern	4	2
Polygynous: usual co-wives pattern	5	11
Minimal (stem) extended families	6	-
Small extended families	7	3
Large extended families	8	-

Note: *Zambian traditional societies according reported domestic organisation:*
Independent nuclear, occasional polygyny:........... Chokwe Lala Lamba Lunda Shila
Polygynous: unusual co-wives pattern:................ Bemba Tumbuka
Polygynous: usual co-wives pattern:.................... Chewa Iwa Kaonde Kunda Lozi Luba Luchazi Mambwe Ndembu Ngoni Nyanja
Small extended families:.................................. Ila Luvale Tonga

Five traditional societies lived in independent nuclear families but practiced occasional or limited polygyny. However, couples in most Zambian traditional societies lived in polygamous families. In eleven societies, co-wives occupied the same house and in two societies (Bemba and Tumbuka), they occupied separate housing units. The Ila, Luvale and Tonga traditional societies lived in small extended families—not more than two related polygamous families.

Marital composition

Description	Code	Number of societies
No data	-9999	-
Independent nuclear, monogamous	1	-
Independent nuclear, occasional polygyny	2	5
Preferentially sororal, co wives in same dwelling	3	-
Preferentially sororal, co wives in separate dwellings	4	2
Non-sororal, co wives in same dwelling	5	-
Non-sororal, co wives in separate dwellings	6	14
Independent polyandrous families	7	-

Note: *Zambian traditional societies according reported marital composition:*

Independent nuclear, occasional polygyny:	Chokwe	Lala	Lamba	Lunda	Shila					
Preferentially sororal, co wives in sep. dwellings:	Bemba	Tumbuka								
Non-sororal, co wives in separate dwellings:	Chewa	Ila	Iwa	Kaonde	Kunda	Lozi	Luba	Luchazi	Luvale	Mambwe
	Ndembu	Ngoni	Nyanja	Tonga						

Couples in five Zambian traditional societies (the same as domestic organisation) lived in independent nuclear unions with occasional or limited polygyny members. In the remaining societies, couples lived polygamous unions with co-wives occupying separate quarters. In such marital unions, co-wives do not interact (Murdock 1967b). In two societies the wives were related most likely sisters but not in most societies. [Distribution of marital composition is not different from domestic organisation except that it refers to parties in a sexual or marital union. This variable is removed from the data set for duplicating the same information.]

3.7 Postpartum sex taboos (column 36)

Murdock (1967b) coded information on the duration that each traditional society prescribed for a lactating mother to avoid sexual intercourse (duration of postpartum sex taboos).

Postpartum sex taboos

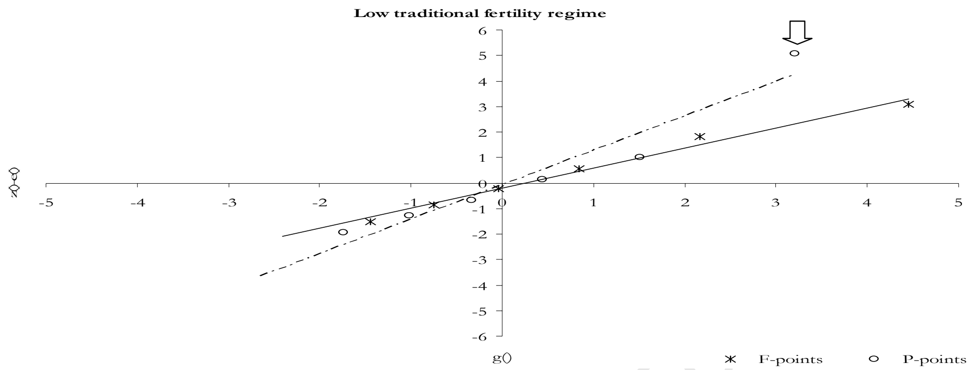
Description	Code	Number of societies
No data	-9999	15
None	1	-
No longer than 1 month	2	1
1 to 6 months	3	2
6 months to 1 year	4	-
More than one to two years	5	2
Over two years	6	1

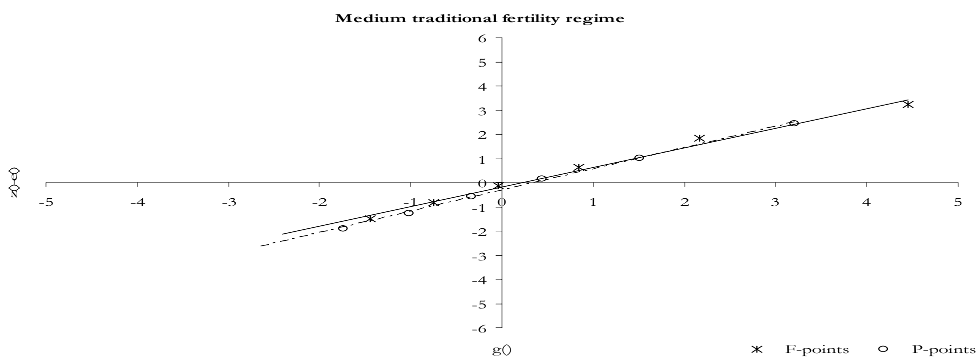
Note: *Zambian traditional societies according the reported precribed length of postpartum sex taboo:*

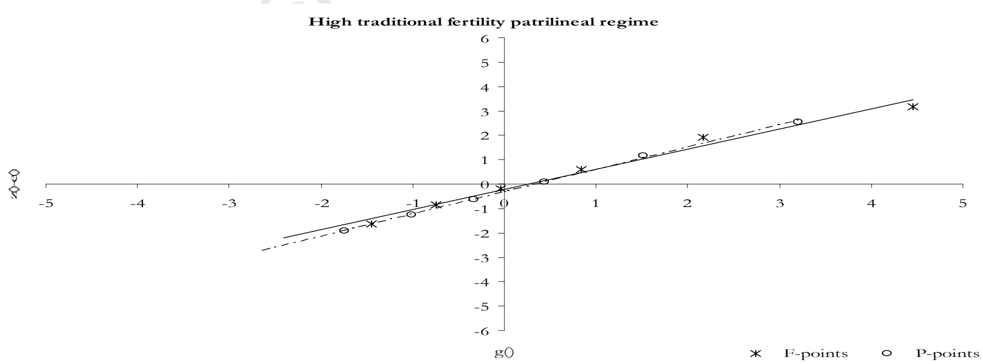
No information:	Chokwe	Iwa	Kaonde	Kunda	Lala	Lozi	Luba	Luchazi	Lunda	Luvale
	Mambwe	Ndembu	Ngoni	Nyanja	Shila					
No longer than 1 month:	Lamba									
1 to 6 months:	Bemba	Chewa								
More than one to two years:	Tonga	Tumbuka								
Over two years:	Ila									

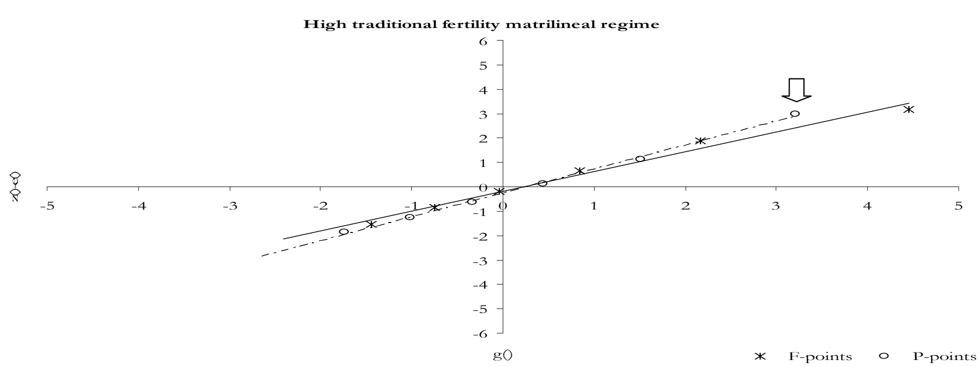
The Tonga, Tumbuka and Ila societies required a lactating mother to avoid sex for more than one year. [However, assessment of this information against other Zambian societies is not possible because most traditional societies have no information on duration of postpartum sex taboos. It removed from the data set for being scanty.]

Appendix 6.1.a: Plot of the Y values of cumulated parity (P-points) and cumulated current fertility (F-points) before fitting the Relational Gompertz Function for each traditional reproductive regime: Zambia 1990 Census

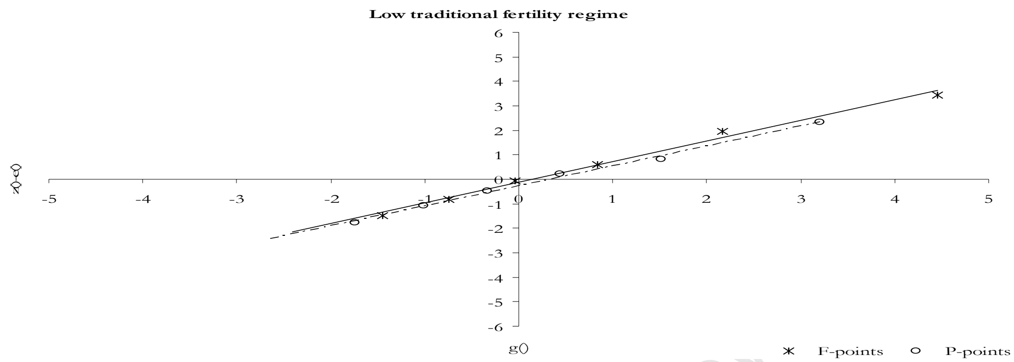


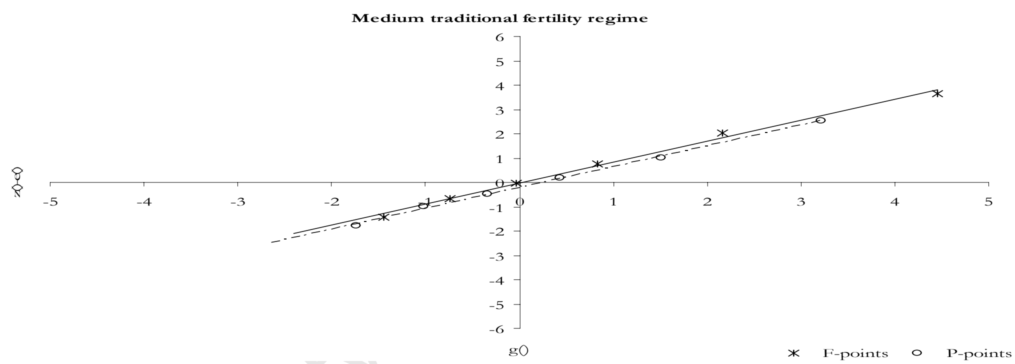


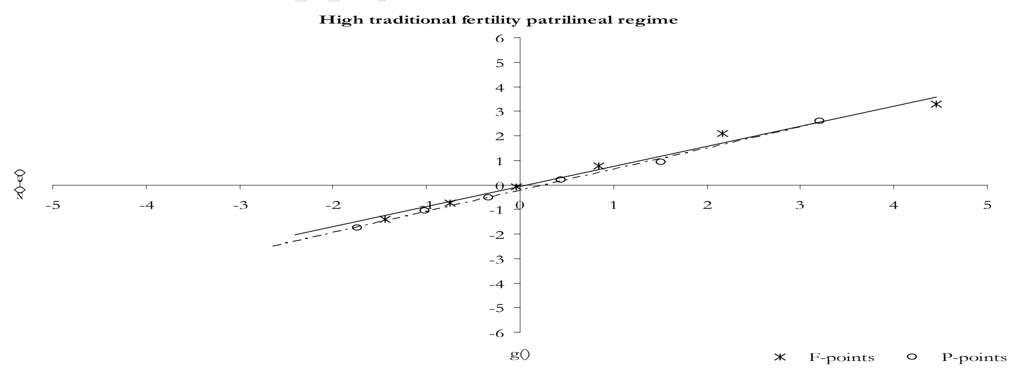


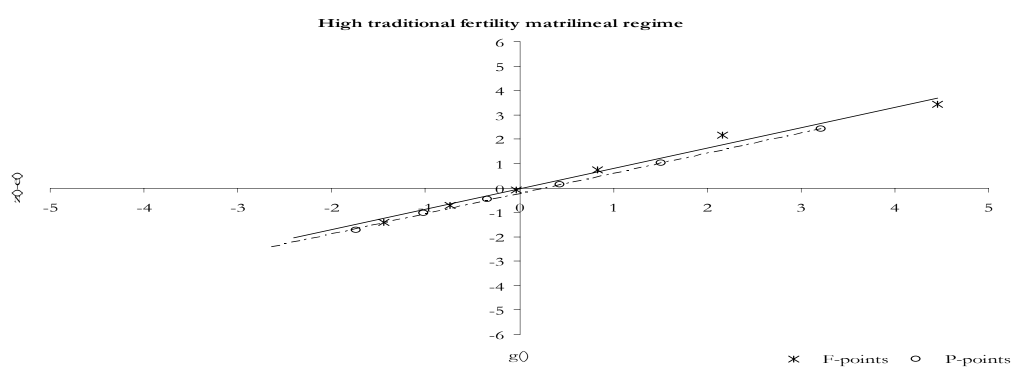


Appendix 6.1.b: Plot of the Y values of cumulated parity (P-points) and cumulated current fertility (F-points) before fitting the Relational Gompertz Function for each traditional reproductive regime: Zambia 2000 Census









Appendix 7.1.a: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1990 Census

	Low Trad. Fert.		Med. Trad. Fert.		High Traditional fertility				All Zambians	
					Patrilineal		Matrilineal			
	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Age										
15-19	26.1	11,202	27.8	19,302	28.3	17,576	27.6	68,068	27.6	116,148
20-24	19.9	8,527	22.0	15,241	21.8	13,527	21.6	53,388	21.5	90,683
25-29	15.8	6,784	16.2	11,266	15.9	9,875	16.1	39,785	16.1	67,710
30-34	13.4	5,727	12.6	8,747	12.2	7,604	12.2	29,980	12.4	52,058
35-39	9.0	3,849	7.8	5,375	8.4	5,237	8.6	21,176	8.5	35,637
40-44	9.1	3,885	7.3	5,077	7.6	4,706	7.8	19,220	7.8	32,888
45-49	6.8	2,910	6.2	4,330	5.9	3,655	6.1	14,983	6.1	25,878
Residence										
Urban	30.8	13,206	28.7	19,875	47.2	29,375	44.7	110,299	41.0	172,755
Rural	69.2	29,678	71.3	49,463	52.8	32,805	55.3	136,301	59.0	248,247
Province										
Central	4.0	1,723	16.8	11,645	5.1	3,169	9.5	23,426	9.5	39,963
Copperbelt	4.6	1,955	4.9	3,404	19.2	11,923	26.6	65,522	19.7	82,804
Eastern	0.4	181	0.4	252	30.5	18,973	13.9	34,318	12.8	53,724
Luapula	0.2	93	0.2	119	0.9	588	12.4	30,651	7.5	31,451
Lusaka	8.5	3,647	17.0	11,805	17.8	11,061	12.5	30,885	13.6	57,398
Northern	0.3	149	0.4	244	23.8	14,823	13.3	32,837	11.4	48,053
NWestern	1.7	729	0.2	155	0.2	131	8.3	20,351	5.1	21,366
Southern	10.5	4,513	59.1	40,946	2.3	1,426	1.7	4,236	12.1	51,121
Western	69.7	29,894	1.1	768	0.1	86	1.8	4,374	8.3	35,122
Education										
None	35.5	15,208	30.9	21,422	34.7	21,556	35.6	87,893	34.7	146,079
Primary	43.3	18,563	48.4	33,547	43.6	27,104	44.9	110,811	45.1	190,025
Secondary+	20.4	8,744	19.5	13,552	20.7	12,860	18.5	45,550	19.2	80,706
Not stated	0.9	369	1.2	817	1.1	660	1.0	2,346	1.0	4,192
Marital status										
Married	51.9	22,245	58.4	40,489	60.6	37,666	58.3	143,723	58.0	244,123
Marriage disrupted	11.0	4,734	7.5	5,230	7.5	4,638	10.0	24,659	9.3	39,261
Never Married	35.1	15,068	31.8	22,029	29.7	18,453	29.6	72,914	30.5	128,464
Not stated	2.0	837	2.3	1,590	2.3	1,423	2.2	5,304	2.2	9,154
Age at first marriage										
10-14	5.4	1,400	6.7	2,967	8.8	3,599	10.8	17,566	9.3	25,532
15-19	58.1	15,109	62.8	27,978	65.5	26,777	64.1	104,603	63.6	174,467
20-24	28.2	7,336	24.2	10,789	21.3	8,696	20.1	32,698	21.7	59,519
>24	8.2	2,143	6.3	2,816	4.4	1,805	5.0	8,200	5.5	14,964
Age at first birth										
10-14	3.0	757	3.8	1,573	4.3	1,634	5.1	7,697	4.6	11,660
15-19	52.9	13,446	58.6	24,526	58.4	22,202	60.2	90,940	59.0	151,114
20-24	36.3	9,219	31.6	13,239	31.8	12,068	29.3	44,192	30.7	78,718
>24	7.8	1,977	6.1	2,545	5.5	2,084	5.4	8,110	5.7	14,715
Economic activity										
Working for pay or profit	8.6	3,698	9.1	6,341	10.7	6,676	9.1	22,519	9.3	39,234
Working - unpaid/family	58.0	24,881	60.6	41,986	59.8	37,156	60.7	149,569	60.2	253,592
Not working	32.0	13,744	28.5	19,734	27.7	17,226	28.6	70,527	28.8	121,231
Not stated	1.3	561	1.8	1,277	1.8	1,122	1.6	3,985	1.6	6,945
Household status										
Head	7.9	3,407	4.9	3,410	6.1	3,818	7.2	17,660	6.7	28,295
Spouse	43.0	18,429	47.1	32,640	51.6	32,113	49.1	121,023	48.5	204,205
Child	28.2	12,108	28.6	19,840	26.6	16,558	27.5	67,848	27.6	116,354
Other relative	19.0	8,156	17.8	12,360	14.6	9,055	15.0	36,953	15.8	66,524
Unrelated	1.7	749	1.4	986	0.9	536	1.2	2,886	1.2	5,157
Not stated	0.1	35	0.1	102	0.2	100	0.1	230	0.1	467
Total	100.0	42,884	100.0	69,338	100.0	62,180	100.0	246,600	100.0	421,002

Source: 1990 Census

Notes: Figures are unweighted

Age not stated has been redistributed proportionally from age 20.

Appendix 7.1.b: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 2000 Census

	Low Trad. Fert.		Med. Trad. Fert.		High Traditional fertility				All Zambians	
					Patrilineal		Matrilineal			
	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number	Per cent	Number
Age										
15-19	25.4	13,277	26.0	23,534	25.2	20,578	25.1	78,867	25.3	136,256
20-24	21.5	11,235	22.7	20,537	22.4	18,237	22.2	69,628	22.2	119,637
25-29	16.7	8,702	17.1	15,446	17.5	14,285	17.3	54,251	17.2	92,684
30-34	12.0	6,250	12.4	11,212	12.5	10,197	12.5	39,188	12.4	66,847
35-39	9.9	5,192	9.5	8,637	9.8	8,013	10.0	31,376	9.9	53,218
40-44	8.2	4,306	7.4	6,704	7.2	5,890	7.4	23,291	7.5	40,191
45-49	6.2	3,239	4.9	4,455	5.4	4,368	5.6	17,677	5.5	29,739
Residence										
Urban	28.9	15,015	26.4	23,868	44.7	36,170	41.6	130,180	38.3	205,233
Rural	71.1	36,944	73.6	66,560	55.3	44,809	58.4	182,520	61.7	330,833
Province										
Central	4.4	2,322	18.4	16,612	5.3	4,358	9.3	29,110	9.7	52,402
Copperbelt	4.5	2,337	4.8	4,348	17.3	14,073	22.9	71,988	17.2	92,746
Eastern	0.6	316	0.5	412	29.4	23,985	13.8	43,405	12.6	68,118
Luapula	0.1	74	0.1	112	0.6	521	13.2	41,529	7.8	42,236
Lusaka	9.6	4,987	17.8	16,079	19.5	15,941	14.6	45,792	15.4	82,799
Northern	0.4	217	0.3	315	25.4	20,682	14.2	44,666	12.2	65,880
NWestern	1.7	898	0.3	262	0.2	164	8.6	26,986	5.3	28,310
Southern	9.8	5,102	57.0	51,639	2.1	1,732	1.8	5,760	11.9	64,233
Western	68.9	35,948	0.8	746	0.1	112	1.6	5,042	7.8	41,848
Education										
None	28.5	14,894	22.0	19,939	26.2	21,332	27.5	86,333	26.5	142,498
Primary	40.8	21,311	48.5	43,904	41.5	33,878	43.6	137,179	43.9	236,272
Secondary+	29.9	15,584	28.5	25,785	31.5	25,655	28.0	87,844	28.8	154,868
Not stated	0.8	412	1.0	897	0.9	703	0.9	2,922	0.9	4,934
Marital status										
Married	49.9	26,042	60.9	55,158	61.9	50,513	60.1	189,003	59.5	320,716
Marriage disrupted	13.6	7,106	10.9	9,899	11.2	9,159	12.8	40,328	12.3	66,492
Never Married	36.5	19,053	28.1	25,468	26.8	21,896	27.0	84,947	28.1	151,364
Not stated	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Economic activity										
Working for pay or profit	7.0	3,643	9.9	8,953	10.7	8,744	8.8	27,504	9.1	48,844
Working - unpaid/family	69.1	36,064	64.0	57,927	64.2	52,394	66.1	207,875	65.8	354,260
Not working	23.9	12,494	26.1	23,645	25.0	20,430	25.1	78,899	25.2	135,468
Not stated	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Religion										
Catholic	11.3	5,922	13.4	12,113	18.9	15,437	28.6	89,943	22.9	123,415
Protestant	74.8	39,072	78.4	70,978	70.8	57,740	60.7	190,898	66.6	358,688
Other/None	13.8	7,207	8.2	7,434	10.3	8,391	10.6	33,437	10.5	56,469
Not stated	0.0	0	0.0	0	0.0	0	0.0	0	0.0	0
Household status										
Head	11.9	6,188	7.8	7,067	8.8	7,197	10.1	31,865	9.7	52,317
Spouse	41.2	21,507	45.5	41,176	50.1	40,901	50.1	157,382	48.5	260,966
Child	27.8	14,501	23.5	21,273	23.1	18,870	23.9	75,144	24.1	129,788
Other relative	18.1	9,445	22.2	20,103	17.1	13,948	15.1	47,432	16.9	90,928
Unrelated	1.1	560	1.0	906	0.8	652	0.8	2,455	0.8	4,573
Total	100.0	52,201	100.0	90,525	100.0	81,568	100.0	314,278	100.0	538,572

Source: 2000 Census

Notes: Figures are unweighted

Appendix 7.1.c: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1992 Zambia DHS

	Low Trad. Fert.			Med. Trad. Fert.			High Traditional fertility						All Zambians		
							Patrilineal			Matrilineal					
	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.
	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number
Age															
15-19	22.9	136	162	28.5	373	340	27.0	287	263	29.1	1,137	1,151	28.1	1,933	1,916
20-24	19.5	115	135	20.6	270	246	18.8	200	184	21.2	830	846	20.6	1,416	1,411
25-29	16.4	97	118	17.2	225	205	17.5	187	172	16.5	644	659	16.8	1,153	1,154
30-34	16.8	100	122	11.7	153	139	14.1	150	137	12.4	487	499	12.9	889	897
35-39	10.8	64	75	9.1	119	108	10.8	114	105	8.6	338	353	9.2	636	641
40-44	6.6	39	49	8.0	104	96	6.8	72	67	6.8	268	278	7.0	483	490
45-49	7.0	42	54	4.9	64	59	5.1	54	49	5.4	209	218	5.4	369	380
Residence															
Urban	36.3	215	199	31.9	417	385	59.8	637	588	57.6	2,253	2,081	51.2	3,522	3,253
Rural	63.7	377	516	68.1	891	808	40.2	427	389	42.4	1,661	1,923	48.8	3,356	3,636
Province															
Central	5.5	33	30	13.1	171	155	4.9	53	48	8.9	349	317	8.8	605	550
Copperbelt	6.2	37	34	5.6	73	67	25.2	268	247	33.8	1,322	1,218	24.7	1,699	1,566
Eastern	0.9	5	5	0.1	1	1	24.4	260	235	11.7	459	414	10.5	725	655
Luapula	0.0	0	0	0.7	9	8	1.5	16	18	10.3	402	556	6.2	426	582
Lusaka	9.0	53	49	17.7	231	212	22.2	236	218	16.3	638	589	16.8	1,159	1,068
Northern	0.2	1	1	0.0	0	0	18.3	195	176	11.1	434	393	9.2	630	570
NWestern	1.8	11	17	0.2	3	3	0.3	4	4	4.2	166	363	2.7	183	387
Southern	16.3	96	88	61.9	810	732	3.0	32	29	2.4	95	87	15.0	1,033	936
Western	60.1	356	491	0.8	10	15	0.2	2	2	1.3	49	67	6.1	418	575
Education															
None	18.3	108	149	13.6	177	161	15.4	163	148	17.2	674	718	16.3	1,124	1,176
Primary	57.8	343	423	65.1	851	776	57.9	616	566	59.3	2,321	2,402	60.0	4,130	4,167
Secondary+	23.9	142	143	21.3	279	256	26.8	285	263	23.5	918	883	23.6	1,624	1,545
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.0	1	1
Marital status															
Married	55.0	326	400	65.1	851	776	64.9	690	634	62.9	2,461	2,536	62.9	4,328	4,346
Marriage disrupted	16.8	100	122	9.7	127	116	10.5	112	103	11.9	464	478	11.7	803	819
Never Married	28.1	167	193	25.2	330	301	24.6	262	240	25.3	989	990	25.4	1,747	1,724
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Type of marriage															
Monogamous	80.4	262	319	68.7	585	535	77.6	536	492	88.2	2,172	2,223	82.1	3,554	3,569
Polygamous - 2 wives	15.3	50	64	13.7	117	106	15.8	109	101	8.5	210	219	11.2	486	490
Polygamous - >2 wives	4.4	14	17	17.6	149	135	6.5	45	41	2.8	68	82	6.4	277	275
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.5	11	12	0.3	11	12
Age at first marriage															
10-14	12.6	54	62	12.3	120	109	16.4	132	122	18.7	546	575	16.6	852	868
15-19	60.0	255	322	68.4	669	610	65.5	525	482	64.9	1,898	1,951	65.2	3,348	3,365
20-24	23.4	100	119	17.8	174	159	16.2	130	119	14.3	419	425	16.0	823	822
>24	4.0	17	19	1.5	15	14	1.9	15	14	2.1	62	63	2.1	110	110
Age at first birth															
10-14	6.3	28	32	6.7	66	60	8.9	70	65	7.8	220	235	7.6	383	392
15-19	67.9	299	371	72.1	703	641	64.3	504	463	69.7	1,975	2,039	69.2	3,480	3,514
20-24	22.2	98	116	19.5	190	174	23.5	184	168	19.9	564	566	20.6	1,036	1,024
>24	3.7	16	20	1.7	17	15	3.2	25	23	2.6	72	72	2.6	130	130
Conception ever used															
Never used	55.3	328	387	69.9	914	831	47.9	510	469	61.3	2,398	2,488	60.3	4,150	4,175
Traditional methods	26.3	156	209	13.2	173	158	23.3	248	226	15.1	592	614	17.0	1,169	1,207
Modern methods	18.4	109	119	16.9	221	204	28.8	306	282	23.6	924	902	22.7	1,560	1,507
Conception currently using															
Never used	88.9	527	632	90.4	1,183	1,078	85.4	909	835	88.9	3,480	3,573	88.6	6,099	6,118
Traditional methods	6.4	38	54	4.0	52	48	6.8	72	65	4.0	158	161	4.7	320	328
Modern methods	4.7	28	29	5.6	73	67	7.9	84	77	7.1	276	270	6.7	461	443
Economic activity															
Working for pay or profit: not at home	40.4	240	291	27.4	358	329	35.3	376	344	32.2	1,261	1,266	32.5	2,235	2,230
Working for pay or profit: at home	15.4	92	116	10.9	143	131	16.0	170	156	13.2	517	549	13.4	921	952
Not working	44.1	262	308	61.7	807	733	48.3	514	473	54.2	2,123	2,177	53.9	3,706	3,691
Not stated	0.0	0	0	0.0	0	0	0.4	4	4	0.3	12	12	0.2	17	16
Religion															
Catholic	13.3	79	95	13.4	175	161	26.7	284	261	36.0	1,407	1,371	28.3	1,945	1,888
Protestant	79.5	471	560	83.9	1,097	1,000	70.9	755	693	62.1	2,429	2,546	69.1	4,752	4,799
Other/None	7.3	43	60	2.6	34	31	2.1	22	20	1.9	75	85	2.5	175	196
Not stated	0.0	0	0	0.1	1	1	0.3	3	3	0.1	2	2	0.1	7	6
Household status															
Head	12.0	71	88	4.6	60	55	6.1	65	60	6.5	255	273	6.5	450	476
Spouse	46.0	273	337	54.2	708	647	54.6	581	533	52.6	2,059	2,143	52.6	3,621	3,660
Child	29.1	173	199	29.4	384	350	31.9	340	312	31.3	1,227	1,211	30.9	2,123	2,072
Other relative	10.7	64	75	10.8	141	128	6.8	72	66	8.7	342	343	9.0	618	612
Unrelated	2.1	13	16	1.1	14	13	0.6	7	6	0.8	31	33	0.9	65	68
Not stated										0.0	1	1	0.0	1	1
Total	100.0	593	715	100.0	1,308	1,193	100.0	1,064	977	100.0	3,914	4,004	100.0	6,879	6,889

Source: 1992 DHS

Appendix 7.1.d: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 1996 Zambia DHS

	Low Trad. Fert.			Med. Trad. Fert.			High Traditional fertility						All Zambians		
							Patrilineal			Matrilineal					
	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.
	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number
Age															
15-19	26.6	196	237	25.8	317	321	23.7	277	242	24.9	1,164	1,135	25.0	1,955	1,935
20-24	24.2	179	222	21.5	264	265	23.7	277	243	22.7	1,058	1,047	22.8	1,778	1,777
25-29	13.6	101	122	16.6	205	202	14.9	174	155	16.5	770	769	16.0	1,250	1,248
30-34	11.1	82	107	14.2	175	178	15.2	178	159	13.5	628	623	13.6	1,063	1,067
35-39	9.6	71	93	10.2	126	128	9.9	115	102	9.1	423	425	9.4	735	748
40-44	8.7	64	80	6.6	82	81	6.4	75	65	7.0	328	325	7.0	549	551
45-49	6.3	47	65	5.1	62	67	6.3	73	67	6.3	296	303	6.1	478	502
Residence															
Urban	34.5	256	245	33.7	416	325	51.5	602	482	47.1	2,200	1,843	44.5	3,473	2,895
Rural	65.5	484	681	66.3	816	917	48.5	567	551	52.9	2,468	2,784	55.5	4,335	4,933
Province															
Central	3.8	28	33	14.6	180	221	4.3	50	51	8.0	375	419	8.1	633	724
Copperbelt	6.1	45	34	7.5	93	67	18.2	213	157	25.6	1,196	841	19.8	1,547	1,099
Eastern	0.3	2	2	0.2	3	3	29.0	339	347	15.4	718	752	13.6	1,061	1,104
Luapula	0.1	1	1	0.3	4	5	1.3	15	18	15.0	700	865	9.2	720	889
Lusaka	13.8	102	78	23.1	284	228	21.2	248	186	14.7	688	519	16.9	1,322	1,011
Northern	0.2	1	1	0.2	3	3	23.7	277	245	12.2	568	513	10.9	849	762
NWestern	1.3	10	19	0.1	1	3	0.2	2	5	5.9	274	538	3.7	287	565
Southern	8.8	65	62	52.7	650	693	1.9	22	20	1.4	64	56	10.2	800	831
Western	65.6	486	696	1.1	13	19	0.2	3	4	1.9	86	124	7.5	588	843
Education															
None	14.2	105	149	8.5	105	111	14.0	164	154	14.3	668	730	13.3	1,042	1,144
Primary	54.8	405	529	63.6	784	821	57.2	669	602	59.0	2,754	2,778	59.1	4,612	4,730
Secondary+	31.0	230	248	27.8	342	309	28.8	336	277	26.7	1,245	1,119	27.6	2,153	1,953
Not stated	0.0	0	0	0.1	1	1	0.0	0	0	0.0	0	0	0.0	1	1
Marital status															
Married	49.0	363	456	61.7	759	784	63.8	746	675	62.0	2,892	2,906	61.0	4,760	4,821
Marriage disrupted	16.2	120	157	11.6	143	137	12.9	151	126	13.9	649	643	13.6	1,062	1,063
Never Married	34.8	258	313	26.7	329	321	23.3	273	232	24.1	1,125	1,077	25.4	1,985	1,943
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.0	1	1	0.0	1	1
Type of marriage															
Monogamous	85.5	310	384	71.7	545	551	78.5	585	522	86.8	2,511	2,512	83.0	3,951	3,969
Polygamous - 2 wives	10.9	39	54	19.5	148	158	14.3	107	103	9.8	282	291	12.1	576	606
Polygamous - >2 wives	3.4	12	17	8.5	65	73	6.8	51	47	2.7	77	80	4.3	205	217
Not stated	0.2	1	1	0.2	2	2	0.4	3	3	0.8	22	23	0.6	27	29
Age at first marriage															
10-14	11.0	53	68	10.0	90	96	15.2	136	123	16.9	598	620	15.1	878	907
15-19	55.8	269	353	66.4	599	619	64.8	581	523	64.2	2,273	2,287	63.9	3,721	3,782
20-24	26.4	127	154	19.2	173	170	18.0	161	140	15.9	564	543	17.6	1,026	1,007
>24	6.8	33	38	4.4	40	36	2.0	18	15	3.0	108	100	3.4	198	189
Age at first birth															
10-14	5.0	26	34	6.7	61	64	7.0	62	56	7.1	245	244	6.8	394	398
15-19	66.2	352	458	67.7	620	638	66.7	592	526	68.5	2,361	2,381	67.9	3,924	4,003
20-24	25.0	133	161	21.1	194	189	22.6	200	179	21.1	729	720	21.7	1,255	1,249
>24	3.9	21	26	4.5	41	39	3.8	34	29	3.2	112	109	3.6	208	203
Conception ever used															
Never used	53.3	394	502	50.1	617	636	42.4	495	442	53.4	2,492	2,519	51.2	4,000	4,099
Traditional methods	15.8	117	155	15.6	192	205	22.4	262	234	15.2	708	759	16.4	1,279	1,353
Modern methods	30.9	229	269	34.3	422	401	35.2	411	357	31.4	1,467	1,349	32.4	2,530	2,376
Conception currently using															
Never used	83.2	616	778	81.1	998	1,020	77.0	901	795	81.6	3,807	3,779	81.0	6,321	6,372
Traditional methods	5.9	44	59	7.5	93	96	10.5	123	112	7.7	359	386	7.9	618	653
Modern methods	10.8	80	89	11.4	141	126	12.5	146	126	10.8	502	462	11.1	869	803
Economic activity															
Working for pay or profit: not at home	33.3	246	312	25.6	315	306	31.9	373	316	31.6	1,476	1,561	30.9	2,411	2,495
Working for pay or profit: at home	10.3	76	93	14.2	175	177	14.2	166	149	15.0	700	715	14.3	1,117	1,134
Not working	55.6	411	515	60.0	739	757	53.9	630	568	53.1	2,480	2,340	54.6	4,260	4,180
Not stated	0.8	6	6	0.2	2	2	0.0	0	0	0.2	12	11	0.3	20	19
Religion															
Catholic	14.0	104	126	11.9	146	138	19.8	232	208	30.1	1,406	1,345	24.2	1,887	1,817
Protestant	83.0	614	769	87.1	1,072	1,090	78.9	923	812	68.5	3,199	3,216	74.4	5,808	5,887
Other/None	2.5	19	27	0.9	11	12	0.9	11	10	1.0	48	51	1.1	89	100
Not stated	0.5	3	4	0.1	2	2	0.3	4	3	0.3	15	15	0.3	25	24
Household status															
Head	13.3	98	127	7.3	90	81	10.1	119	104	10.8	506	512	10.4	813	824
Spouse	39.2	290	366	51.5	634	657	52.0	608	548	48.8	2,279	2,322	48.8	3,811	3,893
Child	36.0	266	331	28.3	348	344	28.4	332	285	30.3	1,416	1,348	30.3	2,362	2,308
Other relative	9.8	73	87	11.8	145	144	8.9	104	91	9.2	428	408	9.6	750	730
Unrelated	1.7	12	15	1.2	14	16	0.5	6	5	0.8	38	37	0.9	72	73
Total	100.0	740	926	100.0	1,232	1,242	100.0	1,169	1,033	100.0	4,667	4,627	100.0	7,808	7,828

Source: 1996 DHS

Appendix 7.1.e: Demographic and socio-economic characteristics of Zambian women aged 15-49 by traditional reproductive regime: 2001-02 Zambia DHS

	Low Trad. Fert.			Med. Trad. Fert.			High Traditional fertility						All Zambians		
							Patrilineal			Matrilineal					
	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.	Weighted		Unweig.
	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number	Per cent	Number	Number
Age															
15-19	22.1	175	174	24.1	275	264	23.3	275	251	23.9	1,037	1,067	23.6	1,762	1,756
20-24	23.8	189	191	21.4	243	230	21.9	259	236	21.5	934	948	21.8	1,625	1,605
25-29	17.9	142	141	18.1	206	199	19.4	229	208	17.3	753	767	17.8	1,329	1,315
30-34	12.1	96	95	11.3	128	121	13.3	157	144	13.2	574	593	12.8	955	953
35-39	9.9	78	79	9.7	111	108	8.3	98	93	10.7	464	482	10.1	751	762
40-44	8.0	63	64	9.0	102	92	8.2	97	88	7.3	318	339	7.8	581	583
45-49	6.1	49	48	6.4	73	74	5.7	67	65	6.0	261	280	6.0	450	467
Residence															
Urban	29.3	232	206	30.4	346	289	47.1	556	446	43.1	1,871	1,559	40.3	3,005	2,500
Rural	70.7	560	586	69.6	792	799	52.9	625	639	56.9	2,470	2,917	59.7	4,447	4,941
Province															
Central	3.2	25	40	15.6	177	281	3.1	37	58	6.2	267	423	6.8	506	802
Copperbelt	4.4	35	21	7.2	82	50	20.6	243	148	26.4	1,146	697	20.2	1,506	916
Eastern	0.7	5	5	0.9	10	10	29.8	352	340	12.8	558	538	12.4	925	893
Luapula	0.1	1	1	0.1	1	1	1.0	12	12	13.9	605	609	8.3	619	623
Lusaka	8.9	71	56	17.1	195	154	19.1	226	179	13.7	595	471	14.6	1,086	860
Northern	0.8	6	7	0.7	8	9	24.1	285	321	16.8	730	822	13.8	1,030	1,159
NWestern	2.7	21	53	0.3	3	8	0.2	2	6	7.5	326	809	4.7	352	876
Southern	10.0	79	69	57.8	657	571	1.9	22	19	1.1	48	42	10.8	807	701
Western	69.2	549	540	0.4	4	4	0.2	2	2	1.5	66	65	8.3	621	611
Education															
None	15.5	122	123	9.6	109	99	10.9	129	127	12.3	533	619	12.0	893	968
Primary	54.4	431	434	59.9	682	668	53.5	632	602	59.3	2,573	2,694	57.9	4,318	4,398
Secondary+	30.2	239	235	30.5	347	321	35.6	421	356	28.4	1,234	1,163	30.1	2,241	2,075
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Marital status															
Married	54.5	432	433	63.0	717	692	65.0	768	716	61.1	2,650	2,753	61.3	4,567	4,594
Marriage disrupted	16.5	131	129	11.7	133	127	12.2	144	129	14.5	628	656	13.9	1,036	1,041
Never Married	29.0	230	230	25.3	287	269	22.9	270	240	24.5	1,062	1,067	24.8	1,850	1,806
Not stated	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0	0.0	0	0
Type of marriage															
Monogamous	83.4	360	360	73.8	530	509	81.6	627	574	87.9	2,330	2,390	84.2	3,847	3,833
Polygamous - 2 wives	12.0	52	51	16.1	115	113	13.1	100	102	9.4	249	291	11.3	516	557
Polygamous - >2 wives	4.4	19	21	9.9	71	69	4.8	37	37	2.2	57	60	4.0	184	187
Not stated	0.2	1	1	0.2	1	1	0.5	4	3	0.5	14	12	0.4	20	17
Age at first marriage															
10-14	9.1	51	53	10.1	86	85	13.1	120	113	15.2	498	536	13.5	754	787
15-19	57.9	326	330	67.4	574	555	67.8	618	574	66.2	2,170	2,257	65.8	3,688	3,716
20-24	26.0	146	141	18.4	156	146	15.9	145	132	15.6	511	520	17.1	959	939
>24	7.0	40	38	4.1	35	33	3.1	28	26	3.0	98	96	3.6	202	193
Age at first birth															
10-14	4.0	24	25	5.2	45	43	4.3	37	34	5.9	196	211	5.4	302	313
15-19	65.9	394	398	72.2	620	603	67.5	587	543	68.5	2,258	2,360	68.6	3,859	3,904
20-24	26.8	160	158	19.7	169	161	24.9	216	198	22.3	736	754	22.8	1,282	1,271
>24	3.3	20	18	2.8	24	22	3.4	29	31	3.2	106	107	3.2	179	178
Conception ever used															
Never used	47.0	372	375	42.2	480	461	39.7	469	437	42.5	1,846	1,977	42.5	3,168	3,250
Traditional methods	13.2	105	110	10.2	116	118	13.6	161	164	11.3	491	579	11.7	872	971
Modern methods	39.8	315	307	47.6	542	509	46.8	552	484	46.2	2,003	1,920	45.8	3,413	3,220
Conception currently using															
Never used	79.1	627	629	74.2	844	817	73.7	871	801	75.2	3,263	3,432	75.2	5,604	5,679
Traditional methods	5.9	47	48	4.9	56	53	7.0	83	84	5.8	251	285	5.9	436	470
Modern methods	14.9	118	115	21.0	239	218	19.3	229	200	19.0	826	759	18.9	1,412	1,292
Economic activity															
Working for pay or profit: not at home	33.3	246	312	27.4	358	329	35.3	376	344	32.2	1,261	1,266	31.9	2,242	2,251
Working for pay or profit: at home	10.3	76	93	10.9	143	131	16.0	170	156	13.2	517	549	12.9	905	929
Not working	55.6	411	515	61.7	807	733	48.3	514	473	54.2	2,123	2,177	54.9	3,856	3,898
Not stated	0.8	6	6	0.0	0	0	0.4	4	4	0.3	12	12	0.3	23	22
Religion															
Catholic	7.4	59	61	11.6	132	124	17.9	211	201	30.5	1,325	1,322	23.2	1,726	1,708
Protestant	88.6	702	698	87.0	990	944	81.1	959	871	68.1	2,958	3,090	75.3	5,608	5,603
Other/None	3.6	29	30	1.1	13	17	1.0	11	12	1.1	49	57	1.4	102	116
Not stated	0.4	3	3	0.3	3	3	0.1	1	1	0.2	9	7	0.2	16	14
Household status															
Head	13.7	109	107	10.5	119	109	9.2	109	99	11.0	478	507	10.9	814	822
Spouse	45.6	361	365	50.4	574	555	55.5	655	611	52.6	2,284	2,366	52.0	3,874	3,897
Child	28.8	228	230	28.4	323	304	27.5	324	289	28.0	1,216	1,235	28.1	2,092	2,058
Other relative	10.2	80	77	9.0	102	99	7.4	87	80	7.6	329	330	8.0	598	586
Unrelated	1.7	13	13	1.8	20	21	0.5	6	6	0.8	34	38	1.0	74	78
Total	100.0	792	792	100.0	1,138	1,088	100.0	1,182	1,085	100.0	4,340	4,476	100.0	7,452	7,441

Appendix 7.1.f: Proportions of never married and nulliparous Zambian women aged 15-49 by traditional reproductive regime: Zambia 1990 and 2000 Censuses; 1992, 1996 and 2001-02 Zambia DHS

Age Group	Low Traditional Fertility Regime		Medium Traditional Fertility Regime		High traditional fertility regime: Patrilineal		High traditional fertility regime: Matrilineal	
	NMarried	Nulliparous	NMarried	Nulliparous	NMarried	Nulliparous	NMarried	Nulliparous
1990 Census								
15-19	0.83	0.76	0.78	0.69	0.75	0.66	0.74	0.67
20-24	0.42	0.40	0.32	0.34	0.30	0.32	0.30	0.33
25-29	0.21	0.21	0.14	0.16	0.12	0.14	0.13	0.16
30-34	0.11	0.12	0.08	0.10	0.05	0.08	0.06	0.09
35-39	0.07	0.10	0.05	0.08	0.03	0.05	0.04	0.07
40-44	0.04	0.10	0.03	0.07	0.02	0.05	0.03	0.07
45-49	0.03	0.10	0.02	0.07	0.02	0.06	0.02	0.08
SMAM	23.1		21.8		21.1		21.3	
MAFB		22.5		21.5		21.0		21.2
2000 Census								
15-19	0.81	0.80	0.72	0.77	0.70	0.78	0.70	0.77
20-24	0.43	0.36	0.26	0.29	0.27	0.33	0.27	0.32
25-29	0.23	0.18	0.12	0.15	0.11	0.16	0.12	0.16
30-34	0.12	0.12	0.06	0.09	0.05	0.09	0.05	0.10
35-39	0.07	0.09	0.04	0.06	0.03	0.07	0.03	0.07
40-44	0.05	0.07	0.02	0.06	0.02	0.06	0.02	0.06
45-49	0.04	0.06	0.02	0.06	0.02	0.06	0.01	0.06
SMAM	23.3		21.0		20.7		20.9	
MAFB		22.6		21.5		21.9		21.8
1992 DHS								
15-19	0.83	0.76	0.70	0.71	0.69	0.72	0.69	0.73
20-24	0.32	0.25	0.18	0.16	0.24	0.25	0.19	0.20
25-29	0.09	0.14	0.06	0.07	0.07	0.09	0.05	0.08
30-34	0.02	0.04	0.03	0.02	0.02	0.03	0.02	0.05
35-39	0.01	0.01	0.01	0.03	0.00	0.00	0.01	0.03
40-44	0.02	0.02	0.00	0.01	0.00	0.00	0.00	0.02
45-49	0.00	0.03	0.00	0.02	0.00	0.04	0.00	0.00
SMAM	21.5		19.9		20.1		19.7	
MAFB		20.8		19.8		20.1		20.5
1996 DHS								
15-19	0.81	0.75	0.73	0.77	0.74	0.77	0.71	0.76
20-24	0.37	0.22	0.22	0.20	0.16	0.18	0.19	0.22
25-29	0.23	0.12	0.08	0.06	0.08	0.06	0.07	0.09
30-34	0.05	0.07	0.06	0.03	0.01	0.03	0.02	0.04
35-39	0.04	0.05	0.02	0.01	0.01	0.01	0.01	0.01
40-44	0.03	0.00	0.01	0.02	0.02	0.00	0.01	0.02
45-49	0.00	0.01	0.00	0.03	0.00	0.00	0.01	0.01
SMAM	22.6		20.6		20.0		19.9	
MAFB		20.9		20.1		20.3		20.6
2001-02 DHS								
15-19	0.81	0.75	0.73	0.75	0.73	0.79	0.71	0.72
20-24	0.32	0.22	0.22	0.20	0.18	0.22	0.24	0.22
25-29	0.13	0.08	0.10	0.08	0.05	0.11	0.06	0.07
30-34	0.07	0.07	0.03	0.04	0.03	0.05	0.04	0.03
35-39	0.01	0.01	0.02	0.03	0.01	0.04	0.00	0.02
40-44	0.02	0.02	0.01	0.02	0.00	0.01	0.01	0.01
45-49	0.02	0.02	0.00	0.00	0.00	0.01	0.00	0.02
SMAM	21.6		20.5		20.0		20.4	
MAFB		20.5		20.5		21.0		20.2

Appendix 7.2.a: Variable description and codes

Variable		Code	Label
Name	Description		
v104_reh	Head of the household	1	No
		2	Yes
v131_pro	Location	1	Non Traditional line-of-rail
		2	Traditional line-of-rail Rural
		3	Traditional line-of-rail Urban
v141_res	Residence	1	Rural
		2	Urban
v152_edu	Education	1	None
		2	Primary
		3	Secondary and higher education
v192_eco	Economic activity	1	Not working outside the home
		2	Working outside the home for pay or profit
v161_rel	Religion	1	Catholic
		2	Non-Catholic
v172_mst	Marital status	1	Married
		2	Marriage disrupted
		3	Single
v173_mst	Type of marriage		
		1	Monogamous
		2	Polygamous
		3	Single
v231_con	Ever used contraception	1	No
		2	Yes
v232_con	Currently using contraception	1	No
		2	Yes

Appendix 7.3.a: Means, standard deviations (in italics) and univariate analysis results of selected present-day determinants of fertility for Zambian traditional reproductive regimes

1990 Census

Variable		Low trad.	Med. trad.	High traditional fert.		Univariate	
Name	Description (Range)	fertility	fertility	Patrilineal	Matrilineal	*F* ratio	*P* value
v104_reh	Head of the household	1.08	1.05	1.06	1.07	184.47	0.000
	(1-2, 1=No)	*0.27*	*0.22*	*0.24*	*0.26*		
v131_pro	Location	1.40	2.20	1.81	1.88	7,515.10	0.000
	(1-3, 1=Non Trad. Rail line)	*0.71*	*0.45*	*0.94*	*0.94*		
v141_res	Residence	1.31	1.29	1.47	1.44	2,728.97	0.000
	(1-2, 1=Rural)	*0.46*	*0.45*	*0.50*	*0.50*		
v152_edu	Education	1.85	1.89	1.86	1.83	142.42	0.000
	(1-3, 1=None)	*0.74*	*0.70*	*0.73*	*0.72*		
v192_eco	Economic activity	1.09	1.09	1.11	1.09	65.68	0.000
	(1-2, 1=Not working)	*0.28*	*0.29*	*0.31*	*0.29*		
v172_mst	Marital status	1.82	1.72	1.68	1.70	252.94	0.000
	(1-3, 1=Married)	*0.93*	*0.92*	*0.91*	*0.90*		
Total number in each regime		41,297	66,136	59,391	236,392		

Note: degree of freedom 1 = 3, degree of freedom 2 = 403,212)

2000 Census

Variable		Low trad.	Med. trad.	High traditional fert.		Univariate	
Name	Description (Range)	fertility	fertility	Patrilineal	Matrilineal	*F* ratio	*P* value
v104_reh	Head of the household	1.12	1.08	1.09	1.10	256.67	0.000
	(1-2, 1=No)	*0.32*	*0.27*	*0.28*	*0.30*		
v131_pro	Location	1.42	2.21	1.81	1.86	9,503.58	0.000
	(1-3, 1=Non Trad. Rail line)	*0.72*	*0.45*	*0.94*	*0.93*		
v141_res	Residence	1.29	1.26	1.45	1.42	3,446.62	0.000
	(1-2, 1=Rural)	*0.45*	*0.44*	*0.50*	*0.49*		
v152_edu	Education	2.01	2.07	2.05	2.01	200.66	0.000
	(1-3, 1=None)	*0.77*	*0.71*	*0.76*	*0.75*		
v192_eco	Economic activity	1.07	1.10	1.11	1.09	219.83	0.000
	(1-2, 1=Not working)	*0.26*	*0.30*	*0.31*	*0.28*		
v172_mst	Marital status	1.87	1.68	1.65	1.67	802.65	0.000
	(1-3, 1=Married)	*0.92*	*0.89*	*0.88*	*0.88*		
Total number in each regime		51,551	89,531	80,282	309,788		

Note: degree of freedom 1 = 3, degree of freedom 2 = 531,148)

Appendix 7.3.b: Means, standard deviations (in italics) and univariate analysis results of selected present-day determinants of fertility for Zambian traditional reproductive regimes

1992 DHS

Variable Name	Variable Description (Range)	Low trad. fertility	Med. trad. fertility	High traditional fert. Patrilineal	High traditional fert. Matrilineal	Univariate *F* ratio	Univariate *P* value
v104_reh	Head of the household	1.12	1.05	1.06	1.07	14.44	0.000
	(1-2, 1=No)	*0.33*	*0.21*	*0.24*	*0.25*		
v131_pro	Location	1.40	2.21	2.03	2.00	140.22	0.000
	(1-3, 1=Non Trad. Rail line)	*0.69*	*0.46*	*0.96*	*0.95*		
v141_res	Residence	1.28	1.32	1.60	1.52	108.87	0.000
	(1-2, 1=Rural)	*0.45*	*0.47*	*0.49*	*0.50*		
v152_edu	Education	1.99	2.08	2.12	2.04	6.84	0.000
	(1-3, 1=None)	*0.64*	*0.59*	*0.64*	*0.63*		
v192_eco	Economic activity	1.41	1.28	1.35	1.32	13.33	0.000
	(1-2, 1=Not working)	*0.49*	*0.45*	*0.48*	*0.47*		
v161_rel	Religion	1.87	1.87	1.73	1.66	98.12	0.000
	(1-2, 1=Catholic)	*0.34*	*0.34*	*0.44*	*0.48*		
v172_mst	Marital status	1.71	1.60	1.60	1.62	3.07	0.027
	(1-3, 1=Married)	*0.86*	*0.86*	*0.86*	*0.86*		
v173_mst	Type of marriage	1.99	1.90	1.85	1.81	9.24	0.000
	(1-3, 1=Monogamous)	*0.94*	*0.89*	*0.91*	*0.94*		
v231_con	Ever used contraception	1.63	1.48	1.81	1.60	30.80	0.000
	(1-3, 1=No)	*0.75*	*0.77*	*0.86*	*0.83*		
v232_con	Currently using contraception	1.16	1.15	1.23	1.18	3.94	0.008
	(1-3, 1=No)	*0.46*	*0.49*	*0.58*	*0.53*		
Total number in each regime		715	1,192	970	3,976		

Note: degree of freedom 1 = 3, degree of freedom 2 = 6,849)

1996 DHS

Variable Name	Variable Description (Range)	Low trad. fertility	Med. trad. fertility	High traditional fert. Patrilineal	High traditional fert. Matrilineal	Univariate *F* ratio	Univariate *P* value
v104_reh	Head of the household	1.14	1.07	1.10	1.11	11.13	0.000
	(1-2, 1=No)	*0.35*	*0.25*	*0.30*	*0.31*		
v131_pro	Location	1.34	2.21	1.73	1.69	212.68	0.000
	(1-3, 1=Non Trad. Rail line)	*0.68*	*0.47*	*0.93*	*0.90*		
v141_res	Residence	1.26	1.26	1.46	1.40	55.23	0.000
	(1-2, 1=Rural)	*0.44*	*0.44*	*0.50*	*0.49*		
v152_edu	Education	2.10	2.16	2.12	2.08	5.22	0.001
	(1-3, 1=None)	*0.64*	*0.56*	*0.64*	*0.63*		
v192_eco	Economic activity	1.34	1.25	1.31	1.34	13.63	0.000
	(1-2, 1=Not working)	*0.47*	*0.43*	*0.46*	*0.47*		
v161_rel	Religion	1.86	1.89	1.80	1.71	83.24	0.000
	(1-2, 1=Catholic)	*0.34*	*0.32*	*0.40*	*0.45*		
v172_mst	Marital status	1.85	1.63	1.57	1.61	22.40	0.000
	(1-3, 1=Married)	*0.90*	*0.87*	*0.84*	*0.84*		
v173_mst	Type of marriage	2.09	1.92	1.84	1.83	22.30	0.000
	(1-3, 1=Monogamous)	*0.96*	*0.90*	*0.91*	*0.94*		
v231_con	Ever used contraception	1.75	1.81	1.92	1.75	11.19	0.000
	(1-3, 1=No)	*0.88*	*0.89*	*0.88*	*0.88*		
v232_con	Currently using contraception	1.25	1.28	1.35	1.28	4.58	0.003
	(1-3, 1=No)	*0.61*	*0.63*	*0.69*	*0.64*		
Total number in each regime		915	1,235	1,027	4,577		

Note: degree of freedom 1 = 3, degree of freedom 2 = 7,750)

2001-02 DHS

Variable Name	Variable Description (Range)	Low trad. fertility	Med. trad. fertility	High traditional fert. Patrilineal	High traditional fert. Matrilineal	Univariate *F* ratio	Univariate *P* value
v104_reh	Head of the household	1.13	1.10	1.09	1.11	3.19	0.023
	(1-2, 1=No)	*0.34*	*0.30*	*0.29*	*0.32*		
v131_pro	Location	1.33	2.16	1.67	1.62	184.62	0.000
	(1-3, 1=Non Trad. Rail line)	*0.64*	*0.44*	*0.91*	*0.87*		
v141_res	Residence	1.26	1.27	1.41	1.35	24.59	0.000
	(1-2, 1=Rural)	*0.44*	*0.44*	*0.49*	*0.48*		
v152_edu	Education	2.14	2.21	2.21	2.12	9.67	0.000
	(1-3, 1=None)	*0.66*	*0.59*	*0.64*	*0.62*		
v192_eco	Economic activity	1.36	1.36	1.39	1.50	43.86	0.000
	(1-2, 1=Not working)	*0.48*	*0.48*	*0.49*	*0.50*		
v161_rel	Religion	1.92	1.89	1.82	1.70	106.06	0.000
	(1-2, 1=Catholic)	*0.27*	*0.32*	*0.39*	*0.46*		
v172_mst	Marital status	1.74	1.61	1.56	1.63	6.87	0.000
	(1-3, 1=Married)	*0.88*	*0.86*	*0.83*	*0.84*		
v173_mst	Type of marriage	1.99	1.90	1.81	1.85	6.80	0.000
	(1-3, 1=Monogamous)	*0.95*	*0.91*	*0.92*	*0.95*		
v231_con	Ever used contraception	1.92	2.05	2.04	1.99	3.93	0.008
	(1-3, 1=No)	*0.93*	*0.94*	*0.92*	*0.93*		
v232_con	Currently using contraception	1.35	1.45	1.44	1.40	3.31	0.019
	(1-3, 1=No)	*0.72*	*0.81*	*0.78*	*0.76*		
Total number in each regime		787	1,083	1,080	4,450		

Note: degree of freedom 1 = 3, degree of freedom 2 = 7,396)

Appendix 7.4.a: Error correlations of selected present-day determinants of fertility for Zambian traditional reproductive regimes

Census data sources

Variable		Error correlations				
Name	Description	v131_pro	v141_res	v152_edu	v192_eco	v172_mst
1990 Census						
v104_reh	Head of the household	-0.03	-0.01	-0.02	0.24	0.07
v131_pro	Location		0.66	0.29	0.14	0.05
v141_res	Residence			0.37	0.16	0.08
v152_edu	Education				0.19	0.16
v192_eco	Economic activity					-0.01
v172_mst	Marital status					
2000 Census						
v104_reh	Head of the household	-0.02	-0.03	-0.02	0.19	0.06
v131_pro	Location		0.48	0.29	0.10	0.08
v141_res	Residence			0.36	0.06	0.15
v152_edu	Education				0.11	0.19
v192_eco	Economic activity					-0.02
v172_mst	Marital status					

DHS data sources

Variable		Error correlations								
Name	Description	v131_pro	v141_res	v152_edu	v192_eco	v161_rel	v172_mst	v173_mst	v231_cont	v232_cont
1992 DHS										
v104_reh	Head of the household	-0.05	-0.01	-0.02	0.15	0.00	0.10	0.27	0.09	0.02
v131_pro	Location		0.71	0.29	-0.02	0.01	0.10	0.04	0.14	0.10
v141_res	Residence			0.39	0.01	-0.04	0.15	0.08	0.16	0.12
v152_edu	Education				0.06	-0.04	0.20	0.13	0.20	0.15
v192_eco	Economic activity					-0.01	-0.12	-0.06	0.20	0.12
v161_rel	Religion						-0.01	0.00	-0.02	-0.02
v172_mst	Marital status							0.89	-0.25	-0.14
v173_mst	Type of marriage								-0.21	-0.13
v231_con	Ever used contraception									0.49
v232_con	Currently using contraception									
1996 DHS										
v104_reh	Head of the household	-0.03	0.00	-0.01	0.12	-0.02	0.06	0.25	0.05	-0.02
v131_pro	Location		0.66	0.29	-0.05	0.01	0.07	0.03	0.15	0.10
v141_res	Residence			0.38	0.02	-0.02	0.13	0.09	0.18	0.13
v152_edu	Education				0.05	-0.02	0.22	0.16	0.21	0.12
v192_eco	Economic activity					0.00	-0.10	-0.04	0.14	0.06
v161_rel	Religion						-0.05	-0.05	-0.01	-0.02
v172_mst	Marital status							0.89	-0.26	-0.18
v173_mst	Type of marriage								-0.22	-0.19
v231_con	Ever used contraception									0.51
v232_con	Currently using contraception									
2001-02 DHS										
v104_reh	Head of the household	-0.02	0.00	-0.04	0.11	-0.01	0.10	0.30	0.06	-0.05
v131_pro	Location		0.61	0.24	-0.10	0.06	0.08	0.03	0.15	0.13
v141_res	Residence			0.37	-0.11	0.04	0.13	0.08	0.17	0.14
v152_edu	Education				-0.06	-0.02	0.21	0.14	0.17	0.13
v192_eco	Economic activity					-0.02	-0.14	-0.07	0.09	0.03
v161_rel	Religion						-0.01	-0.01	0.01	0.01
v172_mst	Marital status							0.89	-0.33	-0.24
v173_mst	Type of marriage								-0.28	-0.25
v231_con	Ever used contraception									0.52
v232_con	Currently using contraception									