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Dedication

To my beloved girlfriend Mable Mvula and siblings (Faith Chanda, Monica Mushinge, Musonda Mushinge, Fridah Gray, Valeria Gray, Kelvin Mushinge, Franklin Choonga, Vanessa Choonga, Katebe Mwansa, Mwape Mushinge, Kabamba Mushinge, Chilufya Justin Mushinge and Benjamin Mushinge).

Thesis abstract

Child stunting remains one of the biggest public health concerns in Zambia and other low and middle-income countries (LMICs). A formidable challenge faced in improving child health outcomes in LMICs includes persistent socioeconomic and residential disparities. Despite achieving an overall decline in the prevalence of child stunting over the past decades, children residing in rural areas and less-privileged households continue to fall behind their peers from urban areas and wealthier households in Zambia and other LMICs. Notably, studies have shown that children residing in rural areas and less privileged households have a higher risk and burden of stunted growth in sub-Saharan Africa (SSA). However, basic rural-urban differentiation in child stunting can potentially conceal wealth differentials that exist within rural and urban areas. Specifically, cross country analyses have revealed that wealth differentials were higher in urban areas compared to rural areas; and higher than the overall urban-rural odds of stunting among children under five years of age.

Using data from the 2013/14 Zambia Demographic Health Survey (ZDHS), differences in the relationship between socioeconomic status and child stunting in urban and rural areas of Zambia were assessed in this study. Furthermore, the study examines the effect of socioeconomic status and residence type in predicting child stunting prevalence in Zambia. To achieve these, the thesis used chi-square tests and logistic regression analysis. To the best of my knowledge, this is the first single-country analysis primarily focused on Zambia that has disaggregated the effect of predictors of child stunting by residence type. It is anticipated that the results of this dissertation will broaden the knowledge-base on wealth and residential differentials in child nutritional outcomes in Africa and thereby provide useful information to policymakers and technocrats in Zambia.

Overall, the findings indicate that children under five years who reside in urban areas and poorer households have a higher likelihood of becoming stunted compared to their peers in rural and wealthier households. However, the relationship between child stunting and household wealth (SES) differs slightly after segregating by residence type. In both rural and urban areas, there is a consistent inverse relationship between

the odds of stunted growth among under-fives and SES. Furthermore, these findings indicate that socioeconomic differentials are wider in rural areas compared to urban areas and much wider than the overall rural-urban odds ratios in Zambia. These findings could possibly be because of socioeconomic inequalities in child stunting that are higher in rural areas than urban areas. However, there is a need for further research to examine the causes of differentials in child stunting that may exist in rural and urban locations of Zambia.

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1.1 Background

Zambia is one of the countries with the highest prevalence of chronic child malnutrition or stunting[1] in the world, with lasting consequences for children who suffer from this nutritional disorder (Weise, 2012). Child stunting is one of the major impediments to human development globally, affecting 162 million children under the age of five years (World Health Organisation [WHO], 2014). Child stunting is a largely irreversible outcome of inadequate nutrition and repeated bouts of infection during the first 1000 days of a child's life. Stunting has long-term effects on individuals and societies, including: diminished cognitive and physical development, reduced productive capacity and poor health, and an increased risk of degenerative diseases such as diabetes (WHO, 2014). Stunting before the age of 2 years predicts poorer cognitive and educational outcomes in later childhood and adolescence and has significant educational and economic consequences at the individual, household and community levels (Walker *et al.*, 2007). Child stunting reflects low height for age which illuminates the relationship between poverty and undernutrition and is a risk marker of child development (Kennedy *et al.*, 2006).

Globally, there has been a significant decline in the prevalence of stunting below the age of 5 years. The under-five stunting prevalence rate has gradually reduced from 39.5% in 1990 to 22.9% in 2016 (Weise, 2012; Shekar *et al.*, 2017). This drop in the prevalence of child stunting has been modest in sub-Saharan Africa (SSA). In 2016, more than one-third of stunted children in the world lived in SSA (Shekar *et al.*, 2017). Within SSA, some countries have experienced negligible changes, whereas others have had substantial changes in their child stunting prevalence rates. In 2012, the WHO adopted a new global target of reducing the proportion of stunted children under the age of five years by 40% by 2025 (De Onis *et al.*, 2013). Like several other SSA countries that made minimal progress in achieving targeted reductions in child stunting as stipulated by the Millennium Development Goals (MDGs), Zambia has made it an important priority to reduce child stunting over the coming years (National Food and Nutrition Commission of Zambia, 2011). However, beyond national and

[1] Child Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. The term Child Stunting will be used synonymously with "chronic undernutrition" and "poor linear growth".

regional averages there are large disparities in child stunting and child nutritional status in Zambia if there is stratification done based on wealth and residence type (Menon, Ruel & Morris, 2000; Masiye *et al.*, 2010).

Universally, one-third of rural children under five years of age are stunted compared to one quarter in urban areas (Weise, 2012; World Health Organization, 2014). Likewise, children under the age of five in the poorest communities are twice as likely to be stunted as children in the richest communities. The measurement of these wealth and residential differentials in child stunting is important in understanding the consequences for child health amidst the rapid urban population explosion evident over the last few decades in the SSA and the rest of the developing world. Joint efforts by the Zambian Government and its collaborating partners to address child health and nutrition issues have been underway since the 1990s. Although these efforts have contributed to the overall reduction in child stunting, a wide variation in stunting still exists. In particular, the child stunting prevalence was at 48% amongst the children of poorest 20% and rural households (Central Statistical Office, 2009). Studies that focussed on Zambia primarily established that children from rural areas as well as those from poor households have inferior chronic undernutrition rates and are more likely to be stunted than their urban and wealthier counterparts (Masiye *et al.*, 2010). However, none of these studies has sought to quantify the socioeconomic differentials[2] between rural and urban areas. Inasmuch as rural-urban and poor-rich comparisons are useful and informative, they mask socioeconomic disparities at lower administrative levels at which nutritional policy and planning and implementation are conducted. This study aims to fill that gap using the most recent Zambia Demographic Health Survey (2013/14).

1.2 Problem statement

Child stunting remains one of the major public health concerns in the developing world. Chronic undernutrition (stunting) is highlighted as a major risk factor of

[2] Socioeconomic differentials in stunting refer to the designated differences, variations and disparities in the child stunting prevalence between different socioeconomic strata/groups.

mortality and overall disease burden in infants and children. Zambia has one of the highest prevalence of child stunting in the Sub-Saharan region and the rest of the world (Menon,P., Ruel,M.T. & Morris, 2000; Masiye *et al.*, 2010). The country has made advances towards the reduction of child stunting over the past three decades (Katherine, 2016). However, large disproportions in child stunting status in Zambia have persisted amongst sub-groups within the population (Masiye *et al.*, 2010).

Specifically, Zambia's child stunting prevalence is characterised by huge differentials in child stunting when stratified by wealth status and residence type (rural or urban). Evidence has shown that under-fives residing in rural areas in Zambia and other lower-middle-income countries (LMICs) have a higher burden and risk of getting stunted (Menon, Ruel and Morris, 2000; L. Smith, Ruel and Ndiaye, 2005; Van de Poel, O'Donnell and Van Doorslaer, 2007). Similarly, the prevalence of child stunting in Zambia and other LMICs follows the wealth gradient; which illustrates that children from wealthier groups are less likely to be stunted compared to their counterparts from less privileged groups and households (Fotso, 2007; Van De Poel *et al.*, 2008). However, changes in the population and socioeconomic dynamics between urban and rural areas over time challenge the commonly held assumption that children in urban areas have a lower burden and risk of stunted growth in under-fives. There has been a dramatic rise in the global population, from 5 billion people in 1990 to approximately 7.3 billion people in 2017 (World Bank 2017). Over this period, the proportion of the population residing in urban areas has increased from 43% in 1990 to 50.2% in 2008 and 54.2% in 2016 (World Bank 2017). For the first time in history, in 2008, the urban population was higher than the rural population. This is in comparison to only a third who resided in cities in 1985 (Pacierek, *et al.,* 2013). It is estimated that the urban population is growing three times faster than the rural population in SSA (United Nations: Department of Social and Economic Affairs: Population Division, 2014). Zambia's urban population equally has increased from 34% in 2000 to 41.4% in 2016. Unfortunately, this rise in urban population has not been coupled with simultaneous job creation, provision of social services and distribution of resources in Zambia and the rest of SSA. Stromquis (1999) asserted that the impact of structural adjustment programmes (SAPs) had been quite severe on Zambia in the 1990s, following reduced public spending on municipal services, housing and infrastructure. The impact of programmes culminated in high levels of poverty and stunting in rural and urban locations in Zambia. Nevertheless, Zambia's economic performance improved,

resulting in an average annual GDP growth rate of 7.2% per annum between 2001 and 2013 (Mulungu & Ng'ombe, 2017). However, this improvement in economic performance had not translated into any meaningful decline in child stunting as the prevalence rate remained at 45%, way above the worldwide average of 27% in 2007 (Central Statistical Office 2009; de Onis & Branca, 2016).

On the contrary, the rapid increase in urban populations in SSA has been accompanied by chronic child undernutrition and urban poverty over the years. Haddad, Ruel & Garrett (1999) revealed that in a study of 14 SSA countries, the absolute number and share of poor people living in urban areas increased between 1980 and 1994. The poor and undernourished urban population increased between the 1980s and the late 1990s and has done so at a rate which has outpaced corresponding changes in rural areas (Haddad, Ruel & Garrett, 1999). The urban share of total poverty in Zambia had been projected to increase from 30% in 2002 to 40% in 2020 (Haddad, Ruel & Garrett, 1999; Sahn, 2003). Furthermore, Haddad et al. (1999) observed that the locus of poverty and chronic undernutrition seems to be changing from rural to urban areas in SSA. If this projection is to be true, then it is expected that the urban proportion of child stunting in Zambia will grow immensely in the coming years. Nevertheless, residing in urban areas does not automatically confer a nutritional status advantage for urban children over their rural counterparts. In some cases, evidence has shown that children from the poorest households residing in urban areas can be just as stunted as children from the poorest rural households (Fotso, 2006a). In addition, others have shown that the differentials in child stunting between the richest and the poorest are wider in urban areas than rural areas (Menon,P., Ruel,M.T. & Morris, 2000).

Disparities in child health and nutrition outcomes are not only a threat to Zambia's long-term ambitions but also perpetuate the intergenerational health-poverty trap that affects millions of individuals and families. The health-poverty trap is a phenomenon in which health conditions and poverty inherently reinforce each other, thereby making it extremely difficult for the poor to emancipate themselves out of the poverty cycle (Ogujiuba & Omoju, 2013) These wealth and residential differentials in child stunting status are exacerbated by rapid population growth amidst poverty in both rural and urban locations in less developed countries.

Unlike other Sub-Saharan African (SSA) countries experiencing rapid urban population growth, Zambia has experienced one of the least urban population growth rates (United Nations: Department of Social and Economic Affairs: Population Division, 2014; The World Bank, 2015). However, Zambia is a LMIC which has more than half of its population living on less than US$1.90 a day (Sachs *et al.*, 2017). Moreover, poverty is mainly a rural phenomenon in which 76.6% of Zambia's poor population were residing in rural areas in 2015, a figure three times which was prevalent in urban areas, at 23.4% (Republic of Zambia, 2016). It is therefore of utmost import that policies and strategies that aimed at curtailing wealth and residential differentials in child nutritional status provide everyone with equal opportunities in health and productivity.

Since the study by Kuate-Defo (1996), many studies have emerged from SSA and other developing countries that have attempted to examine the magnitude of socioeconomic differentials in child stunting and other health outcomes comparing rural and urban locations (Ruel, Haddad and Garrett, 1999; Menon, Ruel. & Morris, 2000; Fotso, 2007; Van de Poel, O'Donnell and Van Doorslaer, 2007). To the best of our knowledge, this study will be the first to systematically address the quantification of wealth differentials in the occurrence of child stunting between the rural and urban areas with a principal focus on Zambia. Secondly, no single country study conducted in Zambia has ever disaggregated the impact of the determinants of child nutritional status by residence type (rural-urban). Given this perspective, the drive of conducting this research is to contribute to the scarce empirical works on wealth and residential differentials in child stunting conducted in Zambia.

1.3 Justification

In the year 2012, the World Health Assembly Resolution 65.6 endorsed a comprehensive implementation plan on maternal, infant and young child nutrition, which specified six global nutrition targets for 2025 (WHO, 2014). The first target agreed upon was to achieve a 40% reduction in global child stunting prevalence by

2025. Like other WHO Member states, the Zambian government and its partners have placed a greater emphasis on the need to reduce child stunting rates and other forms of poor child health outcomes (Ministry of Health, 2017).

To formulate and implement effective policies and strategies to address child stunting in rural and urban areas as well as in rich and poor sections of Zambian communities, there is a need for clear evidence of the extent of disparities across and within countries. The publication of the report by the WHO commission of social determinants suggested that progress towards population health improvements begins with the identification and measurement of the magnitude and extent of the disparities in health outcomes amongst marginalized groups, their characteristics and attributes in terms of where they reside, their occupations, wealth as well as the health aspects in which they face marginalisation (Commission on the Social Determinants of Health, 2008). This information becomes important in designing policies aimed at changing their predicament. In addition, Zambia's Ministry of Health has recognised that the accomplishment of positive health outcomes entails utilizing evidenced-based decisions (National Food and Nutrition Commission of Zambia, 2011). Without comparable robust information about stunting in rural and urban areas, health authorities, planners, policymakers and donor financiers face sizeable challenges to optimally fund and target appropriate health interventions relevant to child stunting.

After the failure to meet targeted reductions in child undernutrition as stipulated by the MDGs in 2015, the Zambian government and other stakeholders have reinforced the need for a multi-sectoral approach towards the fight against child stunting (Ministry of Health, 2017). This study comes at a time when Zambia and other WHO member countries in SSA have domesticated Sustainable Development Goals (SDGs) and have obtained lessons from the Millennium Development Goals (MDGs), which ended in 2015[3]. From 2015, several interventions through various remedial policies and programmes have been implemented to curtail stunted growth amongst children in Zambia. Since the 2013/14 DHS dataset is being used, findings from this study may not be reflective of the prevailing trends. However, the results may act as a baseline

[3] In 2015, heads of states of UN member countries agreed on Sustainable Development Goals at the UN General Assembly, which supersedes the Millennium Development Goals that sets an agenda for a period commencing from 2015-2030.

for future studies. It is envisioned that this research study will provide important knowledge about the relationship between wealth status and child stunting in rural and urban areas, thereby providing useful information to policymakers and technocrats in Zambia.

1.4 Aims and objectives

1.4.1 Aims

To understand the role of socioeconomic status and residence type in predicting child stunting in Zambia

1.4.2 Specific objectives

- To assess differences in the relationship between socioeconomic status and child stunting in urban and rural areas of Zambia.
- To assess the effect of residence type and socioeconomic status on child stunting in Zambia.

1.5 Literature review

On average, child stunting and other child health status outcomes have been characterised by rural-urban disparities in developing countries over the past few decades (Van de Poel, O'Donnell and Van Doorslaer, 2007). A substantial body of empirical studies have shown that average child nutrition outcomes in urban areas are significantly better than in rural areas in a large cross-section of low- and middle-income countries (Menon, Ruel & Morris, 2000; Smith, Ruel & Ndiaye, 2005; Fotso, 2007; Van de Poel, O'Donnell and Van Doorslaer, 2007). Braun *et al.*'s study of 33 countries from Sub-Saharan Africa, Asia and Latin America shows that urban children have better mean nutrition outcomes as compared to their rural counterparts (Bambra *et al.*, 2007). The study by Van De Poel *et al.* (2007) of 47 developing countries corroborates these findings with results revealing significant differences in rural-urban stunting prevalence rates in 43 of 47 countries. Additionally, it shows that the median rural-urban relative risk ratio is 1.4 for both stunting and child mortality (Van de Poel, O'Donnell & Van Doorslaer, 2007). Masiye *et al.*'s (2010) study revealed that there is a higher prevalence of stunting, underweight and wasting in children in rural areas than in urban areas in Zambia (Masiye *et al.*, 2010).

There are various factors that explain the difference in child stunting and child health between rural and urban areas. Smith *et al.'s* (2005) findings suggest that the better nutritional status of urban children compared to their rural counterparts is likely due to the cumulative effect of a series of more favourable conditions including socioeconomic conditions and an advantage to proximal determinants (Smith, Ruel & Ndiaye, 2005). Several studies have shown that the odds of suffering from growth stunting are much higher among children living in the poorest households than among children in the wealthiest households in low and middle income countries (Haddad, Ruel & Garrett, 1999; Menon, Ruel & Morris, 2000; Fotso, 2006b, 2007; Bambra *et al.*, 2007). These studies illustrate that stunted growth in children under five has a socioeconomic gradient. The socioeconomic gradient refers to an inverse relationship between socioeconomic status and health outcomes (Szwarcwald, Souza-Júnior & Damacena, 2010). In several cases, the association between socioeconomic status and child stunting remain strong even after controlling for child and mother characteristics (Van de Poel, O'Donnell & Van Doorslaer, 2007). Similar studies in the Democratic Republic of Congo and Zambia found a strong relationship between child growth stunting and socioeconomic status (Masiye *et al.*, 2010; Kismul *et al.*, 2017).

A simple comparison of rural-urban disparities poses a danger in understanding the relationship between socioeconomic status and child stunting in rural and urban locations because they conceal the large socioeconomic difference that exists between rural and urban areas. Cross-sectional studies conducted in low and middle income countries have indicated that within-urban socioeconomic differentials in child stunting are wider than within-rural socioeconomic differentials and also larger than the overall rural-urban differentials (Fotso & Kuate-Defo 2006; Liu, Fang & Zhao 2013; Menon, Ruel & Morris, 2000; Van de Poel, O'Donnell, & Van Doorslaer 2007). In extreme circumstances, within-urban odds ratios were ten times higher for children of the richest households compared to the poorest in Peru and the Dominican Republic; whereas within-rural odds ratios were smaller than 3.5 in all countries except in Brazil (Menon, Ruel & Morris, 2000). However, longitudinal studies conducted in low- and middle-income countries have shown that in urban areas, wealth differentials of child stunting are larger than those in rural areas (Haddad, Ruel

& Garrett, 1999; Fotso, 2007). On the contrary, these studies have shown that the urban advantage in child stunting is on the decline. The findings illustrate that there is a difference in the magnitude of socioeconomic inequality in child stunting prevalence between rural and urban children in low and middle-income countries.

1.6 Conceptual framework

The conceptual framework proposed is an amalgamation of the United Nations International Children's Fund (UNICEF), Mosley and Chen (1984) and Garcia *et al.* (2015) frameworks that explain child malnutrition (Mosley & Chen, 1984; UNICEF, 1990; Commission on Social Determinants of Health *et al.*, 2015). These frameworks are both cardinal in the sphere of research on the determinants of child undernutrition and health in developing countries.

The UNICEF child undernutrition framework recognises and acknowledges the complexity of the causes and determinants of chronic malnutrition (UNICEF, 1990). The UNICEF conceptual framework on undernutrition is a guide used for interventions from a multi-sectoral and multidimensional perspective, moving from macro to micro levels of focus (Reinhardt & Fanzo, 2016). This framework has been widely used in various studies to tackle child malnutrition and has been lauded for its flexibility and applicability in different contexts and settings (Smith & Haddad, 2000; Smith, Ruel & Ndiaye, 2005). However, the framework has also been a subject of critique for being unidirectional and for complexity arising from its assumption that children of the same household are influenced by the same environmental factors (Krahnstoever Davison, Davison & Birch, 2001).

On the other hand, Mosley and Chen's (1984) framework postulates that the determinants of child survival are categorised into five factors. These are maternal factors; environmental factors; personal illness (prevention, treatment), injuries and personal deficiencies. This model suggests that socioeconomic determinants must operate through a set of proximate determinants that directly influence the risk of illness and overall health and wellbeing. In addition, Garcia *et al.* (2013) draw insights

from frameworks proposed by Mosley and Chen (1984) as well as Davison and Birch (2001) to simultaneously explain the drivers of both undernutrition and overnutrition. This framework recognises that malnutrition (undernutrition/overnutrition) is a result of the interplay between proximate, household and community-level factors. This framework is convenient as it can also be used to explain the double burden of malnutrition.

1.6.1 Framework used in the study

The factors that affect child stunting include: (i) the child's characteristics such as sex, age, breastfeeding duration, multiple births, birth weight and birth order; (ii) mother's characteristics such as body mass index (BMI), mother's education, marital status and the mother's age at birth; (iii) household characteristics such as family size, household composition, housing, , food security and income, and; (iv) community characteristics such as access to and utilisation of health care services such as delivery and antenatal care services, residence type and water and sanitation (Fotso & Kuate-Defo, 2006). The conceptual framework is illustrated in Figure 1 below.

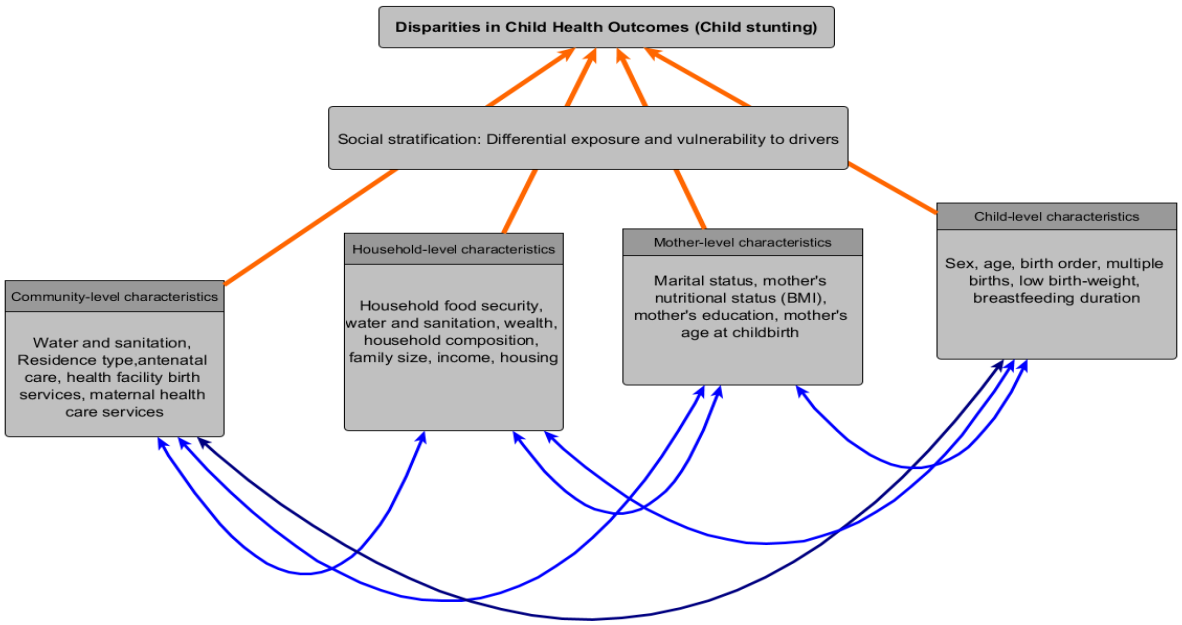

Figure 1: Conceptual framework for disparities in child stunting in low and middle-income countries

Literature has shown that these factors influence child health and nutritional outcomes (Kuate-Defo, 1996; Garrett & Ruel, 1999). The framework in Figure 1 posits that disparities in child health outcomes (child stunting) between different population sub-groups among children under five is a manifestation of differences in characteristics that occur at child, mother, household and community levels (Mosley & Chen, 1984; UNICEF, 1990; Fotso & Kuate-Defo, 2006; Garcia *et al.*, 2013). The framework supposes that these characteristics influence each other and subsequently determine the levels of child health outcomes and specifically child stunting. Furthermore, child stunting is the result of the interplay of characteristics at different levels, namely; child, mother, household and community levels. These characteristics may have a direct or indirect effect on other risk factors with the exception of the child's age and sex, which have independent effects on child stunting.

The framework adopts the social causation theory, which suggests that variations in child health and nutritional outcomes among different population groups are a result of spatial differences in the availability and access to key factors that affect health amongst them. Apart from maternal education, residence type (urban/rural) and wealth are the two other key predictors of child stunting. Studies have shown that rural-urban disparities in child stunting are a result of differences in socioeconomic factors at the household and community levels to a larger extent, and proximate factors to a lesser extent (Garrett & Ruel, 1999; L. Smith, Ruel & Ndiaye, 2005). These factors have been the driving force behind the increase in urban poverty and poor linear growth in most SSA countries (Haddad, Ruel & Garrett, 1999; African Development Bank, 2013). Despite the overwhelming interest and progress in the use of socioeconomic status in health research, its measurement remains unsettled. Like most developing countries, most Zambians lack reliable information on household income. Therefore, this study will use the 'household wealth' index, which was constructed using household-level characteristic data using principal component analysis (PCA).

2 Methodology and study design

2.1 Data sources

The study uses data from the Zambia Demographic Health Survey (ZDHS) 2013/2014. The ZDHS is a national sample survey designed to provide up-to-date information on background characteristics of the respondents, fertility levels, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children.

2.2 Zambia Demographic Health Survey 2013-2014

The sample for the 2013-14 ZDHS was designed to provide estimates at national and provincial levels, as well as for rural and urban areas within the provinces (Central Statistical Office, 2014). The ZDHS is a nationally representative survey in which a two-stage stratified cluster sample design was used, with Enumeration Areas[4] (EAs) (or clusters) selected during the first stage and households selected during the second stage. The sampling frame comprised of 25,631 EAs and 2,815,897 households. A representative sample of 18,052 households was drawn for the 2013-14 ZDHS. In the first stage, 722 EAs (305 in urban areas and 417 in rural areas) were selected with probability proportional to size. Zambia is now administratively divided into 10 provinces (Central, Copperbelt, Eastern, Luapula, Lusaka, Muchinga, Northern, North Western, Southern, and Western). Stratification was achieved by separating each province into urban and rural areas. Therefore, the 10 provinces were stratified into 20 sampling strata. In the second stage, a complete list of households served as the sampling frame in the selection of households for enumeration. An average of 25 households was selected in each EA.

2.3 Dependent variable

To assess child stunting, the survey measured height-for-age for all children aged 0-59 months as our dependent variable. Height-for-age is the most reliable long-term indicator of child nutritional status because it is less sensitive to temporary food shortages (WHO, 1986; Zere & McIntyre, 2003). As recommended by the World

[4] Enumeration Areas are physically demarcated land areas of the entire country into unique areas of an average population size of about 600 people or 130 households. For each EA, information is available on its location, residence type (urban or rural), number of households and total population.

Health Organization, a child is considered stunted if their length or height is below -2 standard deviations growth standard medians for the same age and sex (de Onis & Branca, 2016). The variable will be coded as "1" (stunted) if HAZ was ≤-2 and "0" (not stunted) if HAZ ≥-2. Table A.1 shows a summary of the variables involved in the study.

Table A.1: List and definition of variables [5]

variable	Type of variable	Range/Code
Dependent variable		
Stunted	Binary	1=Stunted, 0=Not Stunted
Explanatory variables		
	Child-level	
Sex of child	Binary	1=Male, 2=female
Age of child (in months)	Ordinal	1=0-11,2=12-23,3=24-35,4=36-47,5=48-59
Birth order	Ordinal	1=1st Born, 2=2nd Born, 3=3rd Born, 4=4th born, 5=>4
Breastfeeding duration	Ordinal	0=Never Breastfed, 1=0-11, 2=12-23, 3=24 or more
	Mother-Level	
Mother's Age at Birth (in years)	Ordinal	1=<16, 2=16-25,3=26-35, 4=36-45,5= 45>
Marital Status	categorical	1=Married, 2=Unmarried
Mother's Education	Ordinal	0=No education, 1=Primary, 2=Secondary, 3=Higher
Mother's BMI at Birth	Ordinal	1=<18.5,2=18.5-24.9 3=>25
Multiple Births	Ordinal	1=Single Born, 2=Twin/higher Order
Breastfeeding Duration	Ordinal	1=0-11, 2=12-23, 3=24 or more 4=Unsure 5=Never Breastfed,
	Household-level	
Wealth Index	Ordinal	1=Richest 20% to 5=Poorest 20%
	Community-level	
Residence type	Binary	1=Urban, 2=Rural
Health Facility Births	Categorical	1=Home 2=Health facility

[5] All explanatory variables coded as 1 act as dummy variables.

		3=Other
Antenatal care	Binary	1=No visits 2=1-3 visits 3=more than 4 visits

2.4 Statistical methods and empirical analytical strategies

The statistical program Stata version 15 was used for the analyses with statistical significance set at $p<0.05$. The focus of the study was children under five years of age whose anthropometric measures had been recorded over the period of the ZDHS survey. The analyses involved the use of chi-square tests, univariate and multiple logistic regression techniques to assess the effect of residence and household wealth on child stunting in Zambia. The chi-square test was utilised to assess the association between child stunting and each of the explanatory variables separately. Only those predictors that showed a statistically significant association with stunted growth were fed into the multiple logistic regression models. Thereafter, univariate and multiple logistic regression models were employed to measure the differences in the relationship between child stunting and socioeconomic status in rural and urban areas after controlling for other predictors. The logistic regression models follow Becker's household determinants of nutrition function (Becker, 1965). A 'nutrition production function' relates child nutritional status (binary 'height-for-age' outcome) to a set of health inputs as follows:

Stunting=f (Wealth, Residence type, Child's age, Birth order, Sex of Child, Mother's age, Marital status, Breastfeeding duration, Mother's BMI, Mother's education, Antenatal care visits, Health facility births).

The first logistic regression assessed the effect of residence type and household wealth on child stunting. A similar logistic regression assessed the effect of residence type and household wealth on child stunting while controlling for other covariates.

The last two models involved separately running logistic regression for rural and urban locations.

3 Research ethics

This study involved the use of the Zambia Demographic Health Survey data sets. This is not expected to raise any ethical matters as we are using existing secondary data which already is in the public domain. However, the study sought ethics approval from the University of Cape Town's Human Research Ethics Committee (HREC).

4 Dissemination of findings

The findings of this study will be shared through publications; namely a policy brief and a research article.

Table A. 2: Research budget

ITEM	DESCRIPTION	TOTAL
Communication	Airtime, data bundles	R 4,000
Transport	Domestic travel which includes taxi fare, Uber fares,	R 5,500
Stationary	Includes pen, paper, printing and photocopying costs	R 1,500
Snacks	Mineral water, soft drinks	R 2,000
Overhead costs	Overhead cost @10% of all other costs	R 1,300
TOTAL COSTS		**R 14,300**

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Part B: Literature review

1.1 Theoretical Review

This section is sub-divided into five sections: 1) theoretical discourse around the determinants of child stunting; 2) definition of inequalities and inequities; 3) theoretical explanations for rural-urban disparities in child nutritional status and health; 4) theoretical explanations for wealth disparities in child nutrition and health; 5) conceptual framework for evaluation of inequalities or disparities in childhood malnutrition. The literature included in this section were obtained from the following electronic database' searches; Google Scholar, PubMed, Medline and ECONLIT.

1.2 Determinants of child stunting in developing countries

In this section, the theoretical discourse around the determinants of child stunting in developing countries is reviewed. The factors that determine child stunting are complex, ranging from social and biological to economic and environmental (Mosley & Chen, 1984; UNICEF, 1990). The determinants of stunted growth in children under five are grouped as follows: child level, mother level, household level and community-level characteristics.

1.2.1 Child-level characteristics

There is a link between stunted growth in children under five and child-level characteristics, which include the age of the child, sex of the child, birth order, breastfeeding duration and the child's birth weight.

1.2.2 Child's age

Age is an important factor in a child's growth and development. Studies have shown evidence that stunted growth can commence immediately after birth, with growth faltering occurring before three years of age being irreversible (Victora *et al.*, 2010). Some studies have shown that the risk of stunting increases with the child's age (Rakotomanana *et al.*, 2017). It is assumed that the weaning period between 6 to 12 months is the period at which children are most vulnerable to growth retardation (Adair and Guilkey, 1997). It has been further suggested that the onset of most child stunting occurs between the ages of 2 to 3 years (Adair & Guilkey, 1997). The exact mechanism that links a child's age to stunted growth has not been established. Rather,

most studies have associated child stunting to poverty within households and communities (Adair & Guilkey, 1997).

1.2.3 Child's sex

Likewise, there are observed gender differentials in child stunting. These differences are more substantial in communities where girls and women are considered less important than boys and men (Omigbodun *et al.*, 2010). These inequalities between males and females are in the form of discriminatory breastfeeding and food supplementary practices and nutrition discrimination within households which subsequently result in nutrition deprivation and chronic undernutrition (Omigbodun *et al.*, 2010). On the contrary, others have argued that differences in nutritional status between girls and boys are due to inherent biological differences (Bates, Gjonça & Leone, 2017). However, there is limited evidence to support this assertion.

1.2.4 Birth order

Birth order has been shown to influence child health and nutritional status. The Bangladesh Demographic Health Survey (BDHS) report showed that unwanted births and child mortality increased with birth order (DHS Bangladesh, 2011). The report further showed that utilisation of antenatal and postnatal health care services from specialists declined rapidly with higher birth order. With higher birth order, parent's attitudes whether consciously or unconsciously become dismissive towards later-born children, which might have adverse consequences on child nutritional status, survival and development (Rahman, 2016).

1.2.5 Breastfeeding duration

The child's breastfeeding duration is directly linked to child nutritional status (Lessen & Kavanagh, 2015). Evidence has shown that the mother's breastmilk contains various bioactive agents that change the function of the gastrointestinal tract and the immune system as well as enhance brain development (Martin, Ling & Blackburn, 2016). Furthermore, studies have suggested that the mother's breast milk curtails infant programming of late metabolic diseases, particularly against protecting type-2 diabetes and obesity. The World Health Organisation recommends that infants should

be exclusively breastfed for 6 months after birth (Jones *et al.*, 2014). Furthermore, the American Academy of Paediatrics (AAP) proposed that breastfeeding of infants should be for at least 12 months.

1.2.6 Children of twin or multiple births

There is an established link between stunted growth in children under five and multiple births. Studies have shown that children of multiple births are likely to have low height-for-age (Magadi, 2011; Fenske *et al.*, 2013). It has been shown that children born as twins or multiples are at higher risk of being born prematurely and having low birth weight compared to single-born children (Magadi, 2011; Fenske *et al.*, 2013). In addition, parents incur more personal costs, which may jeopardise their ability to purchase health care services, nutritious foods and provide a conducive environment for their offspring (Elster *et al.*, 2000). Furthermore, children born as multiples face difficulties in cognitive development compared to those born as singles. Additionally, they are likely to inflict work, stress and exhaustion on their parents which may affect the quality of care on the children and subsequently lead to growth retardation (Elster *et al.*, 2000).

1.2.7 Low birth weight

The child's health status at birth is also directly linked to child nutritional status. Using birth weight as an indicator of health status, studies have shown that children born with low birth weight (LBW) are more likely to be stunted and less healthy compared to those with normal a birth weight (Kramer, 1987; Aryastami *et al.*, 2017). Apart from genetic reasons, LBW is seen as an indication of intrauterine growth retardation (IUGR) and premature births in developing countries (Aryastami *et al.*, 2017). However, most studies do not treat LBW as a key predictor of chronic child undernutrition despite the correlation between the two (Aryastami *et al.*, 2017).

1.3 Mother-level characteristics

Mother-level characteristics influence child stunting (Thomson & Billewicz, 1968) These factors include maternal nutritional status, mothers' marital status, mothers' age at birth and education.

1.3.1 Mother's age at childbirth

Decreased maternal age has been linked to elevated risks of low birth weight. Gibbs *et al.* (2012) found that early maternal age at first birth (<15 years) is associated with increased risk of preterm birth, maternal anaemia and low birth weight. Furthermore, younger maternal age at birth is associated with poor child health outcomes among infants and notably, higher mortality rates in neonates (Fernald & Neufeld, 2007). In addition, malnourished mothers are more likely to give birth to children of low birth weight, thereby increasing the risk of mortality, morbidity and growth failure (Thomson & Billewicz, 1968).

1.3.2 Mother's health status (Body Mass Index)

Maternal nutritional status has been associated with several adverse health outcomes in the offspring that also included child nutritional status (Subramanian *et al.*, 2009). Maternal nutritional status is measured by the Body Mass Index (BMI). Females who have a BMI<18.5 are "underweight". Akombi *et al.* (2017) found that mothers with a BMI of less than 18.5 were more likely to have stunted children than mothers with a BMI of more than 25.

1.3.3 Mother's marital status

Women's marital status is associated with child health and survival (Garbarski & Witt, 2013; Robles *et al.*, 2014). The literature suggests that children born to unmarried women are more likely to experience spells of poverty, and more likely to have worse health outcomes. In addition, children whose parents are not married are more likely to be stunted than those whose parents are married (Bennett, 1992). In addition, the effects of having a single mother persist even after the women marry, indicating that children raised with step-fathers could experience far worse socioeconomic circumstances than those living in households with their own biological parents (Garbarski & Witt, 2013).

1.3.4 Maternal Education

Maternal education is a major determinant of differentials in child nutrition, health and survival (Caldwell, 1979). Maternal education has a positive effect on child nutritional status (The *et al.*, 2016). There are five pathways through which maternal education yields positive effects on child nutritional status namely; socioeconomic status, autonomy, reproductive factors, knowledge, and attitudes (Frost, Forste & Haas, 2005a). The increase in maternal education is a component and determinant of socioeconomic status at individual, household and community levels. Higher education levels are associated with higher income, better housing and sanitation, greater access to diverse diets and health care services. Furthermore, educated women are more likely to be married to educated men, thereby augmenting the socioeconomic wellbeing of the family (Scott, 1991). In addition, research has shown that maternal education directly transfers health knowledge to future mothers. Some have argued that maternal education is correlated with socioeconomic status (Wamani *et al.*, 2004). However, maternal education has a known association with child health inequalities that is independent of other socio-economic indicators (Wamani *et al.*, 2004).

The role of knowledge in child nutritional status, health and survival is multifaceted, relating to increased understanding of health processes and behaviours and enhanced cognitive skills. In particular, increased maternal education enables mothers to have more knowledge about healthy diets and health care services, which subsequently results into nutritious dietary practices and increased use of modern health services and later child nutrition outcomes (Frost, Forste & Haas, 2005a). Furthermore, maternal education has been linked with increased hygienic and cleanliness practices which can reduce diarrhoea diseases and other childhood illnesses which have been linked with undernutrition. In contrast, Caldwell (1979) did not find an inverse relationship between maternal education and the prevalence of diarrhoeal diseases (Caldwell, 1979). Nonetheless, more recent literature suggests a relationship between maternal education and improved hygienic behaviours (Basu & Basu, 1991; Hobcraft, 1993; Luby & Halder, 2008).

The influence of autonomy as pathway facilitating the impact of child nutritional status has been emphasised in many studies. Maternal education has been linked with shifting the balance of power in the household in favour of women, enabling them to become primary decision-makers in childcare within the household (Caldwell, 1979). Furthermore, educated mothers are more likely to question health practitioners and access vital services important to child nutritional status and health (Frost, Forste & Haas, 2005a). In this regard, increased maternal education can indirectly lead to a reduced risk of child undernutrition. Increased maternal education has also been linked with a greater level of control of child reproduction among women, reduced fertility levels and delayed childbearing (Frost, Forste & Haas, 2005b). In addition, increased maternal education has been shown to have an indirect effect which includes reduced parity and lower risk of child undernutrition as stunting has been linked with birth order (Frost, Forste & Haas, 2005a).

Lastly, maternal education has been linked with attitude shift which translates into behaviours that are favourable to child nutritional status. In particular, maternal education is considered to lead in a behavioural shift from traditional conceptualisation of health and disease to increased acceptance of modern medicine (Frost, Forste & Haas, 2005a). Furthermore, research has shown that increased maternal education is associated with increased utilisation of modern medical services when their child is experiencing illnesses. In addition, studies have revealed that maternal education can also impact other attitudes such as tastes and preferences, which can subsequently lead to changes in nutrition and dietary patterns in the household (Skoufias, 1999).

1.4 Household-level characteristics

Household-level characteristics play a substantial role in child nutritional status. The underlying determinants, which impacts child nutritional status through immediate determinants, largely manifest at the household level (Smith & Haddad, 2015). These characteristics include food security, water and sanitation, housing and household wealth within the household.

1.4.1 Household food security

Household food security refers to the accessibility of household resources to consume sufficient food for all members in the household either by agriculture, cash income or through food donations (Katherine, 2016). Household food security is composed of four key factors; access, availability, stability and utilisation. A household with food security should have enough food immediately available, have sufficient resources to acquire it and be able to consume it in order to have an active and healthy life at all times (Smith, El Obeid & Jensen, 2000). Furthermore, food security also includes other determinants, which include maternal knowledge of care and feeding practices, family eating behaviours and family chores. Food insufficiency directly affects child health through such means as reduced food intake and micronutrient deficiencies, which subsequently results in child stunting (Ashiabi & O'Neal, 2007).

1.4.2 Housing

Several studies have shown a link between housing and child nutritional status (Tasnim, Dasvarma & Mwanri, 2017). Child nutritional status is dependent on housing and other facilities and amenities for the provision of nutrients and foods as well as the protection of children from the risk of diseases. Housing is a very important resource that is required in the performance of daily tasks and daily living, which subsequently determines the overall wellbeing of infants, pre-schoolers and adults as well. Social scientists have posited that housing is an essential component of child health and development (Northridge & Sclar, 2002; Leventhal & Newman, 2010). Six key features of a dwelling unit subsequently determine the quality of households. These include physical quality, crowding, residential mobility, homeownership and affordability (shelter costs) (Leventhal & Newman, 2010). Physical quality is measured by structural deficiencies such as plumbing and heat, maintenance deficiencies such as holes in the floor or broken steps. The quality of dwelling units proxies used includes the availability of water facilities, household assets, type of water facility, availability of latrine, the roof of the house, floor and walls of the house in most developing countries (Menon, Ruel & Morris, 2000). These factors ultimately reflect the household's socioeconomic status.

1.4.3 Household wealth or socioeconomic status

Some studies have indicated that disparities in child nutritional status are largely accounted for by disparities in socioeconomic conditions between different groups in society (Smith, Ruel & Ndiaye, 2005; Fotso, 2007). Higher household wealth has been linked with reduced child stunting (Smith, Ruel & Ndiaye, 2005; Fotso, 2007; Van De Poel *et al.*, 2008). The effect of household socioeconomic status, also known as the 'socioeconomic gradient' operates through various mechanisms and channels. The socioeconomic gradient refers to an inverse relationship between socioeconomic status and health outcomes (Szwarcwald, Souza-Júnior &Damacena, 2010). However, the common suggestion is through the 'Health Production Function' (HPF) channel (Jensen & Richter, 2001). The HPF is a dynamic behavioural process through which households combine knowledge, resources and norms and behavioural patterns to produce health (Berman, Kendall & Bhattacharyya, 1994). Children from poorer socioeconomic environments may lack child and maternal care practices, adequate food and may face other adverse risk conditions, thereby leading to poor child nutrition and health outcomes (Devkota & Panda, 2016). The basic idea of the HPF is that 'health outcomes' are a function of certain inputs that individuals invest in to produce good health and lower SES leads to reduced ability to purchase these inputs (Berman, Kendall & Bhattacharyya, 1994). These inputs include education, access to water and sanitation, medicine, health care, housing, food and other goods and services that provide an enabling environment for good health.

The other pathway through which SES affects child linear growth is through psychological-behavioural factors. These characteristics include stress, personality factors, psychological distress, as well as health behaviours and practices (Anderson & Armstead, 1995). With regards to stress, children and adolescents of a lower socioeconomic status experience more negative events in life (stressors) than their wealthier counterparts. Cohen, Kaplan & Salonen (1999) showed a link between stress and health outcomes in children, adolescents and adults, indicating that stress is a plausible mediator associated with SES and health. Likewise, children of lower SES usually reside in unfriendly and unsafe environments, which cause psychological distress. In turn, psychological distress can lead to negative emotions which have biological consequences on the child that include infections, chronic diseases, and undernutrition.

1.5 Community-level characteristics

Underlying characteristics at community-level play a significant role in determining child health, mortality and nutritional status. Firstly, they may influence differentials in child health and nutritional status between different regions and locations. Secondly, community-level characteristics may exacerbate or mitigate differentials based on household socioeconomic attributes by complementing or substituting for certain features in the households. Contextual factors within communities such as residence type, utilisation and availability of antenatal and maternal delivery facilities play a vital role in child nutritional status.

1.5.1 Health facility births

There is an established link between a child being delivered at a health facility and better health outcomes. Studies have shown that children whose mothers delivered at home with traditional delivery systems are more likely to be stunted compared to those delivered at hospitals (Rahman & Chowdhury, 2007; Abuya, Ciera & Kimani-Murage, 2012). It has been established that mothers who have sought health services up until delivery gather more knowledge of breastfeeding practices, maternal and child nutrition, maternal complications and childcare (Rahman & Chowdhury, 2007).

1.5.2 Antenatal care Services

Antenatal care visits are an indication of the contact between expectant mothers and health care professional services at health facilities as well as health-seeking behaviour, which may be linked to better feeding practices and health care for children under five (Hamel *et al.*, 2015). The number of antenatal care visits is inversely related to poor linear growth (Yimer, 2000). The pathways through which antennal care is linked with the avoidance of growth retardation includes giving mothers information about neonatal and child feeding practices, preparing and supporting mothers for the care of new-born children and giving information about prevention of childhood illness (Hamel *et al.*, 2015).

1.5.3 Residence type

Several studies have shown a statistically significant link between residence type and child stunting (Haddad, Ruel & Garrett, 1999; Menon, Ruel & Morris, 2000; Sahn, 2003; Smith, Ruel & Ndiaye, 2005; Fotso, 2007; Van de Poel, O'Donnell & Van Doorslaer, 2007). Most of these studies have shown that children in rural areas have poorer health and nutritional status compared to their urban counterparts. Disparities in child health and nutritional status are attributed to differences in socioeconomic conditions to a larger extent and biological and proximate characteristics to a lesser extent (Smith, Ruel & Ndiaye, 2005).

1.5.4 Water and sanitation

Elements of the health environment at household-level, such as access to safe water, and sanitary facilities for disposal of human waste, also play a big role in child nutritional status (Smith & Haddad, 2015). Poor water and sanitation have been associated with increased prevalence of child stunting and child morbidity (Daniels *et al.*, 1990; Ngure *et al.*, 2014). The lack of access to safe water and environmental sanitation due to unsanitary waste disposal are considered important causes of infectious diseases, especially diarrhoea and intestinal parasites and can ultimately lead to stunted growth of children (UNICEF 1998). The association between low height for age and water and sanitation emanates from the fact that ingestion of high quantities of faecal bacteria from both human and animal sources by infants and young children through mouthing soiled fingers and household items, and the exploratory ingestion of soil and poultry faeces, are common in many low-income environments (Rah *et al.*, 2015). This leads to intestinal infections which affect a child's nutritional status by diminishing appetite, impairing nutrient absorption and increasing nutrient losses.

1.6 Differentials and inequities in health

Health differentials is a generic term used to designate differences and variations in health achievements of individuals and groups (Kawachi, Subramanian & Almeida-Filho, 2002). The premise of this study is to examine the differentials in child stunting based on residence type and household wealth. Therefore, the term "health differentials" is defined are the differences in the burden of child stunting between or amongst different population groups. Health inequity refers to all those inequalities in health that are deemed to be unfair or stemming from some means of injustice (Kawachi, Subramanian and Almeida-Filho, 2002). The identification of health inequities entails normative judgement, which is premised upon ones' theories of justice, theories of society and reasoning underlying the genesis of health inequalities (Kawachi, Subramanian and Almeida-Filho, 2002).

This entails that not all health differentials are unfair. The process of determining what is unjust or unfair is a complex process that requires the availability of resources, public acceptance and ideology (Carter-Pokras & Baquet, 2002). The World Health Organization (2015) advocates for the reduction in health inequalities between different demographic groups. Health inequalities across groups are unjust because they reflect an unfair distribution of the underlying social determinants of health (Kawachi Subramanian & Almeida-Filho, 2002). The existence of inequalities and differentials in health implies the failure of society to organise health resources equitably to ensure access is open to everyone. As such, these inequalities can be modified and be avoided (Alaba & Chola, 2014). This study, however, focuses on health differentials that result in child stunting according to wealth and residence type and makes no moral judgement whatsoever.

1.7 Theoretical explanations for rural-urban disparities in child stunting and child health

Differences in child stunting between rural and urban areas exist along multiple dimensions at child, mother, household and community levels. These differences are presented below and divided into socioeconomic opportunity, socio-cultural factors and health infrastructure categories.

1.7.1 Socioeconomic opportunity

There is an established link between socioeconomic wellbeing and child stunting. The socioeconomic status of individuals and communities plays an important role in explaining rural-urban disparities in child nutritional status (Haddad Ruel & Garrett, 1999; Smith & Haddad, 2000). Rural-urban differences in child stunting by socioeconomic factors have been identified (Smith, Ruel & Ndiaye, 2005; Van de Poel 2007; Masiye *et al.*, 2010). These individuals, household and community socioeconomic factors include women's education, health infrastructure, public services, household size, household income, women's status, socioeconomic status and water and sanitation facilities (Smith, Ruel & Ndiaye, 2005). These factors largely determine whether families can have access to health care, food security, retain a conducive environment and avert growth retardation in children.

Furthermore, others have hypothesised that rural-urban differences in child stunting and health are largely due to the difference in the *strength of association* of the socioeconomic factors between rural and urban areas (Garrett & Ruel, 1999). For example, an additional year of mother's education may have a larger impact on nutritional outcomes in rural areas than in urban areas or vice versa, holding everything else constant (Srinivasan, Zanello & Shankar, 2013). Specifically, Garret & Ruel (1999) hypothesised that the determinants of food security and child nutritional status differ between rural and urban locations (Garrett & Ruel, 1999). However, the study found that the effect of the determinants of child stunting and food security are almost the same for both locations. However, the findings revealed that urban dwellers seem to be slightly more sensitive to changes in incomes than rural dwellers (Garrett & Ruel, 1999). This was attributed to the lack of natural resource "cushion" to absorb income or price shocks and their need to purchase rather than grow their own food. In

essence, rural areas tend to be disadvantaged in terms of key socioeconomic factors relative to urban areas and thus this has significant implications for the residential disparity in child nutritional status (Garrett & Ruel, 1999; Haddad, Ruel & Garrett, 1999; Smith, Ruel & Ndiaye, 2005; Fotso, 2007).

1.7.2 Health infrastructure

The second source of rural-urban disparities in child health is concerning health equipment and infrastructure. This term encompasses various indicators which include the utilization of modern medicine, qualified personnel, public health interventions, water and sanitation (Fox & Heaton, 2012). Health infrastructure and equipment are clearly interconnected with socioeconomic factors as they typically improve with economic gains. Moreover, the health-related factors typically improve as countries develop, but rural areas improve at a relatively slower rate (Fox Heaton, 2012). Studies have shown that whereas the residential gap in health care has shrunk, the disparity between urban and rural areas has persisted. In addition, research has shown that women in rural areas have lower institutional delivery rates compared to urban women (Kuate Defo, 1996). This poses a danger to the mother and child as there is an established link between child mortality and the under-utilisation of medical services. However, the relationship between the use of health infrastructure and child health outcomes is moderated by maternal education because it largely determines whether a mother utilises medical care (Smith, Ruel & Ndiaye, 2005).

1.7.3 Socio-cultural factors and norms

Two aspects of social-cultural factors and relations that are associated with the differences in child stunting by residence type are women's status and cultural practices. The role of women in child health has gained prominence over the years. In particular, women's decision-making autonomy relative to that of men improves child survival by "increasing women's ability to ensure that their children receive adequate nutrition and health practices" (Wickrama & Lorenz, 2002). Studies in SSA have shown a link between women's status and child nutritional status and child survival (Smith, Ruel & Ndiaye, 2005). This school of thought suggests that rural residents are less open to ideological shifts that can improve women's position in communities and households and thereby inhibit the relative improvement in child stunting prevalence.

In addition to women's status, individual's and communities' cultures influence child nutritional status. For example, one study revealed that the predominantly rural Maasai of Kenya encourages the introduction of blood, animal's milk and bitter herbs to infants, which affects exclusive breastfeeding and may subsequently have a negative effect on child nutritional status (Chege, Kimiywe & Ndungu, 2015). Residential differentials in cultural practices at individual and community levels have an important implication for child stunting and child health (Fox & Heaton, 2012).

1.8 Theoretical explanation for socioeconomic disparities in health

There are three pathways that have been advanced to explain socioeconomic differentials in health, namely social selection, social causation and life course perspectives (Commission on Social Determinants of Health *et al.*, 2015). The social selection perspective implies that health determines the socioeconomic position and not the other way around. Thus, healthier persons will move towards better socioeconomic positions compared to less healthy persons, subsequently leading to disparities and inequalities (Jayasinghe, 2015). However, literature has shown that the socioeconomic position of different groups was the underlying cause of health inequalities. Therefore, this inconsistency has compelled other researchers to refute this pathway and suggest that social selection cannot be the only explanation for health differentials.

The social causation perspective suggests that a range of unequally intermediary factors gives rise to inequality in health outcomes. Therefore, socioeconomic inequalities occur when the quality of these intermediary factors are unevenly distributed across different socioeconomic groups. The main intermediary factors that have been identified as playing an important role include psychosocial, biological, behavioural and material factors (Jayasinghe, 2015). Material factors include varying economic opportunities in income, employment and across infrastructure beneficial to communities. Psychosocial factors are chronic stresses that come about from experiences and perceptions of individual status in an unequal society. Behavioural factors are, for example, higher rates of smoking in lower SES groups that lead to differential rates of morbidity and mortality (Smith & Egger, 1996; Raphael, 2006).

Lastly, the life source perspective postulates that a multitude of factors across the life span determines and manifest disease trends overtime (Jayasinghe, 2015). This perspective explicitly recognises the importance of time and timing in comprehending the causal links between exposures and outcomes within an individual's life course in population-level trends and across generations.

1.9 Conceptual frameworks for evaluation of disparities and inequalities in childhood undernutrition

A range of studies across epidemiology and paediatric nutrition has shown that chronic child undernutrition is a product of an interplay of multiple factors (Fotso & Kuate-Defo, 2006). This section aims to describe the major conceptual frameworks used in explaining child malnutrition. In Figure 2, a conceptual framework for understanding childhood obesity is illustrated.

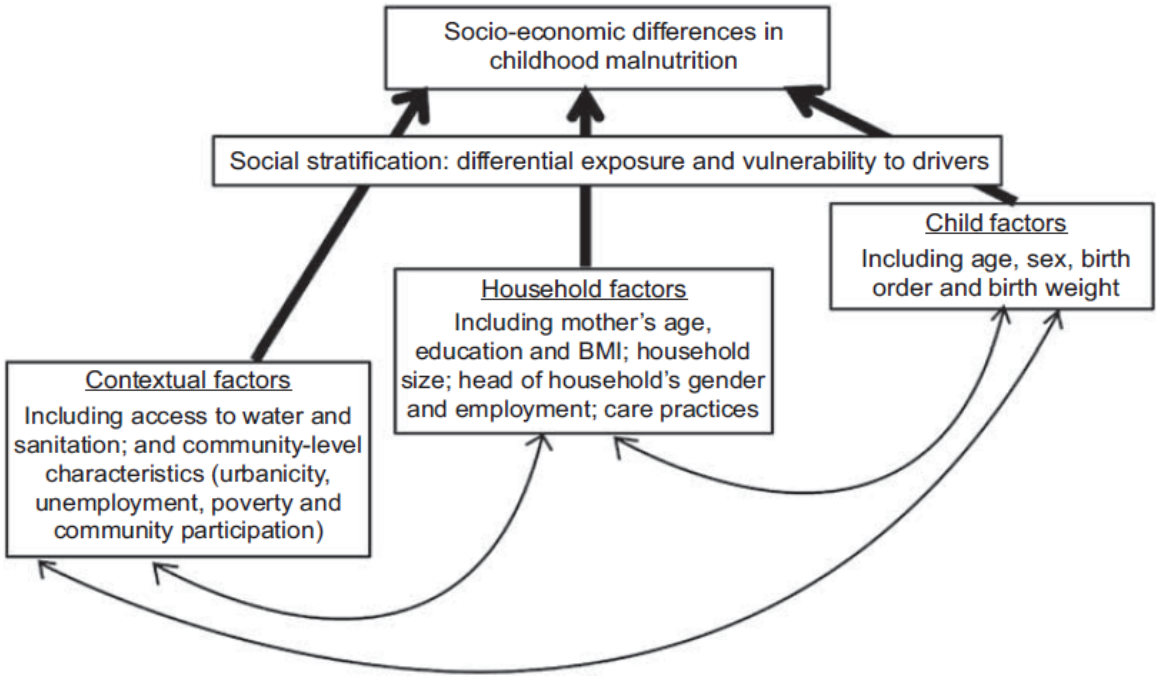

Figure 1: Conceptual framework for understanding socioeconomic determinants of child obesity

Source: (Garcia et al., 2013)

This framework draws insights from frameworks proposed by Mosley and Chen (1984) as well as Davison and Birch (2001) to simultaneously explain the drivers of both under-nutrition and over-nutrition (Garcia *et al.*, 2013). It is recognised that malnutrition, both undernutrition and over nutrition, is a result of an interplay between proximate, household and community-level factors. Proximate factors include the biological characteristics of the child and mother such as child's age, sex, birth weight and birth-order (Garcia *et al.*, 2013). Household factors include family size, household composition, mother's education and BMI, employment status of household head and nutrition practices. Contextual factors include access to clean water and sanitation, medical services, residence type (rural or urban) and community participation. This framework is convenient as it can also be used to explain the double burden of malnutrition.

1.9.1 Mosley and Chen Framework

This framework was originally developed to study factors which affect child mortality and survival and to clarify understanding of the various factors involved in the production of healthy children, in order to provide a basis for formulating health policies and structures (Mosley & Chen, 1984). The model is based on the concept that all social and economic determinants of child survival operate through a set of proximate and biological factors that subsequently affect the probability of a child's survival. Mosley and Chen (1994) classify the biological and proximate factors into five categories namely; personal illness control (treatment and prevention), injuries, environmental contamination, maternal factors and nutrient deficiency (Mosley & Chen, 1984).

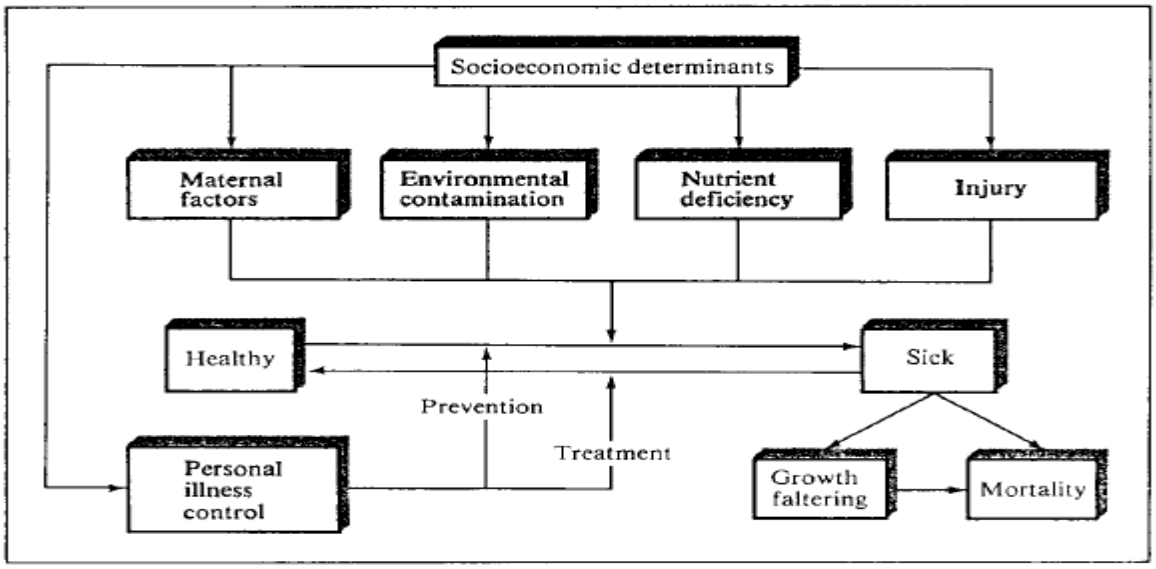

Figure 2: Analytical framework for the study of child survival in developing countries

Source: (Mosley & Chen, 1984)

Essentially, Mosley and Chen (1984) suggest that all social and economic determinants work through these proximate determinants and operate at the individual, household and community levels. The major limitation of this framework for this analysis is that child nutritional status (nutritional deficiency) is treated as a distal factor and not an outcome.

1.9.2 UNICEF malnutrition conceptual framework

UNICEF identified the complexity of the causes and determinants of chronic malnutrition through its conceptual framework (UNICEF, 1990). The UNICEF conceptual framework on undernutrition is a guide used for interventions from a multi-sectoral and multidimensional perspective, moving from macro to micro levels of focus (Reinhardt & Fanzo, 2016). The model does not claim to depict and express exact relationships but is instead a guide in identifying the causes in specific contexts.

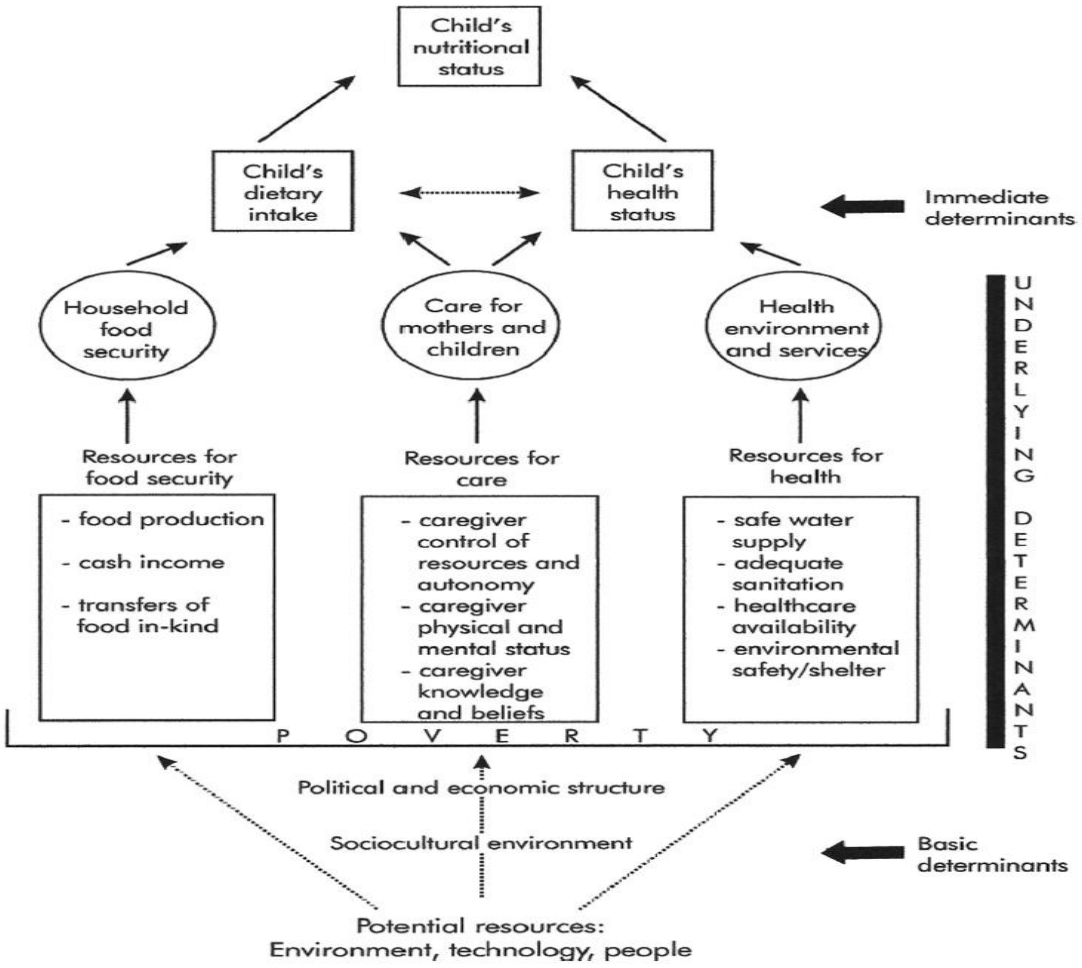

Figure 3: UNICEF malnutrition conceptual framework.

Source: (UNICEF, 1990; Smith & Haddad, 2015)

The framework identifies the causes of malnutrition at these different levels of influence and possible actions aimed at curtailing malnutrition (UNICEF, 1990; Smith & Haddad, 2015). The causes of malnutrition are divided into basic, underlying and immediate causes. This framework has been widely used in various studies on child malnutrition and has been applicable in different contexts and settings (Smith & Haddad, 2000; Smith, Ruel &Ndiaye, 2005). The framework has been criticised for being unidirectional and incorporating the assumption that children of the same household are influenced by the same environmental factors (Krahnstoever Davison, Davison & Birch, 2001).

The present study draws insights from all three frameworks presented above.

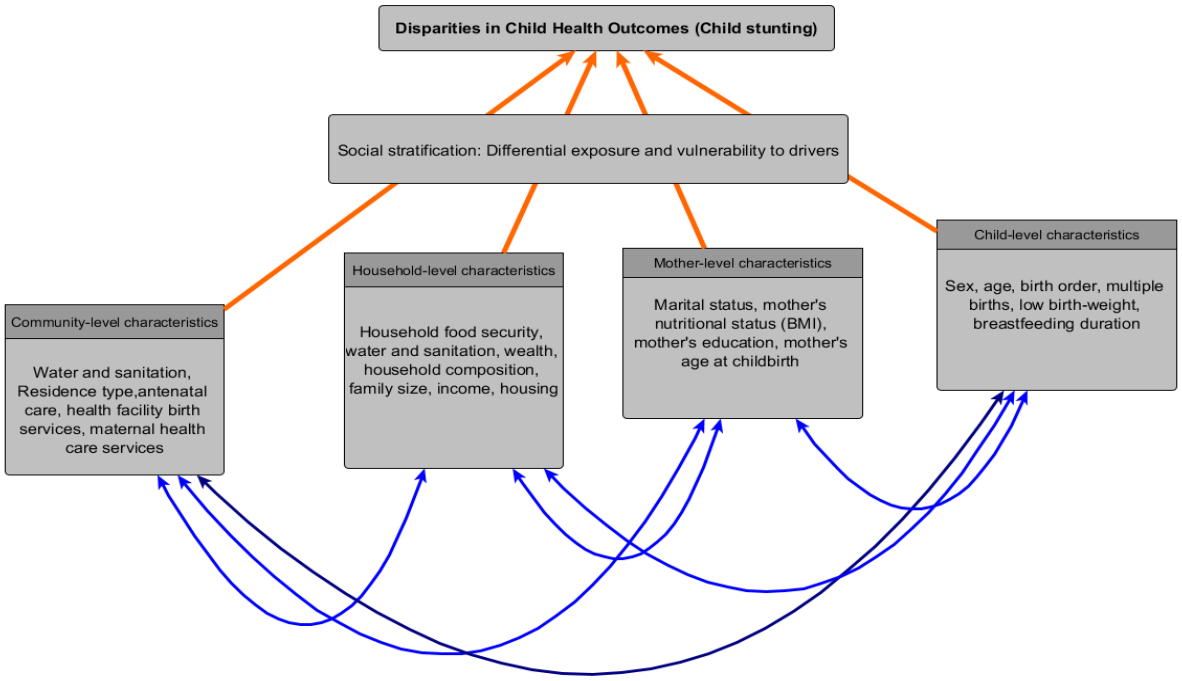

Figure 4: Conceptual framework for disparities in child health outcomes (child stunting) in low and middle-income countries

All three frameworks recognise that child nutrition status is dependent upon some proximate and socioeconomic risk factors which are classified as (i) child's characteristics such as sex, birth weight, breastfeeding duration, birth order; (ii) mother's characteristics such as BMI, mother's education, sexual debut, religion and cultural practices; (iii) household characteristics such as family size, water and sanitation, women's status, household income, household food security, housing, and, (iv) community characteristics such as access to and utilisation of health care services like water and sanitation, delivery and antenatal care services (Fotso & Kuate-Defo, 2006). The framework above recognises that child stunting is a result of an interplay between child, mother, household, community-level factors. These factors significantly influence child health and nutritional status (Kuate-Defo, 1996; Garrett & Ruel, 1999). In this present conceptual framework, it is recognised that child stunting is a manifestation of immediate causes that occur at the individual level which are rooted in factors at child, mother, household and community levels (UNICEF, 1990; Fotso and Kuate-Defo, 2006). The framework further posits that residential and socioeconomic differentials in child stunting are a result of unequal distribution of the

determinants of child stunting across these different groups. This framework adopts the social causation theory which suggests that socioeconomic differentials in child health outcomes (stunting) are as a result of differences in the availability and access to determinants at child, mother, household and community levels. Additionally, the notion that rural-urban disparities in child stunting are a result of differences in socioeconomic opportunity, health infrastructure and socio-cultural norms and factors is adopted.

2 Methodological review

2.1 Objective of the review

The purpose of this section is twofold. The first aim of this section is to summarise the different methods used to examine differentials in child nutritional status between different population sub-groups. Secondly, this section identifies the gaps and weaknesses of the approaches used to explore the most appropriate approach for this study.

2.2 Measuring differentials in child stunting

There are various methods used to investigate differentials in health outcomes. These differentials can be analysed as multivariate, univariate or bivariate (Ataguba, Akazili & McIntyre, 2011). The bivariate analysis involves comparing differentials in health simultaneously in relation to a second variable, while multivariate analysis involves comparisons of inequality simultaneously with at least two other explanatory variables (Gakidou & Murray, 2000). The univariate analysis assesses differentials in the distribution of health in a population without any reference to another group. The simplest method used to assess differentials in population groups is by comparing means or medians of nutrition outcomes such as height-for-age, weight-for-age and weight-for-height Z-scores. Three of the studies reviewed used mean height-for-age Z-scores (HAZ) (Smith, Ruel & Ndiaye, 2005; Kennedy *et al.*, 2006; Vollmer *et al.*, 2014). The use of mean health outcomes has an advantage of describing the whole population of interest (Smith, Ruel & Ndiaye, 2005). However, comparison of differences in mean outcomes is not sufficient as it ignores variation in health with population characteristics such as income and education, which can be used to reveal considerable variations in health experiences of children between different groups (Fotso, 2007).

Chi-square and student t-tests are some of the most widely used bivariate analysis used in assessing rural-urban differentials in child health. However, these tests are only used to assess the significance of the association between two variables rather than the strength or magnitude of the variation for every unit change in the explanatory variable. To determine the differences in the predictors of child nutritional status in rural and urban areas, two of the studies used the student t-test and chi-square test to examine rural-urban differences (Smith, Ruel & Ndiaye, 2005; Liu, Fang & Zhao,

2013). The other bivariate method used to assess disparities in health outcomes is the concentration index or curve (Wagstaff, Doorslaer & Paci, 1989). In recent times, the concentration index has been widely used in the literature on socioeconomic inequalities between different groups referred to as health inequities (Kawachi, Subramanian & Almeida-Filho, 2002). The concentration curve plots cumulative proportions of the population, ranked from poorest to richest, against the cumulative proportion of the health outcome. To ascertain the magnitude and nature of the socioeconomic-related inequality, concentration indices (CI) are computed and interpreted. CIs can either be positive or negative. A negative sign shows that child stunting is concentrated amongst the poor, whilst a positive sign shows that child stunting is concentrated among the wealthy (Novignon *et al.*, 2015). Three of the studies reviewed used concentration indices (Sahn, 2003; Fotso & Kuate-Defo, 2006; Van de Poel, O'Donnell & Van Doorslaer, 2007). Though this measure takes what is going on in the groups into consideration, it has limitations. Firstly, CI requires at least one continuous ranking variable of SES, thus limiting its applicability (Zhang & Wang, 2004). Secondly, when measuring inequality using CI in a health outcome that is not binary, the CI index is not bounded between -1 and 1 (Wagstaff & Van Doorslaer, 2000; Regidor, 2004; O'Donnell *et al.*, 2007). Lastly, it is mainly used for descriptive purposes and controlling for other explanatory variables is not straightforward (Fotso, 2006b).

Therefore, examining the influence of socioeconomic status and residence type on child stunting should utilise multiple regression models as they allow for the controlling of other explanatory variables. One study reviewed used a multivariate regression analysis (Smith, Ruel & Ndiaye, 2005). Six of the studies reviewed used a multivariate logistic regression model (Haddad, Ruel & Garrett, 1999; Menon, Ruel & Morris, 2000; Fotso, 2006b; Fotso & Kuate-Defo, 2006; Vollmer *et al.*, 2014). The regression coefficients of a logistic regression transformation are known as Odds Ratios. The odds ratio between the lowermost and uppermost SES groups is used in this study as a proxy for socioeconomic differentials in child stunting between rural and urban areas. The main advantage of this approach is the use of a single number which makes it easier to compare the magnitude of the inequalities across populations, even though it overlooks the health outcome in the intermediate groups of the socioeconomic variable (Fotso, 2006a).

Drawing on the range of methods used in existing literature, this study will employ univariate, bivariate and multiple logistic regression models to achieve the study objectives.

3 Empirical review

3.1 Objective of the review

This section reviews literature on the role of socioeconomic status (wealth) and residence type (urban or rural) in predicting child stunting in SSA, and in other developing countries. The purpose of this section is to explore the influence of household wealth and residence type in predicting child stunting. In addition, we intend to identify gaps in the literature to explore new ways of conducting new research in Zambia and other less developed countries.

3.1.1 Methods of selecting studies

Child stunting is a condition that is highly characterised by poverty and the lack of development. The studies that were reviewed were from SSA and other low and middle-income countries. The studies included in this section were obtained from the following electronic database' searches; Google Scholar, PubMed, Medline, ECONLIT and Google. Furthermore, we conducted manual searches of some of the identified studies' references. The inclusion criteria for the reviewed studies were as follows:

- The study had to attempt to assess the relationship between child stunting status (as measured by length/height-for-age Z-scores) and one or more socioeconomic covariate of which residence type (rural/urban location) and some proxy of socioeconomic position (wealth index, consumption expenditure, and household expenditure) were included.
- The study must be written in English.
- The study had to have been conducted in the last 20 years (1998-2018).

3.1.2 Studies Reviewed

In total, eleven studies were reviewed. Six (6) of the studies were cross-country studies specifically from SSA countries, four (4) of these studies were cross-country studies from other low and middle-income countries in South East Asia (SEA), Africa and Latin America (LA). Only one study focused primarily on Zambia. Two (2) of the studies were longitudinal studies, while nine (9) were cross-sectional studies in nature.

3.1.3 Samples Reviewed

Six (6) of the studies reviewed involved different samples sizes, which contained anthropometric data for children aged between 0-59 months at the time of their respective surveys. Another three (3) of studies reviewed involved different samples sizes, which contained anthropometric data for children aged between 0-36 months at the time of their respective surveys. The remaining two studies sampled children aged 1-36 and 3-36 months, respectively.

4 Empirical findings

4.1 Sub-Saharan Africa and other developing countries

SSA and South East Asia (SEA) have the highest prevalence rates of child stunting in the developing world. Most of the literature of the relationship between child stunting and socioeconomic status and residence type in SSA and other less developed countries have yielded mixed results.

A substantial body of empirical work has shown that child health and nutritional status of urban children below the age of five are significantly better than those of their rural counterparts in SSA, SEA and many other less developed countries (Kuate-Defo, 1996; Menon, Ruel, & Morris, 2000; Smith, Ruel & Ndiaye, 2005; Kennedy *et al.*, 2006; Fotso, 2007; Van de Poel, O'Donnell & Van Doorslaer, 2007; Masiye *et al.*, 2010). However, child stunting is the most prevalent form of child undernutrition in both rural and urban areas, with an estimated 161 million children falling below two standard deviations from the height-for-age World Health Organization Child Growth Reference Standard (WHO-GRS) median (de Onis & Branca, 2016). There are various outcome measures used for assessing disparities in poor child linear growth between rural and urban areas. The simplest of these is the comparison of anthropometric mean nutritional outcomes such as mean height-for-age, weight-for-age and weight for height Z-scores as well as the proportion of stunted children for a given sample of a population. Studies that have used prevalence rates have shown that rural areas have higher child stunting prevalence rates compared to urban areas (Menon, Ruel & Morris, 2000; Fotso & Kuate-Defo, 2006; Fotso, 2007).

Likewise, studies that have made rural-urban comparisons of mean height-for-age Z-scores have found that children from urban areas have significantly higher mean HAZ compared to their rural counterparts (Smith, Ruel & Ndiaye, 2005; Kennedy *et al.*, 2006; Vollmer *et al.*, 2014). In Zambia, Masiye et.al (2010) found that the mean HAZ was significantly lower in rural areas than urban areas. Most studies that have used logistic regression models to assess rural/urban disparities in child stunting have shown that pre-schoolers from rural areas are more likely to be stunted than their urban counterparts (Menon, Ruel & Morris, 2000; Fotso & Kuate-Defo, 2006; Fotso, 2007; Van de Poel, O'Donnell & Van Doorslaer, 2007). However, other studies have shown that the relationship between child stunting and rurality has little or no effect on child stunting after controlling for other proximate, household and socioeconomic determinants (Sastry, 1997; Garrett & Ruel, 1999; Smith, Ruel & Ndiaye, 2005). In extreme cases, rural-urban differentials completely disappear in all SSA countries after controlling for wealth (Fotso, 2007). Furthermore, controlling for proximate factors such as the sex of the child, child's age, and mother's BMI, had little effect on rural/urban disparities in child stunting (Smith, Ruel & Ndiaye, 2005; Fotso, 2007; Srinivasan, Zanello & Shankar, 2013).

As stated before, the literature reveals that there is a strong relationship between socioeconomic status and child stunting in SSA and other less developed countries. The studies we reviewed showed that children under five from poorer households are at a substantially greater risk of being severely under-malnourished than their counterparts from wealthier households (Menon, Ruel & Morris, 2000; Sahna & Stifel, 2003; Kennedy *et al.*, 2006; Fotso, 2007; Van de Poel, O'Donnell & Van Doorslaer, 2007; Van De Poel *et al.*, 2008; Novignon *et al.*, 2015; Smith & Haddad, 2015). In other circumstances, coefficient estimates turned negative; indicating that children from rural areas may tend to have better nutritional status than their counterparts in urban centres when SES is adjusted for (Fotso & Kuate-Defo, 2006). However, these results were not statistically significant at the 10% level of significance. In contrast, the effect of household wealth status on child stunting remains significantly large when the analysis was adjusted for child, mother and community characteristics, illustrating the importance of household wealth in predicting child stunting (Hong, Banta & Betancourt, 2006). In addition, other studies have shown that household wealth status had an overall positive effect on prevalence child stunting, but little or

no effect on children aged below 6 months (Pongou, Ezzati & Salomon, 2006). A single country analysis using household per capita spending as a measure of SES in Zambia found that there is no significant relationship between household per capita expenditure and child stunting (Masiye *et al.*, 2010).

Several studies have attempted to separately measure the effect of household wealth on child stunting in both rural and urban areas. The cross-sectional studies reviewed suggest that intra-urban socioeconomic differentials in child stunting are larger than intra-rural socioeconomic differentials in SSA, SEA and Latin America and also larger than the overall rural-urban differentials (Fotso & Kuate-Defo 2006; Liu, Fang & Zhao 2013; Menon, Ruel & Morris 2000; Van de Poel, O'Donnell & Van Doorslaer 2007). In extreme circumstances, within-urban odds ratios were ten (10) times higher for children of the richest households compared to the poorest in Peru and the Dominican Republic; whereas within-rural odds ratios were smaller in all countries than 3.5, except in Brazil (Menon, Ruel & Morris, 2000).

Similarly, longitudinal studies reviewed showed that intra-urban wealth differentials of child stunting are larger than intra-rural wealth differentials (Haddad, Ruel & Garrett, 1999; Fotso, 2007). However, these studies have shown that the urban advantage in child stunting is on the decline. Haddad et al. (1999) found that the urban share of malnourished children is increasing in 5/7 SSA countries in their study (Haddad, Ruel & Garrett, 1999). Furthermore, Haddad projected that the proportion of the urban poor and stunted would increase and surpass that in rural areas in the following 20 years (Haddad, Ruel & Garrett, 1999). However, several recent studies have shown that urban pre-schoolers still have better nutritional outcomes than their rural cohorts (Fotso, 2007; Paciorek *et al.*, 2013; Srinivasan, Zanello & Shankar, 2013). Fotso et al.(2007) also found that differentials in child malnutrition by residence type have substantially narrowed in 6/13 countries primarily due to a surge in urban chronic malnutrition (Fotso, 2007).

To the best of my knowledge, there has been no study that has solely attempted to simultaneously measure the magnitude of rural-urban and wealth disparities in child stunting in Zambia. However, several cross-country studies that have documented the

magnitude of rural-urban disparities and the degree of socioeconomic disparities in child stunting have included Zambia. These studies have shown that Zambian children in urban areas have a lower prevalence of child stunting than their rural cohorts (Fotso, 2007; Van de Poel, O'Donnell & Van Doorslaer, 2007). Furthermore, the findings reveal that child stunting is affecting the poor in both rural and urban locations of Zambia disproportionately. However, there are wider socioeconomic disparities in urban areas than in rural areas. Other studies within SSA also came to the same conclusions (Menon, Ruel & Morris, 2000; Fotso, 2006b).

Table B.1: **Summary of findings from Sub-Saharan Africa and other low and middle-income countries**

Author(s)	Country and year of Analysis	Statistical methods	Outcome variable	Key explanatory variables	Control variables	Study type and focus	Findings and explanations
Ellen Van De Poel, Owen O'Donnell, Eddy Van Doorslaer	Cross-country study (2007)	Concentration indices Risk ratio	Binary stunted growth variable (Stunted or not stunted)	Residence type, Parental education,	Availability of water and sanitation facilities, sex of the child, age of the child	The cross-sectional study uses DHS data to document the magnitude of rural/urban disparities in child nutritional status and adjust these disparities for socioeconomic characteristics	The results show that urban areas have better child health and nutrition outcomes as compared to rural areas. However, on average rural/urban risk ratios of stunting and under-five mortality fall by more than 53% and 59% after controlling for household wealth, respectively. Additionally, the findings reveal that the level of socioeconomic inequality is higher in urban areas than in rural areas. The odds of suffering from growth stunting are 3.6 times higher among children living in the poorest households than among children in the wealthiest households. The odds of suffering from child growth stunting declines consistently as wealth index increases. This relationship remains strong even after
Jean-Christophe Fotso	Sub-Saharan Africa (2005)	Logistic Regression	Binary stunted growth variable (Stunted or not stunted)	Residence type, Household wealth Index, Community wealth Index	Mother level characteristics: Age at birth of the index child, low birth weight, antennal care, place of delivery, mother's occupation, birth order and interval and breast-feeding duration, father's education and	This is a longitudinal study that aims to improve understanding of differentials in child undernutrition by place of residence and shed light on the underlying factors.	The results show that urban-rural differentials are considerable and expected directions in all countries, indicating that child malnutrition is lower in urban than rural areas. However, after controlling for wealth using standardised community and household wealth indices, the results show that rural-urban differentials disappear in all countries. Furthermore, controlling for father's education and mother's occupation does not alter the results.

					maternal education		
Jean-Christophe Fotso and Bartheley Kuate-Defo	Burkina Faso, Cameroon, Egypt, Kenya and Zimbabwe (2004)	Concentration index; Logistic regression	Child nutritional status (Height for Age Z-score index)	Residence type, household wealth index, household social status and community endowment status.	Control variables used include the number of household members, religion, exposure to media, current age, mother's BMI, age of child, breastfeeding status and immunisation status	This study uses multilevel modelling to investigate the relative contribution of contextual and compositional effects of place of residence and wealth status in perpetuating differences in the prevalence of child stunting among children	The results show that urban-rural differentials in child nutritional status (stunting) are explained by the socioeconomic status of communities and households. The findings further reveal that socioeconomic inequalities in child undernutrition are more pronounced in urban areas than in rural areas.
Jean-Christophe Fotso	15 Sub-Saharan Africa countries (2006)	Logistic Regression models	Binary stunted growth variable (Stunted or not stunted)	Household wealth index and residence type	Maternal education, father education, marital status, religion, mother's BMI, Current age of mother, low birth weight, antenatal care, breastfeeding duration, age-specific immunization status	The study uses DHS data to document and compare the magnitude of inequities in child nutrition across urban and rural areas and investigates the extent to which within urban disparities in child stunting are accounted for by the community, individual and household characteristics	The results show that socioeconomic inequalities exist in both rural and urban areas. However, intra-urban disparities in child stunting in urban areas are larger compared to those in rural areas. Additionally, the findings reveal that parental education, community SES and other covariates only explain a slight part of the within urban differences.
Lisa C. Smith, Marie T. Ruel and Aida Ndiaye	36 less developed countries (2005)	Multivariate regression analysis Chow F-Test Chi-Square test and T-test	Mean height-for-age z-scores	Residence type., women's status, access to safe water and sanitation, maternal education, socioeconomic status	Control variables used include the number of household members, religion,	This study uses DHS data to address the question of whether socioeconomic determinants of child nutritional status differ across rural and urban areas.	Overall, compared to rural children, urban pre-schoolers have better-nourished mothers who are also more likely to receive prenatal and birthing care, which, in turn, may reduce the risk of intrauterine growth retardation.

					exposure to media, current age, mother's BMI, age of child, breastfeeding status and immunisation status		These characteristics, potentiated by higher maternal education, higher incomes, the greater decision-making power of women relative to men, and wider availability of health, water, and sanitation services result in lower rates of childhood malnutrition in urban areas.
Purnima Menon, Marie T Ruel and Saul S Morris	11 less developed countries (2000)	Logistic Regression	Binary stunted growth variable (Stunted or not stunted)	Household wealth, residence type	None	This cross-sectional study uses DHS data to test the hypothesis that intra-urban differentials are greater than intra-rural differentials and that the prevalence of stunting among urban and rural areas are equally high	The findings reveal than rural areas have a higher prevalence of child stunting than urban areas. This analysis further shows that there are large socioeconomic differentials in stunting among children aged 0-36 months. Furthermore, the results show that socioeconomic differentials in child malnutrition do exist in both rural and urban areas. However, they are significantly larger in urban areas
Lawrence Haddad, Marie T Ruel and James Garret	14 African countries (1999)	Logistic Regression	Binary stunted growth variable (Stunted or not stunted)	Household wealth, residence type	None	This is a longitudinal study that aims to improve understanding of differentials in child undernutrition by place of residence and shed light on the underlying factors.	The results show that the ratio of stunting prevalence between the poorer and the wealthier quintiles is greater within urban areas than within rural areas. Additionally, differences between low and high socioeconomic status groups in urban areas are consistently larger than the urban/rural differentials. Although the prevalence of stunting among the lowest socioeconomic group in urban areas are always lower than among the poorest groups in rural areas the gap is often relatively small. Additionally, this study revealed that the absolute number and share of poor people living in urban areas is increased over time from 1952 to 1994. The results, therefore, suggest that the locus of poverty and undernutrition does seem to be changing from rural to urban areas.
Gina Kennedy, Guy Natel, Inge D Brouwer	Angola, Senegal, Central African Republic	Logistic regression	Binary stunted growth variable (Stunted or not stunted)	Residence type, Household wealth index.	None	This cross-sectional study sought to examine the relationship between child undernutrition and poverty in urban and rural areas.	When rural-urban comparisons were made, the prevalence of stunting was significantly greater in rural areas in all three countries. However, when stratified by wealth/SES there is no significant difference in the prevalence of stunting across

	(2005)		Mean Height for Age Z-score				urban and rural populations within the same quintile in any of the countries. In addition, being poor increases the risk of stunting 3.5-fold in Angola, 3-fold in Senegal and 1.5-fold in the Central African Republic.
David Sahn, David Stifel	24 African countries (2003)	Concentration Index	Child stunting (Height for Age Z-score) Mean Height for Age Z-score	Residence type, household wealth index	Parental education	This cross-sectional study seeks to examine the relative and absolute rates of change for urban and rural areas and assess the level of inequality between rural and urban areas in relation to stunting.	The results reveal that the standards of living in rural areas have universally lagged. In 6/12 countries, the asset index poverty headcount is more than 50% greater in rural areas than in urban areas. The study further reveals that living standards of urban dwellers have not improved faster than in rural areas in the case of asset poverty, infant and neonatal mortality rate. Additionally, the nutritional status of children and adults are considerably better in urban areas than in rural areas.
Bhavanar Shankar et.al	Nepal, Bangladesh (2013)	Relative Rural-urban Risk ratio Recentred Influence Function (RIF) regression	Child stunting (Height for Age Z-score)	Residence type, wealth index	Maternal education, spouse education,	Using DHS data this cross-sectional study aims to quantify the contribution of different socioeconomic determinants to rural-urban differences in child nutritional status.	The results show that there are no fundamental differences that determine child nutritional outcomes in urban and rural areas. The disparities in the levels of the limited number of socioeconomic factors contribute a major share of rural-urban disparities in the lowest quantiles of child nutritional outcomes. Furthermore, the results show that the differences in the strength of association between socioeconomic features and child nutritional outcomes account for less than a quarter of rural-urban disparities.
Felix Masiye, Bona Chitah	Zambia (2010)	Multiple regression model	Mean height-for-age Z-score Mean weight-for-age Z-score Mean weight-for-height Z-score	Residence type, and household expenditure	Sex of the child, age of the child, parental education, Access to safe water, type of toilet facility, education of the head of household, age of child	This cross-section study sought to examine the determinants of nutritional status among under-fives in Zambia	The findings reveal that household expenditure is the leading predictor of nutritional status. Additionally, the level of education of the parents of the child has a positive effect on the nutritional status of a child. The findings further show that poor nutritional status falls disproportionately on rural children.

4.2 Discussion of Empirical findings

There is a vast amount of literature predicting the effect of residence type and socioeconomic status on child stunting in SSA, SEA, Latin America and other developing regions. However, the literature on this relationship with an in-depth focus on Zambia alone is scarce. The 11 studies that were reviewed showed dissimilar results.

Several cross-country studies conducted in Zambia and other less developed countries have found that children from rural areas have poorer child nutritional status and higher stunting prevalence rates than their urban counterparts. Likewise, most of these studies have shown that children from poorer households have higher stunting prevalence rates and poorer nutritional outcomes than their wealthier counterparts. However, living in urban areas do not automatically confer an advantage for urban children. The literature suggests that urban children's better nutritional status is mostly attributed to disparities in socioeconomic conditions at household and community levels between rural and urban areas. On the contrary, some literature suggests that children from the poorest households residing in urban areas can be just as stunted as children from the poorest rural areas. In addition, some studies suggest that the differentials in child stunting between the richest and the poorest are wider in urban areas than in rural areas.

However, the measurement of socioeconomic disparities in child stunting between rural and urban areas is faced with some challenges. The first challenge noted is the variability of socioeconomic indicators used. Garret and Ruel (1999) used household expenditure, parental education and family size as measures of SES to assess their effect on children's height-for-age Z-scores in both urban and rural areas of Mozambique (Garrett & Ruel, 1999). Fotso (2006) used both household and community wealth indices as proxies for socioeconomic status to assess the influence of SES on child stunting (Fotso & Kuate-Defo, 2006; Fotso, 2007). This poses a threat to the creation of effective policy as the choice of an indicator has implications for the type of interventions to be used for combating child nutritional outcomes.

Another problem, especially in cross country studies, is the classification of residence type as rural or urban. Some countries classify residence type in terms of

agglomerations and administrative boundaries, while other classify according to population density, size or a mixture of both criteria (United Nations Economic and Social Commission for Western Asia, 1991). Hence, the fact that countries do not have a standard guide for researchers to determine how rural and urban areas are demarcated poses a challenge for researchers in replicating results in other settings. Lastly, three of the studies reviewed had not adjusted for mother, child and community-level covariates, which influence child stunting.

4.3 Conclusion

Globally, there is uncertainty as to whether 'rurality' has a significant impact on stunting once wealth is controlled for. Furthermore, the nature of the relationship between child stunting and household wealth has yielded mixed results after segregating by rural and urban locations in different settings. Therefore, this study in the Zambian setting might produce findings which might be unique, and which may subsequently provide important insights that can be used to guide remedial actions and policy response to curtail child stunting.

The one study that analysed the socioeconomic determinants of child stunting in Zambia did not segregate by residence type. Disaggregating by residence type offers a clearer picture of the disparities in the magnitudes of socioeconomic differentials in child stunting. Furthermore, that study used the Living Conditions and Monitoring Survey (LCMS) dataset, which does not capture child-level and mother-level covariates that play an integral role in child health. In addition, our dataset will use a composite 'household wealth index' which encompasses the underlying factors that have been proven to affect health and stunted growth in under-fives.

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Part C: Journal manuscript

1 Abstract

Proposed Journal: International Journal for equity in Health[6]

Socioeconomic differentials of child stunting in rural and urban areas of Zambia

Douglas Mushinge[7]

Background: Child stunting is the most prevalent form of malnutrition; which remains a significant public health concern. When simple rural-urban comparisons are made, children under five years residing in rural areas have a higher burden and risk of being chronically undernourished compared to their urban counterparts. However, these comparisons conceal the large differentials that subsist between different socioeconomic groups within rural and urban locations.

Methods: Using data from children aged 0-59 months from the 2013/14 Demographic Health Survey (ZDHS), this study examined the magnitude of socioeconomic differentials in child stunting between rural and urban areas. It also investigated the effect of residence type and socioeconomic status on child stunting in Zambia. Household wealth index was constructed based on ownership of using household assets. Chi-square tests, univariate and multiple logistic regression models were used to estimate the effect of many covariates including residence type and household wealth on chronic child undernutrition in Zambia. Odds ratios between the uppermost and lower quintiles from the regression models were estimated to assess socioeconomic differences in child stunting.

Results: The findings indicate that children under five years from urban areas and those from disadvantaged households are more likely to be stunted compared to their counterparts in rural areas and wealthier households, respectively. Specifically, the results follow a wealth gradient; with children from the poorest households showing higher odds of being stunted compared to their peers in the wealthiest households and a quarter of children of the wealthiest households being stunted. However, the wealth gradient is consistently higher in rural areas compared to urban areas; and much wider than the overall rural-urban odds ratios.

Conclusion: This study concludes that child stunting is largely a major concern in urban areas that are characterised by a large wealth gradient in which children from less privileged households have a higher burden and risk of being stunted. However, one in four children residing in the wealthiest households is stunted. Although this finding may be counterintuitive, it has important implications for policies that are aimed at addressing child stunting. This implies that there is a great need for population-wide interventions, especially for those in urban areas and the less privileged without neglecting those in wealthy households. However, the remedial policy actions for child undernutrition in urban and rural areas should be dissimilar as they both face a unique set of challenges.

Keywords: Child stunting; socioeconomic/wealth differentials; residence type; Zambia; household wealth

[6] Instructions for authors appear in the appendix

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2 Background

The last three decades have seen substantial growth in the urban population – globally, the urban population was higher than the rural population in 2007 (United Nations, 2014). It has been projected that 80% of the population of less developed countries will be residing in urban areas by the year 2025 (Menon, Ruel and Morris, 2000). Unfortunately, this rapid growth in sub-Saharan Africa (SSA) countries' urban population has been accompanied by declining economies culminating into reduced capability of local and national government authorities to provide basic social services such as education, water and sanitation, employment opportunities and support for food production (African Population and Health Research Center (APHRC), 2014). In fact, it has been projected that the absolute number and proportion of the urban poor will continue to increase exponentially and outstrip the rural poor population in future (Haddad, Ruel and Garrett, 1999). However, more recent studies have shown that rural areas still have a higher burden and risk of child stunting compared to urban areas (de Onis and Branca, 2016).

When simple comparisons are made, children under five years residing in rural areas in SSA and other less developed countries have a higher burden and risk of getting stunted (Menon, Ruel and Morris, 2000; L. Smith, Ruel and Ndiaye, 2005; Van de Poel, O'Donnell and Van Doorslaer, 2007). Likewise, the prevalence of stunting among under-fives follows the wealth gradient; children from wealthier groups are less likely to be stunted compared to their peers in less privileged groups and households (Fotso, 2007; Van De Poel *et al.*, 2008). However, the change in the population and socioeconomic dynamics between urban and rural areas challenges the commonly held assumption that children in urban areas have a lower burden and risk of stunted growth in under-fives. Furthermore, evidence suggests that the locus of undernourishment and poverty is gradually shifting from rural to urban areas as a result of this trend (Haddad, Ruel and Garrett, 1999; Fotso, 2007).

Empirical studies have shown that under-fives residing in rural areas are at a higher risk on being stunted compared to their urban counterparts (Van de Poel, O'Donnell and Van Doorslaer, 2007; Van De Poel *et al.*, 2008). Likewise, children from the poorest households are more likely to be stunted compared to their counterparts in

the wealthiest households. Programme and policy interventions are made in the allocation of vital resources based on these simple rural-urban and wealth disparities in child stunting. However, simple rural-urban comparisons in child stunting conceal the large differentials that exist between different socioeconomic groups in both rural and urban areas. In fact, there are greater socioeconomic differentials in child stunting in urban areas compared to rural areas (Menon, Ruel and Morris, 2000; Fotso, 2006b; Kennedy *et al.*, 2006).

Zambia's child stunting prevalence rate remains one of the highest globally and in the SSA region. The proportion of children who are stunted has only reduced marginally over the past three decades despite notable improvements in the Zambian health system (Ministry of Health, 2017). In addition, similar improvements have been observed in other health indicators such as institutional deliveries, antenatal care visits coverage, fully immunized coverage and child health attendances (Ministry of Health, 2017). These improvements in population health status can be largely attributed to introduction of pro-poor health systems reforms, policies and initiatives that aimed to promote equity and efficiency in health service delivery (Phiri & Ataguba, 2014). The health reforms and initiatives that were employed to this effect includes amongst other the removal of financial barriers such as user fees. User fee abolition attained the goal of improved utilization of health care services especially at primary health facilities (Blas & Limbambala, 2012; Masiye & Kaonga, 2016).

Despite an increase in the utilization of child health care services in Zambia, evidence illustrates residential and socioeconomic differentials in child stunting and unequal distribution of barriers to access and utilisation of health services have persevered (Menon,P., Ruel,M.T. & Morris, 2000; Phiri & Ataguba, 2014). These barriers to access and utilization of health services include inadequate skilled human resource, mismanagement in the supply and distribution of drugs and medical supplies, inadequate funding, inadequate medical equipment and transportation (Ministry of health Zambia, 2010). In addition, barriers to access and utilization of child health services are predominantly higher for children from poor households and those residing in rural areas (Phiri & Ataguba, 2014). This incapability of the poor and those residing in rural areas in accessing and utilizing child health services may be detrimental to their children's nutritional status and in turn exacerbate the extent of

differentials in child stunting and other child health outcomes compared to their wealthier and urban counterparts (Phiri & Ataguba, 2014).

Widening socioeconomic differentials in health remain one of the biggest challenges of less developed countries which has thereby stimulated national and international organisations to focus on the health and nutrition of under-fives in these countries (Hong, Banta and Betancourt, 2006). The attention given to poverty and chronic undernutrition is premised upon the fact that poverty inhibits human capital development and thereby reinforces the vicious cycle of intergeneration poverty and poor health. Thus, addressing disparities in child health between and within countries and groups remains one of the challenges, especially for World Health Organization (WHO) member countries that subscribe to the Sustainable Development Goals (SDGs) (Lim *et al.*, 2016).

Unlike in many SSA countries experiencing rapid urban population growth, Zambia has one of the least urban population growth rates (United Nations: Department of Social and Economic Affairs: Population Division, 2014; The World Bank, 2015). In addition, Zambia is one of the poorest countries in the world with an estimated 54.4% of the population surviving on less than US$1.90 a day in 2016 (Sachs *et al.*, 2017). Furthermore, poverty is largely a rural phenomenon with an estimated 76.6% of the poor population living in rural areas in 2015, which is three times higher than what was obtained in urban areas, at 23.4% (Republic of Zambia, 2016).

Given this context, the purpose of this paper is to contribute to the scarce empirical literature on wealth and residential differentials in child stunting conducted in Zambia. To the best of our knowledge, this is the first study that systematically addresses the measurement of socioeconomic differentials in the prevalence of child stunting between the rural and urban areas with a primary focus on Zambia.

3 Methods

3.1 Data source

This study uses secondary data from the Zambia Demographic and Health Survey (ZDHS) 2013/2014. The ZDHS is a nationally representative cross-sectional data

which capture up-to-date information on background characteristics of the respondents, nuptiality, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutritional status of mothers and young children. Briefly, the ZDHS uses a two-stage stratified cluster sample design, with enumeration areas (EAs) selected during the first stage and households selected during the second stage. The sampling frame comprised of 25,631 EAs and 2,815,897 households. A total of 18,052 households were drawn for the survey. In the first stage, 722 EAs (305 in urban areas and 417 in rural areas) were selected with probability proportional to size from 10 provinces which were stratified into 20 sampling strata. Subsequently, a complete list of households served as the sampling frame in the selection of households for enumeration. An average of 25 households was selected in each EA. The ZDHS questionnaires allow different units of analysis which are compiled into "recode" files namely; households, household members, men's, women and children's data respectively. This study used data from the women's, children and household files. More details on the sampling design are provided in the ZDHS report (ZDHS).

3.2 Outcome measurement: child stunting

As recommended by the WHO, a child is considered stunted if their length/height-for-age is less than or equal to minus two standard deviations growth standards medians for the same age and sex (de Onis and Branca, 2016). The dependent variable is binary "stunting" variable measured by height-for-age scores (HAZ). Therefore, children were classified into two groups according to their HAZ. The variable was coded as "1" (stunted) if height for age Z-score was <-2 and "0" (not stunted) if HAZ was ≥-2. WHO Child Growth standards have been confirmed and well accepted that children born in every region around the world who are given the optimum start in life have the potential to grow and develop with the same range of weight and height. Therefore, disparities in children growing up to age five are influenced by factors such as health care, environmental factors, feeding practices and nutrition.

3.3 Key explanatory variables

Our key predictors are residence type (rural/urban) and household wealth or socioeconomic status. For residence type, rural area is the dummy variable which was coded as "0" while the urban area was coded as "1". The choice of a measure of

socioeconomic status (SES) for this study is the household wealth index. This choice is largely influenced by the unavailability of other measures of SES in the DHS dataset. The wealth index is particularly valuable in countries that lack reliable data on income and expenditures, which are the traditional indicators used to measure household economic status (Rutstein and Johnson, 2004). It serves as an indicator of the level of wealth that is consistent with consumption expenditure and income measures (Rutstein and Johnson, 2004). In summary, the wealth index has increasingly been used as a measure of SES in less developed countries due to the following reasons; it is representative of long-term economic status, data can be easily collected; it is a convenient way of summarising the living conditions in a household and lastly it is a useful control variable for estimating predictors correlated with household wealth (Chuma and Molyneux, 2009). In addition, other studies which have used consumption expenditure and household income have yielded similar results as those that use the wealth index (Van de Poel, O'Donnell and Van Doorslaer, 2007; Masiye *et al.*, 2010). The wealth index was constructed using household asset data by using Principal Components Analysis (PCA). PCA involves the creation of the wealth index by using household possession and assets such as bicycles, radios, TV sets and water and sanitation services. The household wealth index is divided into five quintiles, with the highest quintile (dummy variable) representing the richest 20% of the households and the lowest quintile representing the poorest 20% of households in Zambia.

3.3 Control variables

Besides household wealth and residence type (rural vs urban), there are other predictors of child stunting at the child, mother, and community levels and are considered in this paper (Fotso and Kuate-Defo, 2006). The analysis conducted in the study adjusts for the effects of these potentially confounding factors due to the fact household wealth is correlated with the mother's health status and other demographic and socioeconomic factors at child, mother, household and community levels. Child-level characteristics include the child's age, sex, birth order, breastfeeding duration and multiple births. Mother-level characteristics include; maternal education, marital status, mother's age at childbirth and mothers' body mass index (BMI). Community-level factors include the utilisation of antenatal care services and maternal delivery services (Fotso and Kuate-Defo, 2006). *Details on the definitions of the variables are contained in Table 1.*

3.4 Statistical analysis

The analyses of data were conducted using Stata version 15. Chi-square tests were used to assess the difference between child stunting prevalence and household wealth, residence type and other background characteristics. Only covariates having a significant effect on child stunting as assessed from the chi-square analysis were fed into the logistic regression models. After that, univariate and multiple logistic regressions were used to examine the effects of residence type and household wealth on child stunting. Univariate logistic regressions were run to examine the separate effect of each predictor before adjusting for others. Afterwards, four multiple logistic regressions were used to assess the effect of household wealth and residence type on child stunting. In the first model, a multiple logistic regressions analysis was applied to assess the effect of household wealth and residence type on the prevalence of child stunting in Zambia without controlling for other covariates. Likewise, the second model involved the application of another multiple logistic regression; which assessed the effect of the household wealth and residence type on child stunting in Zambia after controlling for other covariates. The last two regressions separately assess the effect of household wealth and other covariates on child stunting in urban and rural areas, respectively. The assessment of socioeconomic differentials between rural and urban is done by observing odds ratio coefficients between the richest (dummy) and the other SES groups within rural and urban locations. The level of statistical significance was set at $P<0.05$ and 95% confidence intervals (CI).

4 Results

4.1 Descriptive statistics

The findings reveal that 64% of children sampled aged 0-59 months in Zambia lived in rural areas, while 36% percent are in urban areas. On the other hand, 24% of the children are from the poorest 20% of households while 12% live in the wealthiest 20% of the households. Children are approximately equally distributed by sex. Furthermore, children aged between 12-23 months comprise the highest proportion (22%) while children aged 24-35 months comprised the lowest proportion (18.3%). The other three aged groups of children are almost 20% each. Approximately one-third (33%) of the children are born of fifth-order or higher while 20% are firstborn.

Table C.1: Sample distribution and prevalence of stunting among children aged 0-59 months by household wealth, residence type and other selected characteristics, Zambia 2013/14

Characteristics	**Sample (%)**	**Prevalence of stunting (%)**	***(Chi-squared)***
Residence type			
Urban	36.2	1470 (35.6)	P=0.001
Rural	63.8	3042 (41.8)	
Total	100	4512 (40%)	
Household wealth index			
Poorest	24.2	1292 (46.9)	P=0.001
Poorer	24.2	1161 (42.1)	
Middle	22.8	1003 (38.5)	
Richer	16.7	693 (36.4)	
Richest	12.1	363 (26.2)	
Total	100	4512(40%)	
Child's Sex			
Male	50.2	2400 (42)	P=0.001
Female	49.8	2112 (37.1)	
Total	100	4512(40%)	
Child's Age (month)			
0-11	19.5	499 (22.5)	P=0.001
12-23	22.7	1225 (47.4)	
24-35	18.3	1044 (50.1)	
36-47	19.4	938 (42.3)	
48-59	20.2	806 (35.1)	
Total	100	4512(40)	
Birth Order			
1st Born	20.0	886 (38.8)	P=0.689
2nd Born	17.8	791 (39)	
3rd Born	15.3	695 (39.8)	
4th Born	13.1	582 (39.0)	
>5th Born	33.8	1,558 (40.4)	

Total	100	4512(40)	
Breastfeeding duration			
Not Breastfed	1.5	76 (45.2)	P=0.001
0-11	3.2	151 (41.4)	
11-23	44.0	2082 (42)	
>24	51.3	2136 (37)	
Total	100	4445(39.5)	
Child of multiple births			
Single-born	97.3	4331 (39.01)	P=0.001
Twin or Higher Order	2.7	181 (59.2)	
Total	100	4512(40)	
Mother's education			
No education	11.3	561 (43.5)	P=0.001
Primary	56.2	2689 (42)	
Secondary	29.1	1191 (35.9)	
Higher	3.5	67 (17.1)	
Total	100	4508(40)	
Mother's age at childbirth (year)			
<16	1.5	77 (45.3)	P=0.001
16-25	42.5	2013 (41.5)	
25-35	42.0	1802 (37.7)	
>35	14.0	620 (38.8)	
Total	100	4512(40)	
Mother's BMI			
<18.5	8.7	488 (49.6)	P=0.001
18.5-24.9	70.8	3264 (40.5)	
25>	20.5	748 (31.9)	
Total	100	4501(40)	
Maternal Marital Status			
Married	81.7	3689 (39.6)	P=0.824
Unmarried	18.3	823 (39.3)	
Total	100	4512(40)	

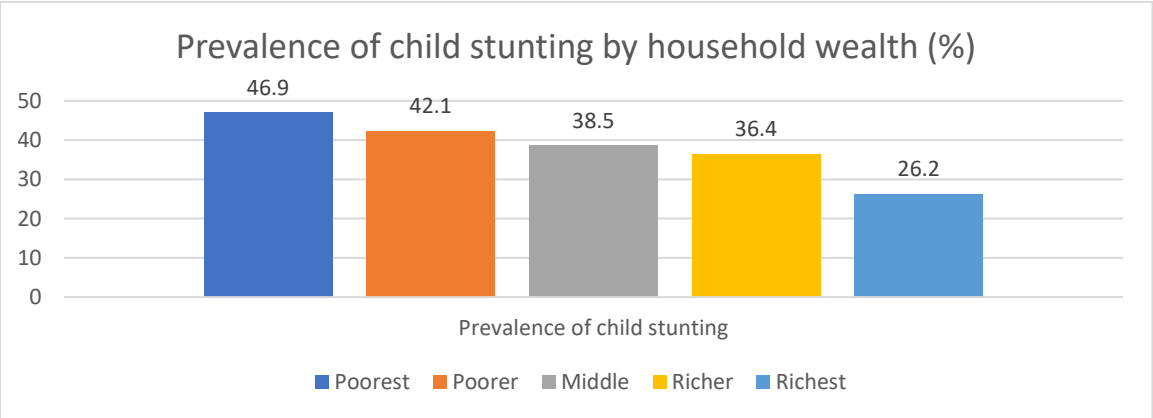
Antenatal care visits			
No visits	2.2	81 (44.5)	P=0.2
1-3 visits	43	1333 (37.9)	
>4 Visits	54.8	1706 (38.1)	
Total	100	3120(38.2)	
Institutional deliveries			
Home	30.9	1540 (43.8)	P=0.001
Health Facility	68.2	2918 (37.6)	
Other	0.9	43 (42.6)	
Total	100	4501(40)	

Source: Authors own computation from the Zambia Demographic and Health Survey 2013/14

Note: X^2 test for categorical variables

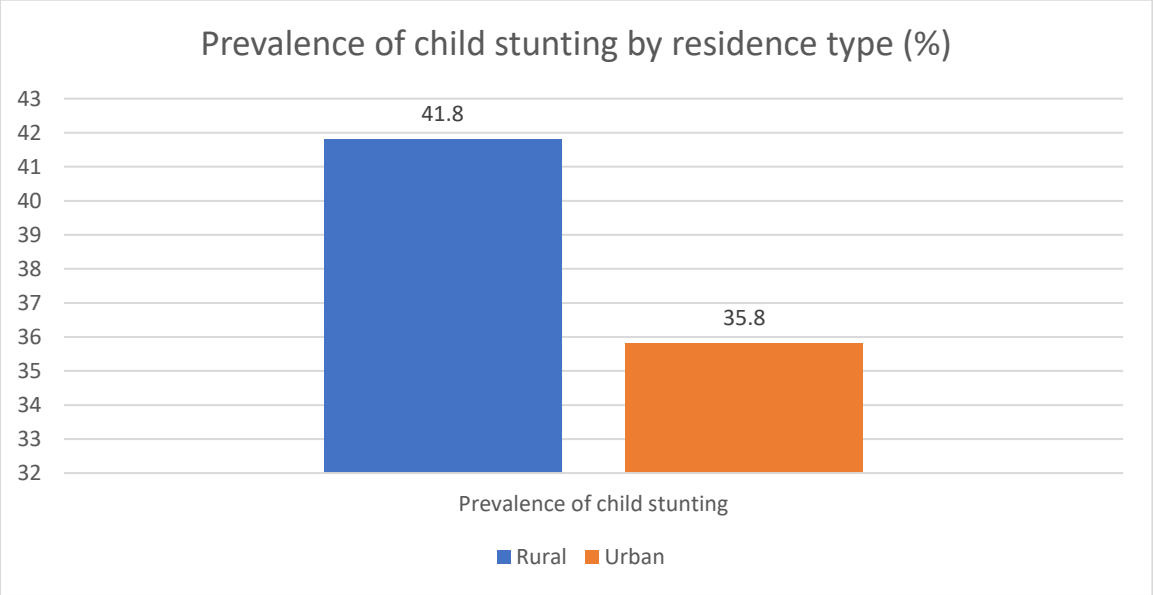
In addition, most (97%) of the children were single births, whereas 3% were born of multiple-births. Slightly more than half (51%) of them were breastfed for more than 24 months while an estimated 3.2% were breastfed for less than 11 months. The majority (56%) of the mothers of the children had primary school education while only 3.5% and 11.3% had tertiary education and no education, respectively. Also, 1.5% of the mothers are aged below 16 years, while more than half are aged above 25 years. Furthermore, 71% of the mothers had normal body weight, while 8.7% are underweight, and 21% are overweight. Most (82%) of the mothers were married, while 18% were not. Most of the mothers (55%) had visited health facilities for antenatal services at least four times during their pregnancy, and a health professional delivered 68% of them.

Figure 1: The prevalence of child stunting by household wealth status (2013/14)



Overall, Zambia's child stunting prevalence rate for children aged between 0-59 months stands at 40% (table 1). The prevalence of childhood chronic undernutrition declines as household wealth increases. It was estimated at 47% for the poorest households and 26% for the wealthiest households. On the other hand, children under-five in urban areas have a lower child stunting prevalence rate (35.6%) than rural under-fives (41.8%). The prevalence of childhood stunted growth is significantly higher among boys (42%) than girls (37.1%). The prevalence of stunted growth is lowest at the age group 0-11 months (22.5%) when children are exclusively breastfed than at older age groups. The prevalence of child stunting rapidly increases from the 12-23-month olds (47%) and peaks at 24-35-month olds (50.1%), after which it levels off with slight fluctuations in the age groups, 36-47 (42.3%) and 48-59 (35.1%).

Figure 2: The prevalence of child stunting by residence type (2013/14)



Among the children who were breastfed, the difference in the prevalence of stunted growth is negligible; ranging from 37% to 42%. Furthermore, stunted growth is significantly higher among higher-born (59%) compared to those who are single-born (39%) (Table 1). The findings show that the prevalence of child stunting reduces with higher maternal education, maternal age and mother's BMI. In addition, the prevalence of stunted growth is highest amongst among children born at home (44%) compared those who were born at health facilities (38%). However, childhood stunted growth is not associated with the number of antenatal care visits, marital status and birth-order.

4.2 Effects of residence type and household wealth status on stunted-growth in under-fives

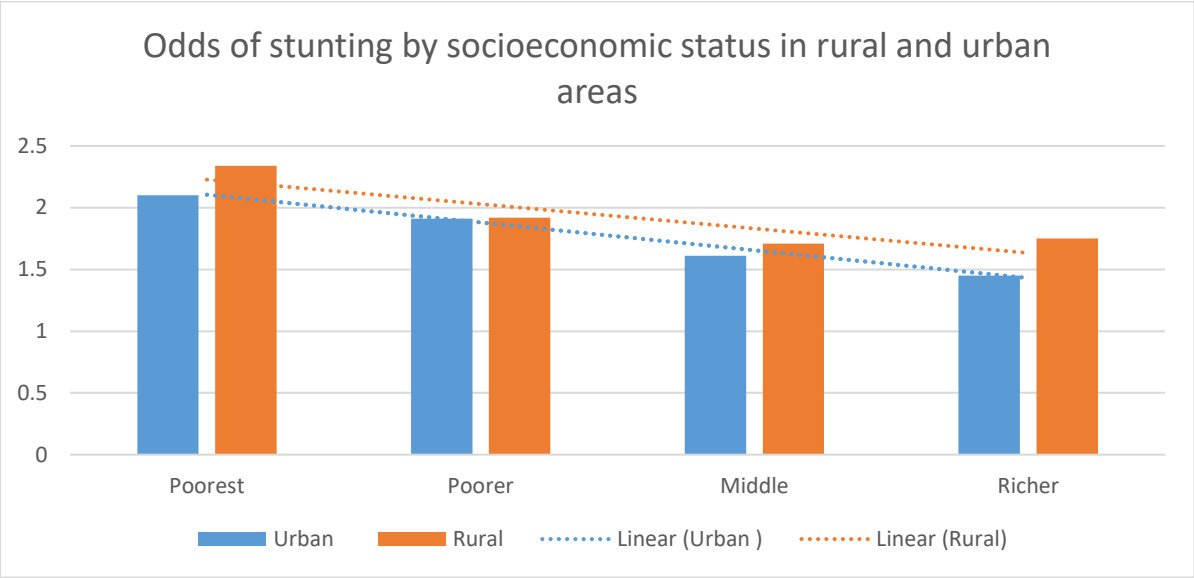
Table 2 presents the univariate and multiple regression results predicting the effect of residence type and wealth on child stunting in Zambia. Univariate results indicate that residence type and household wealth are significantly associated with child stunting. Specifically, the findings show that under-fives residing in urban areas are 23% less likely to be stunted (OR=0.77; 95%CI: 0.71, 0.83). In addition, the prevalence of child stunting amongst under-fives follows the wealth gradient; with children from the poorest households having higher odds of being stunted compared to their peers in the wealthiest households (OR=2.5; 95%CI: 2.2, 2.9).

The multiple logistic regression results also show that child stunting is significantly related to residence type and wealth. Model 1 results indicate that under-fives residing in urban areas are 14% more likely to be stunted compared to their counterparts residing in rural areas (OR=1.14; 95%CI: 1.02, 1.27). On the other hand, under-fives from the poorest households are 2.8 times more likely to be stunted compared to those in the richest households (OR=2.8; 95%CI: 2.3, 3.3).

Model 2 introduces other child, mother and community characteristics into the regression model. The results indicate that residence type and wealth are significantly related to child stunting even after adjusting for other covariates. The results show that under-fives residing in urban areas are 14% more likely to be stunted compared to their counterparts residing in rural areas (OR=1.14; 95%CI: 1.02, 1.27). On the other hand, the results indicate that children from the poorest households are 2.1 times more likely to be stunted compared to those in the richest households (OR=2.1; 95%CI: 1.7, 2.3). The introduction of other covariates reduces the odds of stunted growth of children[8] of the poorest households compared to the richest households.

[8] The terms “children” and “under-fives” are interchangeably used in this paper and they mean the same

Figure 3: Effects of household wealth status on stunted-growth in under-fives in rural and urban areas (2013/14)



Notes: Reference category used is the "the richest"

Source: Author's own computation from the Zambia Demographic and Health Survey 2013/14

However, the association between child stunting and household wealth status is significantly different when the results are segregated by residence type after controlling for other covariates. Model 3 results show that the odds of stunted growth are 2.1 times more likely amongst under-fives from the poorest households compared to the wealthiest in urban areas (OR=2.3, 95CI:1.4, 3.8). Model 4 results reveal that the odds of stunted growth are 2.3 times more likely among the poorest households compared to the wealthiest (OR=2.3, 95CI:1.4, 3.8). In either case, the results follow a wealth gradient, with children from the poorest households showing higher odds of being stunted compared to their peers in the wealthiest households. However, the wealth gradient is consistently higher in rural areas compared to urban areas.

Table C.2: Effects of household wealth status, residence type and other selected characteristics on stunting among children aged 0-59 months, Zambia 2013/14

	Unadjusted Odds Ratios		Adjusted Odds Ratios		Adjusted Odds Ratios		Adjusted Odds Ratios		Adjusted Odds Ratios	
Variables	**Univariate analysis**		**Model 1**		**Model 2 (Full)**		**Model 3 (Urban)**		**Model 4 (Rural)**	
	OR (CI)	**SE**	**OR (CI)**	**SE**	**OR (CI)**	**SE**	**OR (CI)**	**SE**	**OR(CI)**	**SE**
Residence type										
Rural	Reference		Reference		Reference		Reference		Reference	
Urban	0.77 (0.71,0.83)*	0.03	1.14 (1.02,1.27)* *	0.06	1.14 (1.02,1.27) **	0.06	-		-	-
Wealth index										
Richest	Reference		Reference		Reference		Reference		Reference	
Richer	1.61 (1.38, 1.87)	0.12	1.65 (1.4, 1.94) *	0.14	1.4(1.2,1.7) *	0.13	1.4 (1.19, 1.76) *	0.15	1.7 (1.1, 2.9) *	0.45
Middle	1.76 (1.53, 2.0)*	0.13	1.89 (1.6,2.21) *	0.15	1.5 (1.3, 1.9) *	0.14	1.6 (1.3,2.0) *	0.18	1.7 (1.1, 2.78) *	0.42
Poorer	2.1 (1.77, 2.36)*	0.15	2.28 (1.91,2.7) *	0.2	1.7 (1.4, 2.1) *	0.18	1.9 (1.4,2.5) *	0.3	1.9 (1.18, 3.1) **	0.47
Poorest	2.48 (2.16,2.86)*	0.17	2.79 (2.3,3.3) *	0.25	2.1 (1.7,2.6) *	0.2	2.1(1.2, 3.5) *	0.5	2.3 (1.44,3.79) **	0.57
Sex										
Male	Reference				Reference		Reference		Reference	
Female	0.82 (0.76, 0.88)*	0.03			0.79 (0.72,0.85) *	0.03	0.86 (0.75,0.99) **	0.06	0.75 (0.68,0.82) *	0.03
Child's Age										
0-11	Reference				Reference		Reference		Reference	
12-23	3.1 (2.7,3.5)*	0.2			3.2 (2.8,3.6) *	0.22	3.4 (2.7, 4.4) *	0.4	3.1 (2.6, 3.6) *	0.25
24-35	3.5 (3.0,4.0)*	0.23			3.6 (3.1,4.1) *	0.28	4.2 (3.1, 5.6) *	0.6	3.28 (2.7, 3.9) *	0.3
36-47	2.5 (2.2, 2.9)*	0.17			2.6 (2.2,3.1) *	0.2	3.1 (2.4, 4.1) *	0.4	2.39 (0.49, 1.1) *	0.22
48-59	1.86 (1.63,2.1)*	0.13			1.86 (1.6,2.1) *	0.14	2.1 (1.57, 2.75) *	0.29	1.77 (0.46, 0.71) *	0.16
Child of Multiple Birth										
Single	Reference				Reference		Reference		Reference	
Twin or Higher Order	2.3 (1.79,2.85)*	0.26			2.7 (2.0,3.6) *	0.41	2.9 (1.7,4.8) *	0.76	2.65 (1.79,3.86) *	0.51
Mothers Education										
No education	Reference				Reference		Reference		Reference	
Primary	0.94 (0.83,1.1)	0.57			0.99 (0.86, 1.1)	0.06	0.82 (0.6, 1.1)	0.13	1.03 (0.88, 1.2)	0.08
Secondary	0.73 (0.64,0.83)*	0.49			0.89 (0.76,1.0)	0.07	0.83 (0.6, 1.1	0.13	0.87 (0.71,1.1)	0.08

Higher	0.27(0.2, 0.35)*	0.39			0.46 (0.32,0.66) *	0.08	0.44 (0.27,0.69) *	0.1	0.40 (0.19, 0.84) *	0.15
Breastfeeding Duration										
Not Breastfed	Reference				Reference		Reference		Reference	
0-11	0.85 (0.59,1.2)	0.16			0.86 (0.58, 1.27)	0.17	0.76 (0.46, 1.3)	0.2	1.01 (0.55,1.88)	0.97
12-23	0.88 (0.64,1.2)	0.14			0.72 (0.51, 1)**	0.12	0.69 (0.44, 1.1)	0.16	0.74 (0.44, 1.23)	0.25
>24	0.71 (0.52, 0.97)**	0.11			0.71 (0.50, 1.0)**	0.12	0.71 (0.45, 1.1)	0.17	0.73 (0.43,1.2)	0.22
Mothers Age										
<16	Reference				Reference		Reference		Reference	
16-25	0.86 (0.63,1.1)	0.13			0.89 (0.65,1.2)	0.14	0.93 (057,1.5	0.23	0.86 (0.57,1.31)	0.18
25-35	0.73 (0.54,0.99)**	0.11			0.76 (0.55, 1.1)***	012	0.78 (0.48,1.29)	0.19	0.74 (0.49,1.1)	0.15
>35	0.76 (0.56, 1.05)***	0.12			0.74 (0.53, 1.1)***	0.13	0.94 (0.55,1.59)	0.25	0.67 (0.44, 1.0)***	0.67
Mothers BMI										
<18.5	Reference				Reference		Reference		Reference	
18.5-24.9	0.69 (0.61, 0.79)*	0.046			0.72 (0.63,0.84) *	0.05	0.71 (0.54,0.94) *	0.099	0.73 (0.61,0.87 *	0.06
25>	0.48 (0.41,0.56)*	0.037			0.59 (0.5,0.71) *	0.05	0.61 (0.45,0.82) **	0.091	0.57 (0.46,0.71 *	0.06
Place of Delivery										
Home	Reference				Reference		Reference		Reference	
Health Facility	0.77 (0.71,0.84)*	0.03			0.9 (0.82, 0.99) **	0.04	0.89 (0.72,1.1)	0.09	0.73 (0.81,1.1)***	0.05
Other	0.95 (0.64,1.42)	0.19			1.0 (0.63,1.58)	0.23	0.96 (0.3, 3.1)	0.56	0.72 (0.63,1.65)	0.25
		*P<0.01; **p<0.05;***P<0.1;CI= Confidence intervals in parenthesis ; SE=Robust Standard errors								

Model 1: The first model assessed the effect of residence type and household wealth on child stunting without controlling for other covariates.

Model 2: This model assessed the effect of residence type and household wealth on child stunting whilst controlling for other covariates.

Model 3: This model assessed the effect of household wealth and other predictors on child stunting in urban areas

Model 4: This model assessed the effect of household wealth and other predictors on child stunting in rural areas.

Source: Authors own computation from the Zambia Demographic and Health Survey 2013/14

4.3 Effect of other risk and confounding factors

Among the control characteristics, the findings revealed that the child's age and the multiple-birth status had the strongest effect on the risk of being stunted. With regards to children age, the odds of child stunting are at least 1.8 times higher for children of other age groups compared to those under the age of one year (0-11 months) in Zambia. Furthermore, the odds of stunted growth were highest amongst the age group 25-35 months compared those aged below 12 months.

Likewise, the odds of stunted growth were at least 2 times higher for children who have a multiple birth status than for those who are single born ($p<0.05$). Additionally, the findings indicate that there is an association between maternal education and child stunting. Specifically, higher education is associated with reduced odds of stunting. However, the relationship is only statistically significant between mothers with the highest education level and those with no education ($p<0.05$). Furthermore, the results have shown that there is a statistically significant relationship between the mother's age and child stunting ($p<0.01$) in all models except for urban locations.

In addition, the results show that there is an association between stunted growth and mother's BMI. The findings consistently illustrate that the risk of stunted growth reduces with an increase in the mother's BMI. On the other hand, odds of stunting for children who were breastfed for a longer duration were less likely to be stunted compared to those who were never breastfed. However, this association was only statistically significant for under-fives breastfed after 24 months and 12 months before and after controlling for other predictors ($p<0.05$). This relationship becomes statistically insignificant after controlling segregating by residence type (in rural and urban areas). In addition, there is an association between child stunting and the place of delivery. However, this association is only statistically significant for those under-fives who were delivered in health facilities and those that were delivered at home. This association disappears in urban locations after disaggregation by residence type.

5 Discussion

This study clearly shows that there are large socioeconomic differentials in stunting among preschoolers aged 0-59 months old, these differentials are slightly greater

among children in rural areas than urban areas and; children residing in urban areas are more likely to be stunted compared to their rural counterparts.

The first objective of the study was to understand the role of residence type and household in predicting child stunting in Zambia. Our findings consistently show that children residing in the poorest households stand a greater risk of being stunted than their counterparts in wealthier households. In all instances, child stunting follows a wealth gradient; the odds of stunted growth consistently declined with an increase in the household wealth status in Zambia and vice versa. However, one key finding is that more than a quarter of the children in the wealthiest households are stunted. Univariate results indicate that children residing in urban areas are 23% less likely to be stunted compared to their rural counterparts. However, the findings from the multiple regressions are more trustworthy than those from simple regression analyses as they take into consideration other predictors of child stunting. Notably, the multiple regression findings indicate that under-fives residing in urban areas are 14% more likely to be stunted compared to their rural peers. These results are inconsistent with most studies; which shows that children from rural areas are at greater risk of getting stunted compared to their urban counterparts (Menon, Ruel and Morris, 2000; Fotso and Kuate-Defo, 2006; Kennedy *et al.*, 2006; Van de Poel, O'Donnell and Van Doorslaer, 2007; Masiye *et al.*, 2010). However, few studies support these study findings and attribute the depletion of the urban advantage in child nutritional status due to rapid population growth amidst insufficient investment in social services such as education, water and sanitation, food security and high unemployment in urban areas (Haddad, Ruel and Garrett, 1999; Fotso, 2007).

The second objective of this paper is to assess the difference in the relationship between socioeconomic status (wealth) and child stunting in rural and urban areas. The results have shown that wide socioeconomic differentials (wealth gradient) exist in child stunting in both rural and urban areas as children residing in disadvantaged households have much higher odds of stunting compared to their wealthier counterparts. However, these findings indicate that socioeconomic differentials (wealth gradient) are wider in rural areas compared to urban areas. These findings

contradict several other studies which have shown a steeper wealth gradient[9] in urban areas compared to rural locations (Kuate Defo, 1996; Haddad, Ruel and Garrett, 1999; Menon,P., Ruel,M.T. & Morris, 2000). On the other hand, these findings validate one cross country analysis which indicated that within-rural socioeconomic differentials were greater than within urban differentials in Zambia (Fotso, 2006b).

The major strength of the study was disaggregation of the effects of household wealth and other predictors on child stunting by residential type. This stratification revealed that socioeconomic differentials in child stunting are larger in rural areas than in urban areas. Secondly, our study used the household wealth index, which was constructed using household assets and characteristics that are comparable and available across rural and urban areas. In addition, previous similar studies had not controlled for other potentially confounding factors which may have an effect on child stunting such as the mother, child, household and community characteristics (Haddad, Ruel and Garrett, 1999; Menon,P., Ruel,M.T. & Morris, 2000; Kennedy *et al.*, 2006). Three of the models in this study control for other characteristics which affect child stunting apart from residence type and household wealth. However, even after controlling for these characteristics, the direction of the relationship between residence type and wealth remains the same.

This study is not without limitations. Firstly, the only data available was the Zambia Demographic Health Survey 2013/14, which was produced 4-5 years ago. This is a challenge as most of the indicators recorded in the survey may not represent the current picture post-MDGs, especially in the SDGs era. Through the Ministry of Health and other cooperating partners, several health programs and interventions have since been implemented, which might have changed the child stunting trends in present-day Zambia. However, the analysis is still relevant as it could act as a baseline study for future studies. Anyhow, future studies could provide more accurate results by using more recent data. The second limitation is the cross-sectional design of the study—only mere association and no conclusions about causality can be drawn. Lastly, although the household wealth index is a useful measure to assess wealth differentials

[9] The terms "wealth gradient" and "socioeconomic differentials" are used interchangeably.

in a child, it is an indirect measure of SES that is constructed using only household assets endowments which do not indicate community and contextual aspects indicators of socioeconomic position.

6 Conclusion

This study has shown that there is a significantly higher risk of child stunting in urban areas and amongst the disadvantaged while within-rural wealth differentials in child stunting are larger than within-urban wealth differentials. Overall, the findings of this paper suggest that child stunting is largely a phenomenon that is characterised by a large wealth gradient in which children from less privileged households have a higher burden and risk of being stunted. However, more than one-quarter of children under five years in the wealthiest households are stunted. This implies that there is a great need for population-wide interventions that target the less privileged; especially those in urban areas without neglecting the wealthy. However, the policy actions aimed at improving socioeconomic welfare and conditions in rural areas should be dissimilar from those that address the requirements of their urban counterparts because the urban poor face a unique set of challenges compared to their rural counterparts (Mohiddin, Phelps and Walters, 2012).

7 List of Abbreviations

SSA Sub-Saharan Africa

SES Socioeconomic Status

PCA Principal Component Analysis

MDGs Millennium Development Goals

SDGs Sustainable Development Goals

ZDHS Zambia Demographic Health Survey

BMI Body Mass Index

8 Declarations

8.1 Ethics approval and consent to participate

This study used secondary analysis based on publicly available DHS datasets. However, ethics approval was obtained from the Human Research Ethics Committee (HREC) at the University of Cape Town.

8.2 Consent for publication

Permission was obtained from the University of Cape Town prior to publication of this paper.

8.3 Availability of data and material

The dataset used in this paper are available at (https://dhsprogram.com/what-we-do/survey/survey-display-406.cfm)

8.4 Competing Interests

The authors declare that they are no competing interests

8.5 Funding

None

8.6 Author's contributions

DM conceived the idea for the study and its design, data analysis and preparation of the journal manuscript. In addition to their other roles, T.W and J.A supervised the dissertation.

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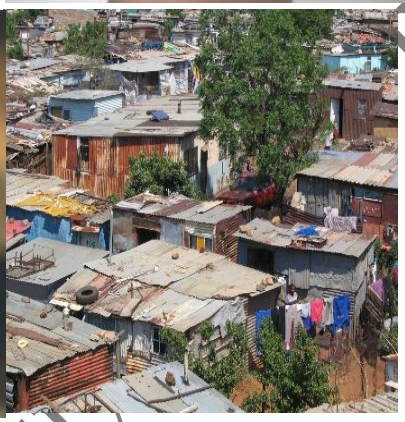
Part D: Policy brief

Policy brief

Socioeconomic differentials of child stunting in rural and urban areas of Zambia



Key points

- Urban kids have a higher risk of getting stunted compared to their rural peers.
- Poorer kids have a higher risk of being stunted compared to their wealthier peers.
- Disparities in child stunting are between the rich and poor are wider in rural areas compared to urban areas.

Introduction

Child stunting remains one of the biggest public health challenges in low and middle-income countries (LMICs) which includes Zambia. An estimated 40% of under-fives in Zambia suffer from stunted growth. Stunting has long-term effects on individuals and societies, including a diminished mental ability and learning capacity, poor school

An estimated 40% of under-fives living in Zambia are stunted

Box 1: What is child stunting?
Stunting is the impaired growth and development that children experience from poor nutrition, repeated infection, and inadequate psychosocial stimulation. Children are defined as stunted if their height-for-age is more than two standard deviations below the WHO Child Growth Standards median.

performance in childhood, reduced earnings and productivity and increased risks and susceptibility to nutrition-related chronic diseases such as diabetes, hypertension and obesity in future. Stunting within the first 1000 days of life can have irreversible consequences on the child's growth, culminating into an increased risk of illnesses and death. The first 1000 days of life is a very critical phase in a child's life during which rapid mental and physical development occurs.

Why is stunting so high in Zambia?

Despite an overall decline in the prevalence of child stunting, Zambia's child stunting prevalence has only reduced marginally over the past two decades. Efforts to have a sustainable reduction in child stunting in the 1990s were inhibited by the implementation of the structural adjustment programs (SAPs).

The SAPs entailed the reduction in government expenditure on social services, liberalisation of the economy and removal of subsidies on welfare. However, these set of policies resulted in declining personal incomes, inflation, and escalation of prices of essential goods and services and high unemployment rates. Consequently, this culminated into the deterioration of education and health care services and an unprecedented surge in poverty levels. Stunted growth reflects long-standing poverty that affects most of the Zambian population. Poverty has remained high in rural areas where nearly 60% of the population resides, and 54% of Zambians continue to survive on less than US$1.90 a day.

The importance of understanding wealth and residential disparities of child stunting

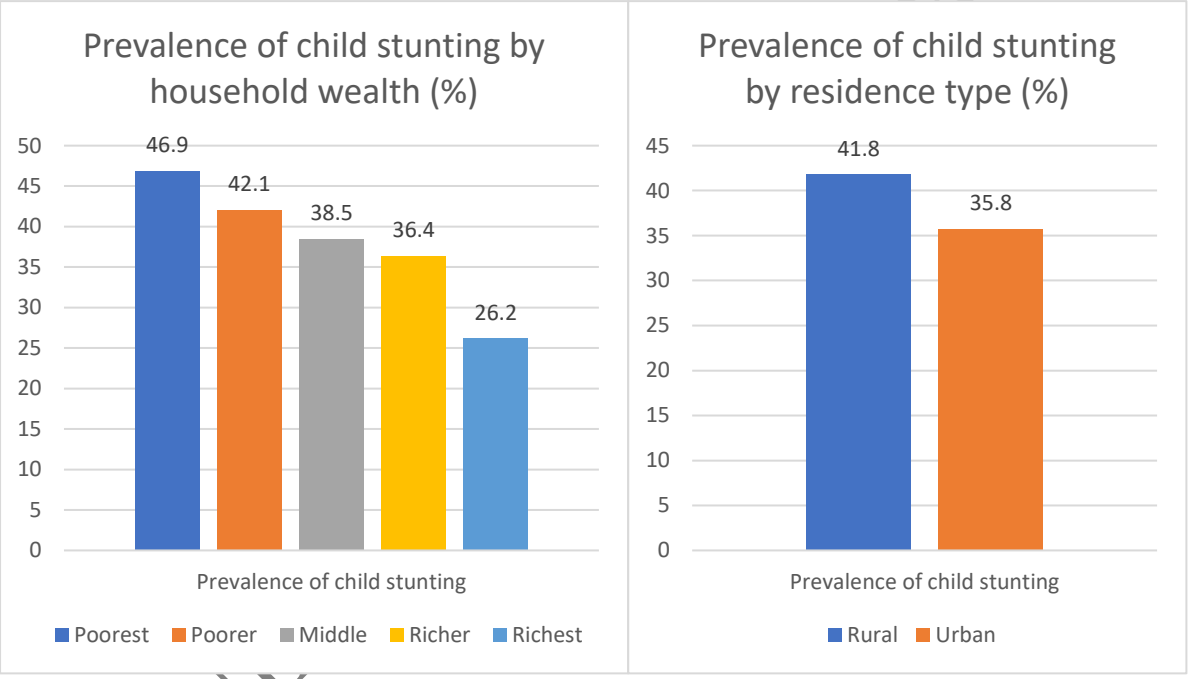
One major challenge faced in attaining sustainable reductions in child stunting is the persistent disparities that exist amongst different population groups in Zambia. Specifically, children residing in rural areas and poorer households have a higher burden of stunted growth compared to their peers who live in urban and wealthier households of Zambia . However, basic rural-urban comparisons of child stunting can potentially conceal vast wealth disparities in child stunting that exist within rural and urban locations. Understanding the differences in health outcomes amongst different population groups is central for policies that aim to reverse the status quo. Additionally, it is paramount for attaining agreed targets for global development agendas such as sustainable development goals (SDGs). Therefore, for governments

and stakeholders to design and implement effective policies, they have to quantify and unravel the socioeconomic and residential disparities in child stunting. This policy brief examines this issue using the 2013/14 Zambia Demographic Health Survey (ZDHS).

Are there wealth and residential disparities in child stunting in Zambia?

Figures 1 presents the distribution of child stunting across different residence types and socioeconomic groups. The burden of child stunting is higher in rural areas than in urban areas.

Figure 1: Distribution of child stunting by residence type and wealth

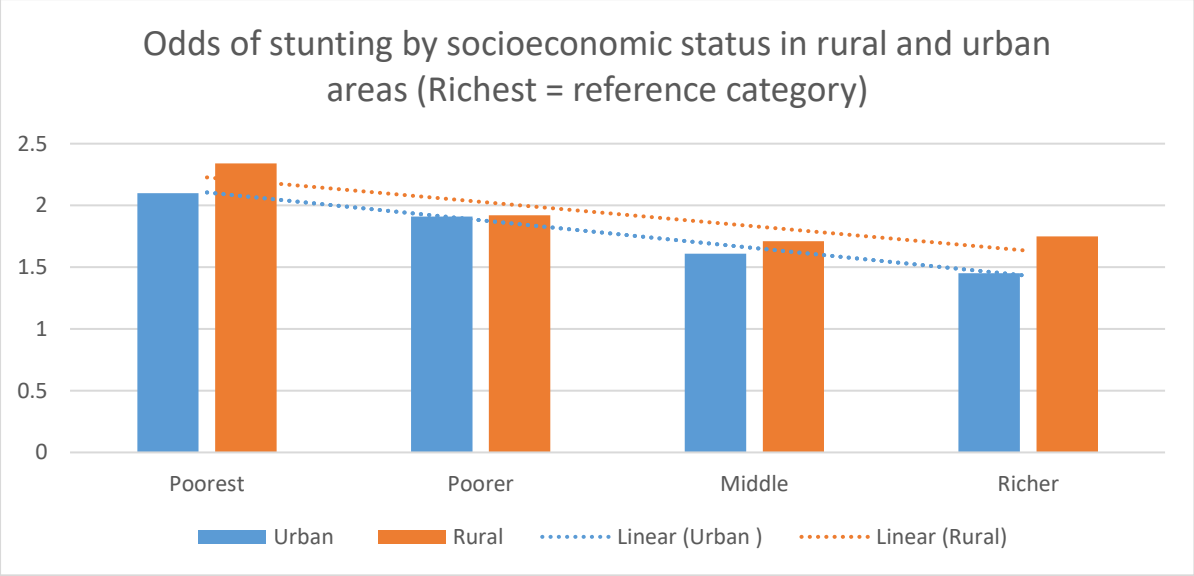


On the other hand, the prevalence of stunting in under-fives is highest amongst the poorest and consistently reduces with an increase in wealth status. Also, stunted growth remains a significant challenge amongst children of the wealthiest as 26.2% of them are stunted.

Is there a difference in the relationship between child stunting and wealth in rural and urban areas?

The likelihood of stunted growth consistently declines with an increase in the household wealth status in Zambia.

Figure 2: The odds of stunting by socioeconomic status in rural and urban areas



However, the difference between child stunting and wealth slightly differs after segregating in rural and urban areas. Specifically, the results show that the rural poor have higher odds of stunting compared to their poor urban counterparts. This variation between stunted growth and wealth is consistently higher throughout all the wealth status groups.

Policy Recommendations

Based on the findings of this research study, governments and stakeholders can use this evidence to address the vast differences that exist in child stunting in Zambia. These findings have critical policy implications for Zambia, Sub-Saharan Africa and other low and middle-income countries (LMICs).

Stunting is the result of a complex array of causal and contextual factors. Solutions will require multifaceted and transdisciplinary approaches (de Onis and Branca, 2016).

- Research programs should be introduced to monitor and track child stunting amongst different socioeconomic groups in both rural and urban areas.
- Stakeholders should implement population-wide interventions such as universal infant nutritional programmes, water and sanitation programmes, agricultural support programmes aimed at improving reducing the burden of child stunting.
- Policymakers should develop effective methods of delivering strategies and interventions such as social cash transfer programs and other welfare programs aimed at reducing wealth disparities in child stunting in both rural and urban areas.
- Policymakers should take on a multisectoral approach that in turn, requires individual, institutional and system-level collaborators to implement effective interventions through engagement across different stakeholders and sector.

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Part E: Appendices

Appendix 1: Plagiarism declaration

Plagiarism Declaration

1) I know that plagiarism is wrong. Plagiarism is to use another's work and pretend it is one's own.
2) I have used the Harvard style for referencing in the research protocol and literature review. The style used by the Vancouver style was applied in the journal manuscript. Each quotation in this thesis from the work(s) of other people has been attributed and has been cited and referenced.
3) This dissertation is my own work. I have not allowed, and will not allow, anyone to copy my work with the intention of passing it off as his/her own work.

Signature:

Name: Douglas Mushinge
Student Number:
4th January 2019

Appendix 2: Research Ethics Approval

Research Ethics Approval

UNIVERSITY OF CAPE TOWN
Faculty of Health Sciences
Human Research Ethics Committee

Room E53-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6626
Email: shuretta.thomas@uct.ac.za
Website: www.health.uct.ac.za/fhs/research/humanethics/forms

26 September 2018

HREC REF: 613/2018

A/Prof John Ataguba
Public Health & Family Medicine
Falmouth Building

Dear A/Prof Ataguba

PROJECT TITLE: SOCIOECONOMIC DIFFERENTIALS IN CHILD STUNTING IN RURAL AND URBAN AREAS IN ZAMBIA (Master's Candidate - Mr D Mushinge)

Thank you for submitting your study to the Faculty of Health Sciences Human Research Ethics Committee.

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study. However, the HREC request confirmation that local Zambian Research Ethics approval will be obtained; or is not required as data are publicly available.

Approval is granted for one year until the 30 September 2019.

Please submit a progress form, using the standardised Annual Report Form if the study continues beyond the approval period. Please submit a Standard Closure form if the study is completed within the approval period.
(Forms can be found on our website: www.health.uct.ac.za/fhs/research/humanethics/forms)

Please quote the HREC REF in all your correspondence.

Please note that the ongoing ethical conduct of the study remains the responsibility of the principal investigator.

Please note that for all studies approved by the HREC, the principal investigator **must** obtain appropriate institutional approval, where necessary, before the research may occur.

The HREC acknowledge that the student, Douglas Mushinge will also be involved in this study.

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE
Federal Wide Assurance Number: FWA00001637.

Institutional Review Board (IRB) number: IRB00001938
This serves to confirm that the University of Cape Town Human Research Ethics Committee complies to the Ethics Standards for Clinical Research with a new drug in patients, based on the Medical Research Council (MRC-SA), Food and Drug Administration (FDA-USA), International Convention on Harmonisation Good Clinical Practice (ICH GCP), South African Good Clinical Practice Guidelines (DoH 2006), based on the Association of the British Pharmaceutical Industry Guidelines (ABPI), and Declaration of Helsinki (2013) guidelines.
The Human Research Ethics Committee granting this approval is in compliance with the ICH Harmonised Tripartite Guidelines E6: Note for Guidance on Good Clinical Practice (CPMP/ICH/135/95) and FDA Code Federal Regulation Part 50, 56 and 312.

Appendix 3: International Journal for Health Equity- (Guide for authors)

International Journal for Health Equity

Overview of manuscript sections for Research Articles
Journal manuscripts for research articles that are submitted to the International Journal of Equity in Health are divided into the sections below (in this order);

Preparing your manuscript

The information below details the section headings that you should include in your manuscript and what information should be within each section.

Please note that your manuscript must include a 'Declarations' section including all of the subheadings (please see below for more information).

Title page

The title page should:

- present a title that includes, if appropriate, the study design e.g.:
    - "A versus B in the treatment of C: a randomized controlled trial", "X is a risk factor for Y: a case control study", "What is the impact of factor X on subject Y: A systematic review"
    - or for non-clinical or non-research studies a description of what the article reports
- list the full names, institutional addresses and email addresses for all authors
    - If a collaboration group should be listed as an author, please list the Group name as an author. If you would like the names of the individual members of the Group to be searchable through their individual PubMed records, please include this information in the "Acknowledgements" section in accordance with the instructions below
- indicate the corresponding author

Abstract

The Abstract should not exceed 350 words. Please minimize the use of abbreviations and do not cite references in the abstract. Reports of randomized controlled trials should follow the CONSORT extension for abstracts. The abstract must include the following separate sections:

- **Background:** the context and purpose of the study

- **Methods:** how the study was performed and statistical tests used
- **Results:** the main findings
- **Conclusions:** brief summary and potential implications
- **Trial registration:** If your article reports the results of a health care intervention on human participants, it must be registered in an appropriate registry and the registration number and date of registration should be in stated in this section. If it was not registered prospectively (before enrolment of the first participant), you should include the words 'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

Three to ten keywords representing the main content of the article.

Background

The Background section should explain the background to the study, its aims, a summary of the existing literature and why this study was necessary or its contribution to the field.

Methods

The methods section should include:

- the aim, design and setting of the study
- the characteristics of participants or description of materials
- a clear description of all processes, interventions and comparisons. Generic drug names should generally be used. When proprietary brands are used in research, include the brand names in parentheses
- the type of statistical analysis used, including a power calculation if appropriate

Results

This should include the findings of the study including, if appropriate, results of statistical analysis which must be included either in the text or as tables and figures.

Discussion

This section should discuss the implications of the findings in context of existing research and highlight limitations of the study.

Conclusions

This should state clearly the main conclusions and provide an explanation of the importance and relevance of the study reported.

List of abbreviations

If abbreviations are used in the text they should be defined in the text at first use, and a list of abbreviations should be provided.

Declarations

All manuscripts must contain the following sections under the heading 'Declarations':

- Ethics approval and consent to participate
- Consent for publication
- Availability of data and material
- Competing interests
- Funding
- Authors' contributions
- Acknowledgements
- Authors' information (optional)

Please see below for details on the information to be included in these sections.

If any of the sections are not relevant to your manuscript, please include the heading and write 'Not applicable' for that section.

Ethics approval and consent to participate

Manuscripts reporting studies involving human participants, human data or human tissue must:

- include a statement on ethics approval and consent (even where the need for approval was waived)
- include the name of the ethics committee that approved the study and the committee's reference number if appropriate

Studies involving animals must include a statement on ethics approval.

See our editorial policies for more information.

If your manuscript does not report on or involve the use of any animal or human data or tissue, please state "Not applicable" in this section.

Consent for publication

If your manuscript contains any individual person's data in any form (including any individual details, images or videos), consent for publication must be obtained from that person, or in the case of children, their parent or legal guardian. All presentations of case reports must have consent for publication.

You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).

See our editorial policies for more information on consent for publication.

If your manuscript does not contain data from any individual person, please state "Not applicable" in this section.

Availability of data and materials

All manuscripts must include an 'Availability of data and materials' statement. Data availability statements should include information on where data supporting the results reported in the article can be found including, where applicable, hyperlinks to publicly archived datasets analysed or generated during the study. By data we mean the minimal dataset that would be necessary to interpret, replicate and build upon the findings reported in the article. We recognise it is not always possible to share research data publicly, for instance when individual privacy could be compromised, and in such instances data availability should still be stated in the manuscript along with any conditions for access.

Data availability statements can take one of the following forms (or a combination of more than one if required for multiple datasets):

- The datasets generated and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]
- The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

- All data generated or analysed during this study are included in this published article [and its supplementary information files].
- The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.
- Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.
- The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name].
- Not applicable. If your manuscript does not contain any data, please state 'Not applicable' in this section.

More examples of template data availability statements, which include examples of openly available and restricted access datasets, are available here.

BioMed Central also requires that authors cite any publicly available data on which the conclusions of the paper rely in the manuscript. Data citations should include a persistent identifier (such as a DOI) and should ideally be included in the reference list. Citations of datasets, when they appear in the reference list, should include the minimum information recommended by DataCite and follow journal style. Dataset identifiers including DOIs should be expressed as full URLs. For example:

Hao Z, AghaKouchak A, Nakhjiri N, Farahmand A. Global integrated drought monitoring and prediction system (GIDMaPS) data sets. figshare. 2014. http://dx.doi.org/10.6084/m9.figshare.853801

With the corresponding text in the Availability of data and materials statement:

The datasets generated during and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS].[Reference number]

Competing interests

All financial and non-financial competing interests must be declared in this section.

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Organization site

ISSN International Centre: The ISSN register. http://www.issn.org (2006). Accessed 20 Feb 2007.

Dataset with persistent identifier

Zheng L-Y, Guo X-S, He B, Sun L-J, Peng Y, Dong S-S, et al. Genome data from sweet and grain sorghum (Sorghum bicolor). GigaScience Database. 2011. http://dx.doi.org/10.5524/100012.

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Appendix 4: Detailed description of Zambia Demographic Health Survey (ZDHS)

Detailed description of Zambia Demographic Health Survey

Objectives of the survey

The Zambia Demographic and Health Survey (ZDHS) is a nationally representative sample survey of women and men of reproductive age. The main objective is to provide information on levels and trends in fertility, childhood mortality, use of family planning methods, maternal and child health indicators including HIV/AIDS. This information is necessary for programme managers, policymakers, and implementers to monitor and evaluate the impact of existing programmes and to design new initiatives for health policies in Zambia.

The primary objectives of the 2013-14 ZDHS are:
• To collect up-to-date information on fertility, infant and child mortality, and family planning.
• To collect information on health-related matters such as breastfeeding, antenatal care,
Children's immunisations, and childhood diseases.
• To assess knowledge of contraceptive practices among women.
• To assess the nutritional status of mothers and children.
• To improve understanding of variations in HIV seroprevalence levels according to social and
Economic characteristics and behavioural risk factors.
• To estimate levels of HIV incidence in the general population of adults.1
• To estimate unmet need for antiretroviral treatment.
In the case of HIV/AIDS, the testing component of the 2013-14 ZDHS was undertaken to provide information to address the monitoring and evaluation needs of government and nongovernmental programmes dealing with HIV/AIDS. It also provides programme managers and policymakers with the information they need to effectively plan and implement future interventions. The overall objective was to collect high-quality and representative data on knowledge, attitudes, and behaviours regarding

HIV/AIDS and other STIs and on the prevalence and incidence of HIV among women and men.

Organisation

The 2013-14 ZDHS was implemented by the Central Statistical Office in partnership with the Ministry of Health, the University of Zambia Teaching Hospital (UTH) Virology Laboratory, the Tropical Diseases Research Centre (TDRC), and the Department of Population Studies at the University of Zambia (UNZA) under the overall guidance of the National Steering Committee. A technical committee provided technical guidance to the survey. The TDRC and the UTH Virology Laboratory provided technical support in the implementation of HIV testing. The government of Zambia, through the Ministry of Health and the Ministry of Finance, provided funding for the survey. Cooperating partners, namely the U.S. Centres for Disease Control and Prevention (CDC), the United Nations Children's Fund (UNICEF), and the United Nations Population Fund (UNFPA), provided additional funds. The Demographic and Health Surveys Program at ICF International, which is funded by the United States Agency for International Development (USAID), provided technical assistance in the areas of survey design, sample design, questionnaire design, interviewer training, fieldwork logistics, blood specimen collection, laboratory testing, and data processing and analysis. The CDC provided technical assistance with HIV protocol development, as well as technical support to the TDRC and the UTH Virology Laboratory during laboratory testing. While significantly expanded in size and content, the 2013-14 ZDHS is a follow-up to the 1992, 1996, 2001-02, and 2007 ZDHS surveys and provides updated estimates of basic demographic and health indicators covered in the earlier surveys. The 2013-14 survey is the third ZDHS to measure HIV prevalence in Zambia and the first to measure HIV incidence. It is also the third survey that includes information on violence against women.

Sample design

The sample for the 2013-14 ZDHS was designed to provide estimates at the national and provincial levels, as well as for rural and urban areas within the provinces. This is the first time the ZDHS has been designed to provide estimates at such disaggregated levels for many of the survey indicators. The updated list of enumeration areas (EAs) for the 2010 Population and Housing Census provided the sampling frame for the survey. The frame comprises 25,631 EAs and 2,815,897 households. An EA is a convenient geographical area with an average size of 130 households or 600 people. For each EA, information is available on its location, type of residence (rural or urban), number of households, and total population. Each EA has a cartographical map with delimited boundaries and main landmarks of the area. A 2013-14 ZDHS cluster is essentially representative of an EA.

A representative sample of 18,052 households was drawn for the 2013-14 ZDHS. The survey used a two-stage stratified cluster sample design, with EAs (or clusters) selected during the first stage and households selected during the second stage. In the first stage, 722 EAs (305 in urban areas and 417 in rural areas) were selected with probability proportional to size. Zambia is now administratively divided into 10 provinces (Central, Copperbelt, Eastern, Luapula, Lusaka, Muchinga, Northern, North Western, Southern, and Western). Stratification was achieved by separating each province into urban and rural areas.

Therefore, the 10 provinces were stratified into 20 sampling strata. In the second stage, a complete list of households served as the sampling frame in the selection of households for enumeration. An average of 25 households was selected in each EA. It was during the second stage of selection that a representative sample of 18,052 households was selected. Prior to selection, EAs were stratified by province and then into urban and rural areas. A complete listing of households in each selected cluster, along with a mapping exercise, was conducted from November 2012 to January 2013 by listers and mappers from the CSO Geographic Information Branch.

All private households were listed. The listing excluded people living in institutional dwelling units (such as army barracks, hospitals, police camps, and boarding schools). The listing teams recorded geographic coordinates for each sampled cluster (centroid) using Global Positioning System (GPS) receivers. All women age 15-49 and men age 15-59 who were either permanent residents of the households or visitors present in the households on the night before the survey were eligible to be interviewed. In addition, a subsample of one eligible woman in each household was randomly selected to be asked additional questions on domestic violence.

All women and men who were eligible for interviews were asked if they would voluntarily give a finger-prick blood sample to allow HIV prevalence estimation from dried blood spot (DBSs). If they consented to DBS collection, they were also offered home-based counselling and testing for HIV with rapid HIV tests. Venous blood was also collected for CD4 counts. Venous blood was processed in the field laboratory, and respondents were given their CD4 count results. Both DBS and venous blood samples were transferred to either the UTH Virology Laboratory or the TDRC laboratory for HIV testing. As a means of assessing nutritional status, height and weight measurements were taken for all children age 0-59 months and women age 15-49 who were usual residents of or visitors in the household.

Questionnaires

Three questionnaires were used in the 2013-14 ZDHS: the Household Questionnaire, the Woman's Questionnaire, and Man's Questionnaire. The three instruments were based on the questionnaires developed by the Demographic and Health Surveys Program and adapted to Zambia's specific data needs. The questionnaires were translated into seven major languages: Bemba, Kaonde, Lozi, Lunda, Luvale, Nyanja, and Tonga. Questionnaires and field procedures were pretested prior to the implementation of the main survey.

The Household Questionnaire was used to collect data such as:

- Age, sex, marital status, and education of all usual members and visitors
- Current school attendance and survivorship of parents among children under age 18
- Characteristics of the structural dwelling/housing unit
- Sanitation facilities and source of water
- Ownership of durable goods, land, and livestock
- Ownership and use of mosquito nets

The Household Questionnaire was also used to record biomarker data, including height and weight data for children and women and HIV and CD4 testing information for women and men. Data on age and sex of household members were used to identify the women and men eligible for individual interviews.

The Woman's Questionnaire was used to collect information from all women age 15-49. Women were asked questions on the following main topics:

- Background characteristics (age, religion, education, literacy, media exposure, etc.)
- Reproductive history
- Knowledge, use, and source of family planning methods
- Fertility preferences
- Maternal health (antenatal, delivery, and postnatal care)
- Fistula prevalence
- Breastfeeding and infant feeding practices
- Child immunisation and childhood illnesses
- Treatment of malaria
- Child mortality
- Marriage and sexual activity
- Women's work and husbands' background characteristics
- Awareness of AIDS and other STIs
- Other health issues (e.g., tuberculosis, injection safety, and smoking)
- Maternal mortality
- Domestic violence

The Man's Questionnaire was administered to all men age 15-59. It collected much of the same information as the Woman's Questionnaire, but it did not contain a detailed reproductive history or questions on maternal and child health or nutrition.

Appendix 5: Zambia Demographic Health Survey (ZDHS) Household Questionnaire

15 June 2013

2013 ZAMBIA DEMOGRAPHIC AND HEALTH SURVEY
HOUSEHOLD QUESTIONNAIRE
WITH HIV/AIDS

MINISTRY OF HEALTH/CENTRAL STATISTICAL OFFICE

IDENTIFICATION

LOCALITY NAME _____

NAME OF HOUSEHOLD HEAD _____

CLUSTER NUMBER .....

HOUSEHOLD NUMBER .....

PROVINCE .....

RURAL/URBAN (RURAL = 1, URBAN = 2) .....

LUSAKA = 1/ OTHER CITY = 2/TOWN = 3/VILLAGE = 4 .....

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR
INTERVIEWER'S NAME				INT. NUMBER
RESULT*				RESULT
NEXT VISIT: DATE				TOTAL NUMBER OF VISITS
TIME				

*RESULT CODES:

1 COMPLETED
2 NO HOUSEHOLD MEMBER AT HOME OR NO COMPETENT RESPONDENT AT HOME AT TIME OF VISIT
3 ENTIRE HOUSEHOLD ABSENT FOR EXTENDED PERIOD OF TIME
4 POSTPONED
5 REFUSED
6 DWELLING VACANT OR ADDRESS NOT A DWELLING
7 DWELLING DESTROYED
8 DWELLING NOT FOUND
9 OTHER _____ (SPECIFY)

TOTAL PERSONS IN HOUSEHOLD

TOTAL ELIGIBLE WOMEN

TOTAL ELIGIBLE MEN

LINE NO. OF RESPONDENT TO HOUSEHOLD QUESTIONNAIRE

**LANGUAGE OF QUESTIONNAIRE: 01 LANGUAGE OF INTERVIEW: NATIVE LANGUAGE OF RESPONDENT

**LANGUAGE CODES: 01 ENGLISH 02 BEMBA 03 KAONDE 04 LOZI 05 LUNDA 06 LUVALE 07 NYANJA 08 TONGA 09 OTHER

TRANSLATOR USED (YES = 1, NO = 2)

SUPERVISOR	FIELD EDITOR	OFFICE EDITOR	KEYED BY
NAME	NAME		
DATE	DATE		

Introduction and Consent

Hello. My name is _____. I am working with the Ministry of Health in collaboration with Central Statstical Office (CSO). We are conducting a survey about health all over Zambia. The information we collect will help the government to plan health services. Your household was selected for the survey. I would like to ask you some questions about your household. The questions usually take about 20 to 30 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on this card.

GIVE CARD WITH CONTACT INFORMATION

Do you have any questions?
May I begin the interview now?

Signature of interviewer: _____ Date: _____

RESPONDENT AGREES TO BE INTERVIEW..... 1 ↓ RESPONDENT DOES NOT AGREE TO BE INTERVIE'..... 2→ END

HOUSEHOLD SCHEDULE

							IF AGE 15 OR OLDER			
LINE NO.	USUAL RESIDENTS AND VISITORS	RELATIONSHIP TO HEAD OF HOUSEHOLD	SEX	RESIDENCE		AGE	MARITAL STATUS	ELIGIBILITY		
	Please give me the names of the persons who usually live in your household and guests of the household who stayed here last night, starting with the head of the household. AFTER LISTING THE NAMES AND RECORDING THE RELATIONSHIP AND SEX FOR EACH PERSON, ASK QUESTIONS 2A-2C TO BE SURE THAT THE LISTING IS COMPLETE. THEN ASK APPROPRIATE QUESTIONS IN COLUMNS 5-20 FOR EACH PERSON.	What is the relationship of (NAME) to the head of the household? SEE CODES BELOW.	Is (NAME) male or female?	Does (NAME) usually live here?	Did (NAME) stay here last night?	How old is (NAME)? IF 95 OR MORE RECORD 95'	What is (NAME'S) current marital status? 1 = MARRIED/ COHABITING/ LIVING TOGETHER 2 = DIVORCED 3 = SEPARATED 4 = WIDOWED 5 = NEVER-MARRIED	CIRCLE LINE NUMBER OF ALL WOMEN AGE 15-49 PUT AN * FOR THE LINE NUMBER OF THE WOMAN SELECTED FOR DOMESTIC VIOLENCE	CIRCLE LINE NUMBER OF ALL MEN AGE 15-59	CIRCLE LINE NUMBER OF ALL CHILDREN AGE 0-5
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
01			M F 1 2	Y N 1 2	Y N 1 2	IN YEARS		01	01	01
02			1 2	1 2	1 2			02	02	02
03			1 2	1 2	1 2			03	03	03
04			1 2	1 2	1 2			04	04	04
05			1 2	1 2	1 2			05	05	05
06			1 2	1 2	1 2			06	06	06
07			1 2	1 2	1 2			07	07	07
08			1 2	1 2	1 2			08	08	08
09			1 2	1 2	1 2			09	09	09
10			1 2	1 2	1 2			10	10	10

(2A) Just to make sure that I have a complete listing. Are there any other persons such as small children or infants that we have not listed? YES → ADD TO TABLE NO

2B) Are there any other people who may not be members of your family, such as domestic servants, lodgers, or friends who usually live here? YES → ADD TO TABLE NO

2C) Are there any guests or temporary visitors staying here, or anyone else who stayed here last night, who have not been listed? YES → ADD TO TABLE NO

CODES FOR Q. 3: RELATIONSHIP TO HEAD OF HOUSEHOLD

01 = HEAD
02 = WIFE OR HUSBAND
03 = CO-WIFE
04 = SON OR DAUGHTER
05 = SON-IN-LAW OR DAUGHTER-IN-LAW
06 = GRANDCHILD
07 = PARENT
08= PARENT-IN-LAW
09 = BROTHER OR SISTER
10 = NIECE/NEPHEW BY BLOOD
11 = NIECE/NEPHEW BY MARRIAGE
12 = OTHER RELATIVE
13 = ADOPTED/FOSTER/ STEPCHILD
14 = NOT RELATED
98 = DON'T KNOW

	IF AGE 0-17 YEARS				IF AGE 5 YEARS OR OLDER		IF AGE 5-24 YEARS		IF AGE 0-4 YEARS
LINE NO.	SURVIVORSHIP AND RESIDENCE OF BIOLOGICAL PARENTS				EVER ATTENDED SCHOOL		CURRENT/RECENT SCHOOL ATTENDANCE		BIRTH REGIS-TRATION
	Is (NAME)'s natural mother alive?	Does (NAME)'s natural mother usually live in this household or was she a guest last night? IF YES: What is her name? RECORD MOTHER'S LINE NUMBER. IF NO, RECORD '00'.	Is (NAME)'s natural father alive?	Does (NAME)'s natural father usually live in this household or was he a guest last night? IF YES: What is his name? RECORD FATHER'S LINE NUMBER. IF NO, RECORD '00'.	Has (NAME) ever attended school?	What is the highest level of school (NAME) has attended? SEE CODES BELOW. What is the highest grade (NAME) completed at that level? SEE CODES BELOW.	Did (NAME) attend school at any time during the 2013 school year?	During this/that school year, what level and grade [is/was] (NAME) attending? SEE CODES BELOW.	Does (NAME) have a birth certificate? IF NO, PROBE: Has (NAME)'s birth ever been registered with the civil authority? 1 = HAS CERTIFICATE 2 = REGISTERED 3 = NEITHER 8 = DON'T KNOW
	(12)	(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)
01	Y N DK 1 2 8 GO TO 14		Y N DK 1 2 8 GO TO 16		Y N 1 2 NEXT LINE	LEVEL GRADE	Y N 1 2 NEXT LINE	LEVEL GRADE	
02	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
03	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
04	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
05	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
06	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
07	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
08	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
09	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
10	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		

CODES FOR Qs. 17 AND 19: EDUCATION

LEVEL	GRADE
0 = NURSERY/ KINDERGATERN	00 = LESS THAN 1 YEAR COMPLETED (USE '00' FOR Q. 17 ONLY. THIS CODE IS NOT ALLOWED FOR Q. 19)
1 = PRIMARY	
2 = SECONDARY	
3 = HIGHER	98 = DON'T KNOW
8 = DON'T KNOW	

	IF AGE 0-17 YEARS				IF AGE 5 YEARS OR OLDER		IF AGE 5-24 YEARS		IF AGE 0-4 YEARS
LINE NO.	SURVIVORSHIP AND RESIDENCE OF BIOLOGICAL PARENTS				EVER ATTENDED SCHOOL		CURRENT/RECENT SCHOOL ATTENDANCE		BIRTH REGIS-TRATION
	Is (NAME)'s natural mother alive?	Does (NAME)'s natural mother usually live in this household or was she a guest last night? IF YES: What is her name? RECORD MOTHER'S LINE NUMBER. IF NO, RECORD '00'.	Is (NAME)'s natural father alive?	Does (NAME)'s natural father usually live in this household or was he a guest last night? IF YES: What is his name? RECORD FATHER'S LINE NUMBER. IF NO, RECORD '00'.	Has (NAME) ever attended school?	What is the highest level of school (NAME) has attended? SEE CODES BELOW. What is the highest grade (NAME) completed at that level? SEE CODES BELOW.	Did (NAME) attend school at any time during the 2013 school year?	During this/that school year, what level and grade [is/was] (NAME) attending? SEE CODES BELOW.	Does (NAME) have a birth certificate? IF NO, PROBE: Has (NAME)'s birth ever been registered with the civil authority? 1 = HAS CERTIFICATE 2 = REGISTERED 3 = NEITHER 8 = DON'T KNOW
	12	13	14	15	(16)	(17)	(18)	(19)	(20)
11	Y N DK 1 2 8 GO TO 14		Y N DK 1 2 8 GO TO 16		Y N 1 2 NEXT LINE	LEVEL GRADE	Y N 1 2 NEXT LINE	LEVEL GRADE	
12	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
13	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
14	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
15	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
16	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
17	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
18	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
19	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		
20	1 2 8 GO TO 14		1 2 8 GO TO 16		1 2 NEXT LINE		1 2 NEXT LINE		

CODES FOR Qs. 17 AND 19: EDUCATION

LEVEL

0 = NURSERY/ KINDERGATERN

1 = PRIMARY

2 = SECONDARY

3 = HIGHER

8 = DON'T KNOW

GRADE

00 = LESS THAN 1 YEAR COMPLETED (USE '00' FOR Q. 17 ONLY. THIS CODE IS NOT ALLOWED FOR Q. 19)

98 = DON'T KNOW

Q21. TABLE FOR SELECTION OF WOMEN FOR THE DOMESTIC VIOLENCE QUESTIONS

LOOK AT THE LAST DIGIT OF THE HOUSEHOLD QUESTIONNAIRE SERIAL NUMBER ON THE COVER PAGE. THIS IS THE ROW NUMBER YOU SHOULD GO TO. CHECK THE TOTAL NUMBER OF ELIGIBLE WOMEN (COLUMN 9) IN THE HOUSEHOLD SCHEDULE. THIS IS THE COLUMN NUMBER YOU SHOULD GO TO. FOLLOW THE SELECTED ROW AND COLUMN TO THE CELL WHERE THEY MEET AND CIRCLE THE NUMBER IN THE CELL. THIS IS THE NUMBER OF THE WOMAN SELECTED FOR THE DOMESTIC VIOLENCE QUESTIONS FROM THE LIST OF ELIGIBLE WOMEN IN COLUMN 9 OF THE HOUSEHOLD SCHEDULE. WRITE THE NAME AND LINE NUMBER OF THE SELECTED WOMAN IN THE SPACE BELOW THE TABLE.

EXAMPLE: THE HOUSEHOLD QUESTIONNAIRE SERIAL NUMBER IS '716' AND THE HOUSEHOLD SCHEDULE COLUMN 9 SHOWS THAT THERE ARE THREE ELIGIBLE WOMEN AGE 15-49 IN THE HOUSEHOLD (LINE NUMBERS 02, 04, AND 05). SINCE THE LAST DIGIT OF THE HOUSEHOLD SERIAL NUMBER IS '6' GO TO ROW '6' AND SINCE THERE ARE THREE ELIGIBLE WOMEN IN THE HOUSEHOLD, GO TO COLUMN '3'. FOLLOW THE ROW AND COLUMN AND FIND THE NUMBER IN THE CELL WHERE THEY MEET ('2') AND CIRCLE THE NUMBER. NOW GO TO THE HOUSEHOLD SCHEDULE AND FIND THE SECOND WOMAN WHO IS ELIGIBLE FOR THE WOMAN'S INTERVIEW (LINE NUMBER '04' IN THIS EXAMPLE). WRITE HER NAME AND LINE NUMBER IN THE SPACE BELOW THE TABLE.

LAST DIGIT OF THE HOUSEHOLD QUESTIONNAIRE SERIAL NUMBER	TOTAL NUMBER OF ELIGIBLE WOMEN AGE 15-49 IN HOUSEHOLD SCHEDULE COLUMN 9							
	1	2	3	4	5	6	7	8
0	1	2	2	4	3	6	5	4
1	1	1	3	1	4	1	6	5
2	1	2	1	2	5	2	7	6
3	1	1	2	3	1	3	1	7
4	1	2	3	4	2	4	2	8
5	1	1	1	1	3	5	3	1
6	1	2	2	2	4	6	4	2
7	1	1	3	3	5	1	5	3
8	1	2	1	4	1	2	6	4
9	1	1	2	1	2	3	7	5

NAME OF SELECTED WOMAN _____

HH LINE NUMBER OF SELECTED WOMAN ..... ☐☐

HOUSEHOLD CHARACTERISTICS

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	How often does anyone smoke inside your house? Would you say daily, weekly, monthly, less than monthly, or never?	DAILY ..... 1 WEEKLY ..... 2 MONTHLY ..... 3 LESS THAN MONTHLY ..... 4 NEVER 5	
102	What is the **main** source of drinking water for members of your household?	PIPED WATER PIPED INTO DWELLING ..... 11 PIPED TO YARD/PLOT ..... 12 PUBLIC TAP/STANDPIPE ..... 13 TUBE WELL OR BOREHOLE ..... 21 DUG WELL PROTECTED WELL ..... 31 UNPROTECTED WELL ..... 32 WATER FROM SPRING PROTECTED SPRING ..... 41 UNPROTECTED SPRING ..... 42 RAINWATER ..... 51 TANKER TRUCK ..... 61 CART WITH SMALL TANK ..... 71 SURFACE WATER (RIVER/DAM/ LAKE/POND/STREAM/CANAL/ IRRIGATION CHANNEL) ..... 81 BOTTLED WATER ..... 91 OTHER _____ 96 (SPECIFY)	105 105
103	Where is that water source located?	IN OWN DWELLING ..... 1 IN OWN YARD/PLOT ..... 2 ELSEWHERE 3	105
104	How long does it take to go there, get water, and come back?	MINUTES ..... [ ][ ][ ] ON PREMISES ..... 996 DON'T KNOW 998	
105	Do you do anything to the water to make it safer to drink?	YES ..... 1 NO ..... 2 DON'T KNOW 8	106A
106	What do you usually do to make the water safer to drink? Anything else? RECORD ALL MENTIONED.	BOIL ..... A ADD BLEACH/CHLORINE/CLORIN ..... B STRAIN THROUGH A CLOTH ..... C USE WATER FILTER (CERAMIC/ SAND/COMPOSITE/ETC.) ..... D SOLAR DISINFECTION ..... E LET IT STAND AND SETTLE ..... F OTHER _____ X (SPECIFY) DON'T KNOW ..... Z	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
106A	How do you store your drinking water?	CLOSED CONTAINER/JERRY CAN ..... 1 OPEN CONTAINER/BUCKET ..... 2 DOES NOT STORE WATER ..... 3 OTHER _____ 6 (SPECIFY)	
107	What kind of toilet facility do members of your household usually use?	FLUSH OR POUR FLUSH TOILET FLUSH TO PIPED SEWER SYSTEM ..... 11 FLUSH TO SEPTIC TANK ..... 12 FLUSH TO PIT LATRINE ..... 13 FLUSH TO SOMEWHERE ELS..... 14 FLUSH, DON'T KNOW WHERE..... 15 PIT LATRINE VENTILATED IMPROVED PIT LATRINE ..... 21 PIT LATRINE WITH SLAB ..... 22 PIT LATRINE WITHOUT SLAB/ OPEN PIT ..... 23 COMPOSTING TOILET ..... 31 BUCKET TOILET ..... 41 HANGING TOILET/HANGING LATRINE ..... 51 NO FACILITY/BUSH/FIELD ..... 61 OTHER _____ 96 (SPECIFY)	→ 110
108	Do you share this toilet facility with other households?	YES ..... 1 NO 2	→ 110
109	How many households use this toilet facility?	NO. OF HOUSEHOLDS IF LESS THAN 10 ..... 0 [ ] 10 OR MORE HOUSEHOLDS ..... 95 DON'T KNOW 98	
110	Does your household have:	YES NO	
	Electricity?	ELECTRICITY 1 2	
	A radio?	RADIO 1 2	
	A television?	TELEVISION 1 2	
	A mobile telephone?	MOBILE TELEPHONE 1 2	
	A non-mobile telephone?	NON-MOBILE TELEPHONE 1 2	
	A refrigerator?	REFRIGERATOR 1 2	
	A bed?	BED 1 2	
	A Chair?	CHAIR 1 2	
	A Table?	TABLE 1 2	
	A Cupboard?	CUPBOARD 1 2	
	A Sofa?	SOFA 1 2	
	A Clock?	CLOCK 1 2	
	A fan?	FAN 1 2	
	A sewing machine?	SEWING MACHINE 1 2	
	A Cassette player?	CASSETTE PLAYER 1 2	
	A plough?	PLOUGH 1 2	
	A grain grinder?	GRAIN GRINDER 1 2	
	A VCR/DVD?	VCR/DVD 1 2	
	A tractor?	TRACTOR 1 2	
	A Hammer mill?	HAMMER MILL 1 2	
	A computer?	COMPUTER 1 2	
	Internet?	INTERNET 1 2	
	A Microwave?	MICROWAVE 1 2	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
111	What type of fuel does your household mainly use for cooking?	ELECTRICITY ..... 01 SOLAR POWER ..... 02 LIQUID PROPANE GAS (LPG) ..... 03 NATURAL GAS ..... 04 BIOGAS ..... 05 KEROSENE ..... 06 COAL, LIGNITE ..... 07 CHARCOAL ..... 08 WOOD ..... 09 STRAW/SHRUBS/GRASS ..... 10 AGRICULTURAL CROP ..... 11 ANIMAL DUNG ..... 12 NO FOOD COOKED IN HOUSEHOLD ..... 95 OTHER _____ 96 (SPECIFY)	→ 114
112	Is the cooking usually done in the house, in a separate building, or outdoors?	IN THE HOUSE ..... 1 IN A SEPARATE BUILDING ..... 2 OUTDOORS ..... 3 OTHER _____ 6 (SPECIFY)	→ 114
113	Do you have a separate room which is used as a kitchen?	YES ..... 1 NO 2	
114	MAIN MATERIAL OF THE FLOOR. RECORD OBSERVATION.	NATURAL FLOOR EARTH/SAND ..... 11 DUNG ..... 12 RUDIMENTARY FLOOR WOOD PLANKS ..... 21 PALM/BAMBOO/LEEDS ..... 22 FINISHED FLOOR PARQUET OR POLISHED WOOD ..... 31 VINYL (PVC) OR ASPHALT STRIPS . 32 CERAMIC/TERRAZZO TILES ..... 33 CONCRETE CEMENT ..... 34 CARPET ..... 35 OTHER _____ 96 (SPECIFY)	

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
115	MAIN MATERIAL OF THE ROOF. RECORD OBSERVATION.	NATURAL ROOFING NO ROOF ..... 11 THATCH/PALM LEAF ..... 12 RUDIMENTARY ROOFING RUSTIC MAT ..... 21 PALM/BAMBOO ..... 22 WOOD PLANKS ..... 23 CARDBOARD ..... 24 FINISHED ROOFING METAL/IRON SHEETS ..... 31 WOOD ..... 32 CALAMINE/CEMENT FIBRE (ASBESTOS) ..... 33 CERAMIC TILES/HARVEY TILES ... 34 CEMENT ..... 35 ROOFING SHINGLES ..... 36 MUD TILES ..... 37 OTHER _____ 96 (SPECIFY)	
116	MAIN MATERIAL OF THE EXTERIOR WALLS. RECORD OBSERVATION.	NATURAL WALLS NO WALLS ..... 11 CANE/PALM/TRUNKS ..... 12 MUD ..... 13 RUDIMENTARY WALLS BAMBOO/POLE WITH MUD ..... 21 STONE WITH MUD ..... 22 PLYWOOD ..... 23 CARDBOARD ..... 24 REUSED WOOD ..... 25 FINISHED WALLS CEMENT ..... 31 STONE WITH LIME/CEMENT ..... 32 BRICKS ..... 33 CEMENT BLOCKS ..... 34 WOOD PLANKS ..... 35 OTHER _____ 96 (SPECIFY)	
117	How many rooms in this household are used for sleeping?	ROOMS ..... [ ][ ]	
118	Does any member of this household own: A watch? A bicycle? A motorcycle or motor scooter? An animal-drawn cart? A car or truck? A boat with a motor? A banana boat?	YES NO WATCH ..... 1 2 BICYCLE ..... 1 2 MOTORCYCLE/SCOOTER ... 1 2 ANIMAL-DRAWN CART ..... 1 2 CAR/TRUCK ..... 1 2 BOAT WITH MOTOR ..... 1 2 BANANA BOAT 1 2	
119	Does any member of this household own any agricultural land?	YES ..... 1 NO 2	→ 121

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
120	How much lima, acres, or hectares of agricultural land do members of this household own?	LIMA . . . . . 1 ☐☐.☐ ACRES . . . . . 2 ☐☐.☐ HECTARES . . . . . 3 ☐☐.☐ 95 OR MORE HECTARES . . . . . 995 DON'T KNOW 998	
121	Does this household own any livestock, herds, other farm animals, or poultry?	YES . . . . . 1 NO 2	→ 123
122	How many of the following animals does this household own? IF NONE, ENTER '00'. IF MORE THAN 95, ENTER '95'. IF UNKNOWN, ENTER '98'.		
	Traditional cattle?	TRADITIONAL CATTLE . . . . . ☐☐	
	Dairy cattle?	DAIRY . . . . . ☐☐	
	Beef cattle?	BEEF . . . . . ☐☐	
	Horses, donkeys, or mules?	HORSES/DONKEYS/MULES . . . ☐☐	
	Goats?	GOATS . . . . . ☐☐	
	Sheep?	SHEEP . . . . . ☐☐	
	Pigs?	PIGS . . . . . ☐☐	
	Chickens?	CHICKENS . . . . . ☐☐	
	Rabbits/Other Poultry?	RABBITS/OTHER POULTRY . . . ☐☐	
	Other Livestock?	OTHER LIVESTOCK . . . . . ☐☐	
123	Does any member of this household have a bank account?	YES . . . . . 1 NO 2	
124	At any time in the past 12 months, has anyone come into your dwelling to spray the interior walls against mosquitoes?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 126
125	Who sprayed the dwelling?	GOVERNMENT WORKER/PROGRA . . . . . A PRIVATE COMPANY . . . . . B NON GOVERNMENTAL ORGANISATION (NGO) . . . . . C OTHER _____ (SPECIFY) X DON'T KNOW . . . . . Y	
126	Does your household have any mosquito nets that can be used while sleeping?	YES . . . . . 1 NO 2	→ 136
127	How many mosquito nets does your household have? IF 7 OR MORE NETS, RECORD '7'.	NUMBER OF NETS . . . . . ☐	

		NET #1	NET #2	NET #3
128	ASK THE RESPONDENT TO SHOW YOU ALL THE NETS IN THE HOUSEHOLD IF MORE THAN 3 NETS, USE ADDITIONAL QUESTIONNAIRE(S).	OBSERVED ..... 1 NOT OBSERVED ... 2	OBSERVED ..... 1 NOT OBSERVED ... 2	OBSERVED ..... 1 NOT OBSERVED ... 2
129	How many months ago did your household get the mosquito net? IF LESS THAN ONE MONTH AGO, RECORD '00'.	MONTHS AGO ... [ ][ ] MORE THAN 36 MONTHS AGO ... 95 NOT SURE 98	MONTHS AGO ... [ ][ ] MORE THAN 36 MONTHS AGO ... 95 NOT SURE 98	MONTHS AGO ... [ ][ ] MORE THAN 36 MONTHS AGO ... 95 NOT SURE 98
130	OBSERVE OR ASK THE BRAND/ TYPE OF MOSQUITO NET. IF BRAND IS UNKNOWN AND YOU CANNOT OBSERVE THE NET, SHOW PICTURES OF TYPICAL NET TYPES/BRANDS TO RESPONDENT.	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PermaNET ..... 11 OLICET ..... 12 OTHER/ DK BRAND ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PermaNET ..... 11 OLICET ..... 12 OTHER/ DK BRAND ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98	LONG-LASTING INSECTICIDE-TREATED NET (LLIN) PermaNET ..... 11 OLICET ..... 12 OTHER/ DK BRAND ... 16 (SKIP TO 133) OTHER BRAND ... 96 DK BRAND 98
131	Since you got the net, was it ever soaked or dipped in a liquid to kill or repel mosquitoes?	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 133) NOT SURE 8
132	How many months ago was the net last soaked or dipped? IF LESS THAN ONE MONTH AGO, RECORD '00'.	MONTHS AGO ... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98	MONTHS AGO ... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98	MONTHS AGO ... [ ][ ] MORE THAN 24 MONTHS AGO ... 95 NOT SURE 98
133	Did anyone sleep under this mosquito net last night?	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8	YES .... 1 NO .... 2 (SKIP TO 135) NOT SURE 8

		NET #1	NET #2	NET #3
134	Who slept under this mosquito net last night? RECORD THE PERSON'S NAME AND LINE NUMBER FROM THE HOUSEHOLD SCHEDULE.	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐
		NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐
		NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐
		NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐
		NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐	NAME____________ LINE NO. ..... ☐☐
135		GO BACK TO 128 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 136.	GO BACK TO 128 FOR NEXT NET; OR, IF NO MORE NETS, GO TO 136.	GO TO 128 IN FIRST COLUMN OF A NEW QUESTIONNAIRE; OR, IF NO MORE NETS, GO TO 136.

136	Please show me where members of your household most often wash their hands.	OBSERVED .... 1 NOT OBSERVED, NOT IN DWELLING/YARD/PLOT .... 2 NOT OBSERVED, NO PERMISSION TO SEE .... 3 NOT OBSERVED, OTHER REASON 4	2, 3, 4 → (SKIP TO 139)
137	OBSERVATION ONLY: OBSERVE PRESENCE OF WATER AT THE PLACE FOR HANDWASHING.	WATER IS AVAILABLE .... 1 WATER IS NOT AVAILABLE 2	
138	OBSERVATION ONLY: OBSERVE PRESENCE OF SOAP, DETERGENT, OR OTHER CLEANSING AGENT.	SOAP OR DETERGENT (BAR, LIQUID, POWDER, PASTE) .... A ASH, MUD, SAND .... B NONE C	
139	ASK RESPONDENT FOR A TEASPOONFUL OF COOKING SALT. TEST SALT FOR IODINE.	IODINE PRESENT .... 1 NO IODINE .... 2 NO SALT IN HOUSEHOLD .... 3 SALT NOT TESTED ______________________ 6 (SPECIFY REASON)	

WEIGHT AND HEIGHT MEASUREMENT FOR CHILDREN AGE 0-5

201	CHECK COLUMN 11 IN HOUSEHOLD SCHEDULE. RECORD THE LINE NUMBER AND NAME FOR ALL ELIGIBLE CHILDREN 0-5 IN QUESTION 202. IF MORE THAN SIX CHILDREN, USE ADDITIONAL QUESTIONNAIRE(S).			
		CHILD 1	CHILD 2	CHILD 3
202	LINE NUMBER FROM COLUMN 11 NAME FROM COLUMN 2	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY MONTH AND YEAR OF BIRTH FROM BIRTH HISTORY AND ASK DAY; IF MOTHER NOT INTERVIEWED, ASK: What is (NAME)'s birth date?	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐
204	CHECK 203: CHILD BORN IN JANUARY 2008 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, GO TO 209)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, GO TO 209)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, GO TO 209)
205	WEIGHT IN KILOGRAMS	KG. ☐☐.☐☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	KG. ☐☐.☐☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	KG. ☐☐.☐☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996
206	HEIGHT IN CENTIMETRES	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996
207	MEASURED LYING DOWN OR STANDING UP?	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3
208	GO BACK TO 203 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF THE NEXT PAGE; IF NO MORE CHILDREN, GO TO 209.			

		CHILD 4	CHILD 5	CHILD 6
202	LINE NUMBER FROM COLUMN 11 NAME FROM COLUMN 2	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____	LINE NUMBER . . . . . ☐☐ NAME _____
203	IF MOTHER INTERVIEWED, COPY MONTH AND YEAR OF BIRTH FROM BIRTH HISTORY AND ASK DAY; IF MOTHER NOT INTERVIEWED, ASK: What is (NAME)'s birth date?	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐	DAY . . . . . ☐☐ MONTH . . . . . ☐☐ YEAR ☐☐☐☐
204	CHECK 203: CHILD BORN IN JANUARY 2008 OR LATER?	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, GO TO 209)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 FOR NEXT CHILD OR, IF NO MORE CHILDREN, GO TO 209)	YES . . . . . 1 NO . . . . . 2 (GO TO 203 IN FIRST COLUMN OF NEW QUESTIONNAIRE; OR, IF NO MORE CHILDREN, GO TO 209)
205	WEIGHT IN KILOGRAMS	KG. ☐☐.☐☐ NOT PRESENT . . . . . 9994 REFUSED . . . . . 9995 OTHER 9996	KG. ☐☐.☐☐ NOT PRESENT . . . . . 9994 REFUSED . . . . . 9995 OTHER 9996	KG. ☐☐.☐☐ NOT PRESENT . . . . . 9994 REFUSED . . . . . 9995 OTHER 9996
206	HEIGHT IN CENTIMETRES	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT . . . 9994 REFUSED . . . . . 9995 OTHER 9996
207	MEASURED LYING DOWN OR STANDING UP?	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3	LYING DOWN . . . . . 1 STANDING UP . . . . . 2 NOT MEASURED 3
208	GO BACK TO 203 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF AN ADDITIONAL QUESTIONNAIRE; IF NO MORE CHILDREN, GO TO 209.			

WEIGHT, HEIGHT, AND HIV TESTING FOR WOMEN AGE 15-49

209	CHECK COLUMN 9 IN HOUSEHOLD SCHEDULE. RECORD THE LINE NUMBER AND NAME FOR ALL ELIGIBLE WOMEN IN 210. IF THERE ARE MORE THAN THREE WOMEN, USE ADDITIONAL QUESTIONNAIRE(S).			
		WOMAN 1	WOMAN 2	WOMAN 3
210	LINE NUMBER FROM COLUMN 9 NAME FROM COLUMN 2	LINE NUMBER ..... ☐☐ NAME _____	LINE NUMBER ..... ☐☐ NAME _____	LINE NUMBER ..... ☐☐ NAME _____
211	WEIGHT IN KILOGRAMS	KG. ☐☐☐.☐☐ NOT PRESENT ..... 99994 REFUSED ..... 99995 OTHER 99996	KG. ☐☐☐.☐☐ NOT PRESENT ..... 99994 REFUSED ..... 99995 OTHER 99996	KG. ☐☐☐.☐☐ NOT PRESENT ..... 99994 REFUSED ..... 99995 OTHER 99996
212	HEIGHT IN CENTIMETRES	CM. ☐☐☐.☐ NOT PRESENT ..... 9994 REFUSED ..... 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT ..... 9994 REFUSED ..... 9995 OTHER 9996	CM. ☐☐☐.☐ NOT PRESENT ..... 9994 REFUSED ..... 9995 OTHER 9996
213	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 220) ↵	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 220) ↵	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 220) ↵
214	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 220) ↵	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 220) ↵	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 220) ↵
215	RECORD LINE NUMBER OF PARENT/OTHER ADULT RESPONSIBLE FOR ADOLESCENT. RECORD '00' IF NOT LISTED.	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐
216	ASK CONSENT FOR DBS COLLECTION FROM PARENT/ OTHER ADULT IDENTIFIED IN 215 RESPONSIBLE FOR NEVER IN UNION WOMEN AGE 15-17.	As part of the survey we also are asking people all over the country to take an HIV test. HIV is the virus that causes AIDS. AIDS is a very serious illness. The HIV test is being done to see how big the AIDS problem is in Zambia. For the HIV test, we need a few drops of blood from a finger. The blood will be collected on a paper card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached so we will not be able to tell you the test results. No one else will be able to know (NAME OF ADOLESCENT)'s test results either. I will provide her with a list of [nearby] facilities offering counselling and testing for HIV. I will also give her a voucher for free services that can be used at any of these facilities. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood on a paper card for the HIV test?		
217	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)

		WOMAN 1	WOMAN 2	WOMAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
218	ASK CONSENT FOR RAPID HIV TEST FROM PARENT/ OTHER ADULT IDENTIFIED IN 215 RESPONSIBLE FOR NEVER IN UNION WOMEN AGE 15-17.	If you want (NAME OF ADOLESCENT)to know her HIV status, I can do a rapid test for her and I can tell her the result. The rapid test is simple and accurate. It takes about 30 minutes. For the HIV test, we need a few (more) drops of blood from a finger. The blood will be from the same finger prick used to collected blood on the card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. I will use two tests to determine the HIV result. I will tell her the result of the tests Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood for the HIV rapid test?		
219	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)
220	ASK CONSENT FOR DBS COLLECTION FROM RESPONDENT	As part of the survey we also are asking people all over the country to take an HIV test. HIV is the virus that causes AIDS. AIDS is a very serious illness. The HIV test is being done to see how big the AIDS problem is in Zambia. For the HIV test, we need a few drops of blood from a finger. The blood will be collected on a paper card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached so we will not be able to tell you the test results. No one else will be able to know your test results either. I will provide you with a list of [nearby] facilities offering counselling and testing for HIV. I will also give you a voucher for free services that can be used at any of these facilities. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood on a paper card for the HIV test?		
221	CIRCLE THE APPROPRIATE CODE, SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)
222	CHECK 219 PARENTAL CONSENT FOR RAPID HIV TEST	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 227)	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 227)	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 227)
223	ASK CONSENT FOR RAPID HIV TEST FROM RESPONDENT	If you want to know your HIV status, I can do a rapid test and I can tell you the result. The rapid test is simple and accurate. It takes about 30 minutes. For the HIV test, we need a few (more) drops of blood from a finger. The blood will be from the same finger prick used to collected blood on the card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. I will use two tests to determine the HIV result. I will tell you the result of the tests right away. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood for the rapid HIV test?		
224	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐

		WOMAN 1	WOMAN 2	WOMAN 3
	NAME FROM COLUMN 2	NAME ______________	NAME ______________	NAME ______________
225	AGE: CHECK COLUMN 7.	15-17 YEARS .... 1 18-49 YEARS .... 2 (GO TO 229)	15-17 YEARS .... 1 18-49 YEARS .... 2 (GO TO 229)	15-17 YEARS .... 1 18-49 YEARS .... 2 (GO TO 229)
226	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 229)	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 229)	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 229)
227	ASK CONSENT FOR ADDITIONAL TESTING FROM PARENT/OTHER ADULT IDENTIFIED IN 215 AS RESPONSIBLE FOR NEVER IN UNION WOMEN AGE 15-17.	We ask you to allow the Ministry of Health to store part of the blood sample on the card at the laboratory for additional tests or research. It is likely that the samples will be used for additional HIV testing in a laboratory. We are not certain about what other additional tests might be done. The blood sample will not have any name or other data attached that could identify (NAME OF ADOLESCENT). You do not have to agree. If you do not want the blood sample stored for additional testing (NAME OF ADOLESCENT) can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
228	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 231)	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 231)	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 231)
229	ASK CONSENT FOR ADDITIONAL TESTING FROM RESPONDENT.	We ask you to allow the Ministry of Health to store part of the blood sample on the card at the laboratory for additional tests or research. It is likely that the samples will be used for additional HIV testing in a laboratory. We are not certain about what other additional tests might be done. The blood sample will not have any name or other data attached that could identify you. You do not have to agree. If you do not want the blood sample stored for additional testing, you can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
230	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 232)	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 232)	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 232)
231	ADDITIONAL TESTS	CHECK 228 AND 230: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.	CHECK 228 AND 230: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.	CHECK 228 AND 230: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.
232	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE TEST(S) FOR WHICH CONSENT HAS BEEN OBTAINED AND PROCEED WITH VCT AND TEST(S			
233	BAR CODE LABEL FOR FILTER PAPER	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.

		WOMAN 1	WOMAN 2	WOMAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
234	RECORD THE RESULT CODE OF THE HOME-BASED HIV TESTING	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 252)	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 252)	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 252)
235	RECORD RESULT OF THE DETERMINE HIV RDT	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6
235A	RECORD RESULT OF THE UNIGOLD HIV RDT	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6
236	CHECK 235 DETERMINE RESULT	CODE 1 ..... 1 (GO TO 237) ANY OTHER CODE 2	CODE 1 ..... 1 (GO TO 237) ANY OTHER CODE 2	CODE 1 ..... 1 (GO TO 237) ANY OTHER CODE 2
236A	CHECK 235A UNIGOLD RESULT	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 252)	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 252)	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 252)
237	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 241)	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 241)	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 241)
238	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 241)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 241)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 241)
239	ASK CONSENT FOR VENOUS BLOOD COLLECTION FROM PARENT/ OTHER ADULT IDENTIFIED IN 215 RESPONSIBLE FOR NEVER IN UNION WOMEN AGE 15-17.	We would like to collect more blood from (NAME OF ADOLESCENT) to do additional testing. The additional tests will see how many CD4 cells (NAME OF ADOLESCENT) has. CD4 cells help a person stay healthy. We will use the same blood in a central laboratory to test for new HIV infections. If you agree, we would like to draw a little bit of blood from (NAME OF ADOLESCENT)'s arm. We will take about a teaspoon of blood. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached to the tests. We will return to the household to tell (NAME OF ADOLESCENT) the CD4 test results. No one else will be able to know (NAME OF ADOLESCENT)'s test results. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood from her arm for the tests?		
240	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 252)

		WOMAN 1	WOMAN 2	WOMAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
241	ASK CONSENT FOR VENOUS BLOOD COLLECTION FROM RESPONDENT	We would like to collect more blood from your to do additional testing. The additional tests will see how many CD4 cells you have. CD4 cells help a person stay healthy. We will use the same blood in a central laboratory to test for new HIV infections. If you agree, we would like to draw a little bit of blood from your arm. We will take about a teaspoon of blood. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached to the tests. We will return to the household to tell you the CD4 test results. No one else will be able to know your test results. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood from your arm for the tests?		
242	CIRCLE THE APPROPRIATE CODE, SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 252)
243	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 247)	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 247)	15-17 YEARS ..... 1 18-49 YEARS ..... 2 (GO TO 247)
244	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 247)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 247)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 247)
245	ASK CONSENT FOR ADDITIONAL TESTING FROM PARENT/OTHER ADULT IDENTIFIED IN 215 AS RESPONSIBLE FOR NEVER IN UNION WOMEN AGE 15-17.	We ask you to allow the Ministry of Health to store part of the blood sample at the laboratory for additional tests or research. We are not certain about what additional tests might be done. The blood sample will not have any name or other data attached that could identify (NAME OF ADOLESCENT). You do not have to agree. If you do not want the blood sample stored for additional testing (NAME OF ADOLESCENT) can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
246	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 249)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 249)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 249)
247	ASK CONSENT FOR ADDITIONAL TESTING FROM RESPONDENT.	We ask you to allow the Ministry of Health to store part of the blood sample at the laboratory for additional tests or research. We are not certain about what additional tests might be done. The blood sample will not have any name or other data attached that could identify you. You do not have to agree. If you do not want the blood sample stored for additional testing, you can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
248	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 250)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 250)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 250)

		WOMAN 1	WOMAN 2	WOMAN 3
	NAME FROM COLUMN 2	NAME ____________	NAME ____________	NAME ____________
249	ADDITIONAL TESTS	CHECK 246 AND 248: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.	CHECK 246 AND 248: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.	CHECK 246 AND 248: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.
250	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE VENOUS BLOOD COLLECTION IF CONSENT HAS BEEN OBTAINED AND PROCEED.			
251	BAR CODE LABEL FOR BLOOD TUBE	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.
251A	RECORD THE DATE OF THE VENOUS BLOOD COLLECTION	DAY .... [ ][ ] MONTH .... [ ][ ] YEAR .... [ ][ ][ ][ ]	DAY .... [ ][ ] MONTH .... [ ][ ] YEAR .... [ ][ ][ ][ ]	DAY .... [ ][ ] MONTH .... [ ][ ] YEAR .... [ ][ ][ ][ ]
251B	RECORD THE TIME OF THE VENOUS BLOOD COLLECTION	HOUR .... [ ][ ] MINUTES .... [ ][ ]	HOUR .... [ ][ ] MINUTES .... [ ][ ]	HOUR .... [ ][ ] MINUTES .... [ ][ ]
252	GO BACK TO 211 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF AN ADDITIONAL QUESTIONNAIRE; IF NO MORE WOMEN, GO TO 253.			

HIV TESTING FOR MEN AGE 15-59

253	CHECK COLUMN 10 IN HOUSEHOLD SCHEDULE. RECORD THE LINE NUMBER AND NAME FOR ALL ELIGIBLE MEN IN 254. IF THERE ARE MORE THAN THREE MEN, USE ADDITIONAL QUESTIONNAIRE(S).			
		MAN 1	MAN 2	MAN 3
254	LINE NUMBER FROM COLUMN 10 NAME FROM COLUMN 2	LINE NUMBER ..... ☐☐ NAME _____	LINE NUMBER ..... ☐☐ NAME _____	LINE NUMBER ☐☐ NAME _____
257	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 264) ↵	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 264) ↵	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 264) ↵
258	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 264) ↵	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 264) ↵	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 264) ↵
259	RECORD LINE NUMBER OF PARENT/OTHER ADULT RESPONSIBLE FOR ADOLESCENT. RECORD '00' IF NOT LISTED.	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐	LINE NUMBER OF PARENT OR OTHER RESPONSIBLE ADULT ☐☐
260	ASK CONSENT FOR DBS COLLECTION FROM PARENT/ OTHER ADULT IDENTIFIED IN 259 RESPONSIBLE FOR NEVER IN UNION MEN AGE 15-17.	As part of the survey we also are asking people all over the country to take an HIV test. HIV is the virus that causes AIDS. AIDS is a very serious illness. The HIV test is being done to see how big the AIDS problem is in Zambia. For the HIV test, we need a few drops of blood from a finger. The blood will be collected on a paper card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached so we will not be able to tell you the test results. No one else will be able to know (NAME OF ADOLESCENT)'s test results either. I will provide him with a list of [nearby] facilities offering counselling and testing for HIV. I will also give him a voucher for free services that can be used at any of these facilities. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood on a paper card for the HIV test?		
261	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)

		MAN 1	MAN 2	MAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
262	ASK CONSENT FOR RAPID HIV TEST FROM PARENT/ OTHER ADULT IDENTIFIED IN 259 RESPONSIBLE FOR NEVER IN UNION MEN AGE 15-17.	If you want (NAME OF ADOLESCENT)to know his HIV status, I can do a rapid test for him and I can tell him the result. The rapid test is simple and accurate. It takes about 30 minutes. For the HIV test, we need a few (more) drops of blood from a finger. The blood will be from the same finger prick used to collected blood on the card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. I will use two tests to determine the HIV result. I will tell him the result of the tests Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood for the HIV rapid test?		
263	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN)
264	ASK CONSENT FOR DBS COLLECTION FROM RESPONDENT	As part of the survey we also are asking people all over the country to take an HIV test. HIV is the virus that causes AIDS. AIDS is a very serious illness. The HIV test is being done to see how big the AIDS problem is in Zambia. For the HIV test, we need a few drops of blood from a finger. The blood will be collected on a paper card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached so we will not be able to tell you the test results. No one else will be able to know your test results either. I will provide you with a list of [nearby] facilities offering counselling and testing for HIV. I will also give you a voucher for free services that can be used at any of these facilities. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood on a paper card for the HIV test?		
265	CIRCLE THE APPROPRIATE CODE, SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)
266	CHECK 263 PARENTAL CONSENT FOR RAPID HIV TEST	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 271)	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 271)	CODE 1 OR BLANK ..... 1 CODE 2 ..... 2 (GO TO 271)
267	ASK CONSENT FOR RAPID HIV TEST FROM RESPONDENT	If you want to know your HIV status, I can do a rapid test and I can tell you the result. The rapid test is simple and accurate. It takes about 30 minutes. For the HIV test, we need a few (more) drops of blood from a finger. The blood will be from the same finger prick used to collected blood on the card. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. I will use two tests to determine the HIV result. I will tell you the result of the tests right away. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood for the rapid HIV test?		
268	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐

		MAN 1	MAN 2	MAN 3
	NAME FROM COLUMN 2	NAME ______________	NAME ______________	NAME ______________
269	AGE: CHECK COLUMN 7.	15-17 YEARS .... 1 18-59 YEARS .... 2 (GO TO 273)	15-17 YEARS .... 1 18-59 YEARS .... 2 (GO TO 273)	15-17 YEARS .... 1 18-59 YEARS .... 2 (GO TO 273)
270	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 273)	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 273)	CODE 5 (NEVER MARRIED) ... 1 OTHER .... 2 (GO TO 273)
271	ASK CONSENT FOR ADDITIONAL TESTING FROM PARENT/OTHER ADULT IDENTIFIED IN 259 AS RESPONSIBLE FOR NEVER IN UNION MEN AGE 15-17.	We ask you to allow the Ministry of Health to store part of the blood sample on the card at the laboratory for additional tests or research. It is likely that the samples will be used for additional HIV testing in a laboratory. We are not certain about what other additional tests might be done. The blood sample will not have any name or other data attached that could identify (NAME OF ADOLESCENT). You do not have to agree. If you do not want the blood sample stored for additional testing (NAME OF ADOLESCENT) can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
272	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 275)	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 275)	GRANTED .... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED .... 2 ______________ (SIGN) (IF REFUSED, GO TO 275)
273	ASK CONSENT FOR ADDITIONAL TESTING FROM RESPONDENT.	We ask you to allow the Ministry of Health to store part of the blood sample on the card at the laboratory for additional tests or research. It is likely that the samples will be used for additional HIV testing in a laboratory. We are not certain about what other additional tests might be done. The blood sample will not have any name or other data attached that could identify you. You do not have to agree. If you do not want the blood sample stored for additional testing, you can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
274	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 276)	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 276)	GRANTED .... 1 RESPONDENT REFUSED ...... 2 ______________ (SIGN) (IF GRANTED, GO TO 276)
275	ADDITIONAL TESTS	CHECK 272 AND 274: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.	CHECK 272 AND 274: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.	CHECK 272 AND 274: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE FILTER PAPER.
276	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE TEST(S) FOR WHICH CONSENT HAS BEEN OBTAINED AND PROCEED WITH VCT AND TEST(S			
277	BAR CODE LABEL FOR FILTER PAPER	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.	PUT THE 1ST BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 2ND BAR CODE LABEL ON THE RESPONDENT'S FILTER PAPER AND THE 3RD ON THE TRANSMITTAL FORM.

		MAN 1	MAN 2	MAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
278	RECORD THE RESULT CODE OF THE HOME-BASED HIV TESTING	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 296)	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 296)	TESTED ..... 1 NOT PRESENT ..... 2 PARENT REFUSED ..... 3 RESPONDENT REFUSED .... 4 OTHER ..... 6 (GO TO 296)
279	RECORD RESULT OF THE DETERMINE HIV RDT	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6	DETERMINE REACTIVE ..... 1 DETERMINE NON-REACTIVE ... 2 INVALID ..... 3 OTHER 6
279A	RECORD RESULT OF THE UNIGOLD HIV RDT	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6	UNIGOLD REACTIVE ..... 1 UNIGOLD NON-REACTIVE ..... 2 INVALID ..... 3 OTHER 6
280	CHECK 279 DETERMINE RESULT	CODE 1 ..... 1 (GO TO 281) ANY OTHER CODE 2	CODE 1 ..... 1 (GO TO 281) ANY OTHER CODE 2	CODE 1 ..... 1 (GO TO 281) ANY OTHER CODE 2
280A	CHECK 279A UNIGOLD RESULT	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 296)	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 296)	CODE 1 ..... 1 ANY OTHER CODE ..... 2 (GO TO 296)
281	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 285)	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 285)	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 285)
282	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 285)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 285)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 285)
283	ASK CONSENT FOR VENOUS BLOOD COLLECTION FROM PARENT/ OTHER ADULT IDENTIFIED IN 259 RESPONSIBLE FOR NEVER IN UNION MEN AGE 15-17.	We would like to collect more blood from (NAME OF ADOLESCENT) to do additional testing. The additional tests will see how many CD4 cells (NAME OF ADOLESCENT) has. CD4 cells help a person stay healthy. We will use the same blood in a central laboratory to test for new HIV infections. If you agree, we would like to draw a little bit of blood from (NAME OF ADOLESCENT)'s arm. We will take about a teaspoon of blood. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached to the tests. We will return to the household to tell (NAME OF ADOLESCENT) the CD4 test results. No one else will be able to know (NAME OF ADOLESCENT)'s test results. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you allow (NAME OF ADOLESCENT) to give blood from his arm for the tests?		
284	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 296)

		MAN 1	MAN 2	MAN 3
	NAME FROM COLUMN 2	NAME _____	NAME _____	NAME _____
285	ASK CONSENT FOR VENOUS BLOOD COLLECTION FROM RESPONDENT	We would like to collect more blood from your to do additional testing. The additional tests will see how many CD4 cells you have. CD4 cells help a person stay healthy. We will use the same blood in a central laboratory to test for new HIV infections. If you agree, we would like to draw a little bit of blood from your arm. We will take about a teaspoon of blood. The equipment used to take the blood is clean and completely safe. It has never been used before and will be thrown away after each test. No names will be attached to the tests. We will return to the household to tell you the CD4 test results. No one else will be able to know your test results. Do you have any questions? You can say yes to the test, or you can say no. It is up to you to decide. Will you give blood from your arm for the tests?		
286	CIRCLE THE APPROPRIATE CODE, SIGN YOUR NAME, AND ENTER YOUR INTERVIEWER NUMBER.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) ☐☐☐ (IF REFUSED, GO TO 296)
287	AGE: CHECK COLUMN 7.	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 291)	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 291)	15-17 YEARS ..... 1 18-59 YEARS ..... 2 (GO TO 291)
288	MARITAL STATUS: CHECK COLUMN 8.	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 291)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 291)	CODE 5 (NEVER MARRIED) ... 1 OTHER ..... 2 (GO TO 291)
289	ASK CONSENT FOR ADDITIONAL TESTING FROM PARENT/OTHER ADULT IDENTIFIED IN 259 AS RESPONSIBLE FOR NEVER IN UNION MEN AGE 15-17.	We ask you to allow the Ministry of Health to store part of the blood sample at the laboratory for additional tests or research. We are not certain about what additional tests might be done. The blood sample will not have any name or other data attached that could identify (NAME OF ADOLESCENT). You do not have to agree. If you do not want the blood sample stored for additional testing (NAME OF ADOLESCENT) can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
290	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 293)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 293)	GRANTED ..... 1 PARENT/OTHER RESPONSIBLE ADULT REFUSED ..... 2 _____ (SIGN) (IF REFUSED, GO TO 293)
291	ASK CONSENT FOR ADDITIONAL TESTING FROM RESPONDENT.	We ask you to allow the Ministry of Health to store part of the blood sample at the laboratory for additional tests or research. We are not certain about what additional tests might be done. The blood sample will not have any name or other data attached that could identify you. You do not have to agree. If you do not want the blood sample stored for additional testing, you can still participate in the HIV testing in this survey. Will you allow us to keep the blood sample stored for additional testing?		
292	CIRCLE THE APPROPRIATE CODE AND SIGN YOUR NAME.	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 294)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 294)	GRANTED ..... 1 RESPONDENT REFUSED ..... 2 _____ (SIGN) (IF GRANTED, GO TO 294)

		MAN 1	MAN 2	MAN 3
	NAME FROM COLUMN 2	NAME ____________	NAME ____________	NAME ____________
293	ADDITIONAL TESTS	CHECK 290 AND 292: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.	CHECK 290 AND 292: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.	CHECK 290 AND 292: IF CONSENT HAS NOT BEEN GRANTED WRITE "NO ADDITIONAL TEST" ON THE TRANSMITTAL FORM.
294	PREPARE EQUIPMENT AND SUPPLIES ONLY FOR THE VENOUS BLOOD COLLECTION IF CONSENT HAS BEEN OBTAINED AND PROCEED.			
295	BAR CODE LABEL FOR BLOOD TUBE	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.	PUT THE 4th BAR CODE LABEL HERE. NOT PRESENT .... 99994 REFUSED .... 99995 OTHER .... 99996 PUT THE 5th BAR CODE LABEL ON THE RESPONDENT'S BLOOD TUBE AND THE 6TH ON THE TRANSMITTAL FORM. PUT THE 7TH LABEL ON THE CD4 RESULT FORM.
295A	RECORD THE DATE OF THE VENOUS BLOOD COLLECTION	DAY .... MONTH .... YEAR	DAY .... MONTH .... YEAR	DAY .... MONTH .... YEAR ....
295B	RECORD THE TIME OF THE VENOUS BLOOD COLLECTION	HOUR .... MINUTES	HOUR .... MINUTES	HOUR .... MINUTES ....
296	GO BACK TO 257 IN NEXT COLUMN OF THIS QUESTIONNAIRE OR IN THE FIRST COLUMN OF AN ADDITIONAL QUESTIONNAIRE; IF NO MORE MEN, END INTERVIEW.			