
# Social Networks, Bargaining Power within Couples, and Maternal Health Care in Tanzania.

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**Abstract**

This thesis focuses on the use of maternal health services and child health in Tanzania. The main focus is on how these issues relate to social networks and bargaining power within couples. These issues are interrelated and are discussed in three essays. The first essay investigates the impact of information externalities in social networks on the use of antenatal services. Particular emphasis is placed on the extent to which the probability of early antenatal check-up and antenatal completion are affected by social networks. Adopting an econometric technique that minimises the problem of omitted variable bias, the analysis suggests that these network effects increase the probability of antenatal care completion by an additional 6 to 35 percent, and may be as high as 59 percent. The study further finds that without adequate control of omitted variables, the network impact would be understated. It is also evident that failure to control for individual and household observable characteristics overstates the impact of networks. Results from the two approaches used in this study confirm that irrespective of the definition of social network, having a high quality contacts increase the probability of utilising maternal health services.

The second essay examines the effect of bargaining power within couples on the probability of delivering in a health facility (public and private), as opposed to a home birth. It further investigates the effect of bargaining on the probability of health care provider choice at childbirth using a multinomial nested logit. Evidence suggests that cooperation within couples in decision-making, female discretion over household resources, and freedom from domestic violence increases the probability of childbirth in a facility, as opposed to home. The study finds that a woman's influence on service use varies if she is better educated than her partner. In addition, while cooperation in household decision and the incidence of domestic violence significantly affect private facility use, female discretion over household resources has a strong effect on public facility choice. Finally, antenatal completion, health knowledge, and maternal specific factors increase the probability of delivering in a public and private facility.

The third essay empirically explores the contribution of intra-household bargaining, to the rural-urban gap in child nutrition. The study analyses the effect of parental bargaining indicators (cooperation in household decisions, the incidence domestic violence and discretion over household resources) on the probability of child stunting in both rural and urban areas. The essay contributes to the literature by demonstrating empirically that differences in intra-

household bargaining increase the rural-urban gap in child health. It further contributes to the literature by correcting for possible sample selection bias. The results suggest that the significant effects of household bargaining indicators on child stunting in Tanzania are mainly from the rural and not the urban population. It provides evidence that weak bargaining power within couples in rural areas account for 5 percent of the rural-urban gap in child nutrition. The contribution reduces to 4 percent after correcting for sample selection bias. The results also suggest that failure to adequately correct for selection bias leads to a substantial underestimation of the overall rural-urban gap in child nutrition by 11 percent.

## Declaration

I declare that this thesis is my own work, except where acknowledged in the text. I further declare that this thesis has not been submitted for a degree at any other University

Candidate ……

Date …….

**Dedication**

To

Soulange and Reagan

**Acknowledgements**

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Any errors remain entirely mine. The acknowledged persons bear no responsibility for the deficiencies contained herein.

## List of Abbreviations

| | |
|---|---|
| AERC | African Economic Research Consortium |
| BFHI | Baby Friendly Hospital Initiative |
| CEDAW | Convention on the Elimination of all forms of Discrimination against Women |
| CHF | Community Health Fund |
| CPP | Collaborative PhD Programme |
| DHS | Demographic and Health Survey |
| EPI | Expanded Programme Immunisation |
| GDP | Gross Domestic Product |
| GSMI | Global Safe Motherhood Initiative |
| HAZ | Height-for-age |
| HIV/AIDs | Human Immunodeficiency Virus/Acquired Immune Deficiency syndrome |
| HSR | Health Sector Reforms |
| HSSP | Health Sector Support Program |
| IIA | Independence of Irrelevant Alternative |
| IMCI | Integrated Management of Childhood Illness |
| IMR | Inverse Mills Ratio |
| LGAs | Local Government Authorities |
| LPM | Linear Probability Model |
| MDGs | Millennium Development Goals |
| MNCHP | Maternal New-born and Child Health Partnership |
| MOHSW | Ministry of Health and Social Welfare |
| NBS | National Bureau of Statistics |
| NGO | Non-Governmental Organisation |
| NHIF | National Health Insurance Fund |
| OLS | Ordinary Least Square |

| | |
|---|---|
| PCA | Principal Component Analysis |
| PHSDP | Primary Health Service Development Program |
| RCHS | Reproductive and Child Health Section |
| SMI | Safe Motherhood Initiative |
| SSA | Sub-Saharan Africa |
| TDHS | Tanzanian Demographic and Health Survey |
| TBAs | Traditional Birth Attendants |
| TV | Television |
| UN | United Nations |
| UNDP | United Nations Development Programme |
| UNFPA | United Nations Fund for Population Activities |
| UNICEF | United Nations International Children's Emergency Fund |
| WHO | World Health Organisation |

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# Chapter 1

## Background and Motivation of the Study

*"Good health of women and children has a universally acknowledged intrinsic value and is a basic human right. Healthy women and children also contribute to economic growth. For every dollar spent on key interventions for reproductive, maternal, new-born and child health, about US$20 in benefits could be generated. The economic case should inform priorities and resource allocation decisions in women and children's health, alongside arguments based on human rights and the intrinsic value of good health" (Partnership for Maternal New-born and Child Health, 2013).*

### 1.1 Introduction

Globally, most governments and development agencies recognise the critical importance for utilising reproductive health services in developing countries, and health care interventions in recent decades have increasingly given priority to reproductive related health issues (Haaga *et al,* 1997; Reproductive, 2004; Kerber *et al.,* 2007). The popularity of reproductive health care as a policy issue stems from its inherent ability to improve maternal and child health outcomes, especially reducing maternal and infant mortality (Granovetter, 1985; Overbosch *et al.*, 2004). It has been shown that the use of maternal health services is an important instrument to counter the risk and vulnerability associated with maternal and infant health (Campbell & Graham, 2006; Gross *et al.,* 2012; Kamal, 2009; Overbosch *et al.,* 2004; Reynolds *et al.,* 2006). For example, it has been shown that over 50 percent of all neonatal mortality between 1995 and 2003 in developing countries emanated from home delivery when trained health professionals were not present (Lawn *et al.,* 2005; Lawn *et al.,* 2006).

Arguably, health outcomes are potential determinants of individual or household wellbeing as well as macroeconomic growth (Luke & Munshi, 2007). For instance, child health status is associated with child growth, skill development and future productivity; and inequality in child health promotes inequality in the adult population in the future (Cravioto & Arrieta, 1986; Zere & McIntyre, 2003a). This suggests to the value of encouraging utilisation of maternal health services to improve maternal and child health, which is essential for household wellbeing and future economic growth (Thomas *et al.,* 1990; Todaro & Smith, 2009). Many of the problems associated with child malnutrition and mortality might be prevented if mothers received proper

antenatal care. The use of maternal health care is especially important in rural areas with poor maternal and child health outcomes. Promoting the use of maternal health services is thus imperative, particularly in rural areas, as it may narrow the rural-urban inequality in child health and rural-urban poverty inequality stemming from differences in skill development and future productivity[1].

In line with this recognition, the government of Tanzania has in the recent decades designed a substantive number of programmes to enhance the utilisation of reproductive health services, most especially maternal and child health care (Mwaikambo, 2010). Some of these programs include the Health Sector Reforms (HSR) and the Health Sector Strategic Plan between 2003 and 2007, the Maternal Newborn and Child Health Partnership (MNCHP), the Primary Health Service Development Program (PHSDP) established in 2007, the Health Sector Support Program (HSSP) III in 2008, and free primary maternal and child health services (Mosha *et al.,* 2006; Mwaikambo, 2010). In addition, health facilities are evenly distributed through the entire economy, with 90 percent of its citizens living within 5 kilometres of a primary health care facility (see Mwaikambo, 2010).

With these enabling interventions, and improvement in the supply of health facilities, one would expect to see an increase in the use of maternal and child health services. Rather, analyses of the micro-data attest to a significant decline in the uptake of maternal health services in Tanzania in the past decade (2000 and 2010). In particular, between 2000 and 2010, the number of pregnant women receiving the required antenatal care visits reduced from 70 to 43 percent, and approximately half of all childbirths between 2005 and 2010 took place at home, of which the majority is not been attended to by a skilled health professional (TDHS, 2010). There is a continued high rural-urban inequality in infant and child nutritional outcomes within this period. Similarly, maternal mortality rates remain significantly high and in 2010, it

[1] It has been over a decade since 189 member states in the world agreed (at the United Nation Submit, 2000) to a set of eight goals to be accomplished by 2015. Important to these was the target to reduce overall under-five mortality by three-quarters. While the world has witnessed a decline in child mortality and improvement in child nutritional status, regional differences remain a point of concern. For example, within the context of child mortality, the Sub-Saharan African (SSA) rates are worse than all other regions of the world (MDGs Report, 2013). While some countries have made substantial progress in Africa and SSA in particular, some have not been able to accomplish this goal. The slow progress can largely be attributed to the prevailing poor child health outcomes in rural relative to urban areas. As the United Nation is at the verge of taking stock of progress made towards these goals, and as member states are delighted with their progress, it is essential to assess how this progress is distributed between different regions and within each member state. Understanding the source of the unequal distribution of this progress within a country is important as it affects decisions made towards enhancing progress and addressing internal inequality in child health.

was 460 per 100,000 (United Nations, 2014). Relative to the rest of world, infant and child mortality rates in Tanzania are still substantively high. With this paradox, namely, intervention programmes against declining service utilisation, this thesis examines the state of maternal health care utilisation and child health in the Tanzanian health care system by focusing on three fundamental areas. These areas include antenatal care utilisation, health care provider choice at delivery, and the rural-urban gap in child health.

Internationally, a growing body of evidence has demonstrated that individual or household resource endowment and community development contribute positively to the use of reproductive health services, as well as maternal and child health outcomes (Celik & Hotchkiss, 2000; Falkingham, 2003; Gabrysch & Campbell, 2009; Mekonnen & Mekonnen, 2003; Nisar & White, 2003). In particular, a number of studies have shown that maternal education, household wealth, and proximity to health facilities are important sources for the utilisation of maternal health services, and in some instances are linked to improvement in child health (Erci, 2003; Matthews *et al.,* 2001; Paredes *et al.,* 2005; Sharma, 2004). Yet another strand of literature has identified positive effects of these factors on child nutrition (Smith *et al.,* 2005; Fotso, 2007), and negative effects on child mortality (Heaton & Forste, 2003; Sastry, 1996; Van de Poel *et al.,* 2007; Van de Poel *et al.,* 2009). Some researchers argue that what limits the ability of most developing countries to achieve their health goals is the enormous rural-urban gap in health outcomes (Fotso, 2007; Harpham, 2009; Lalou & LeGrand, 1997). In addition, information externalities through social interaction (Deri, 2005; Luke & Munshi, 2007; Wallerstein, 1986) and bargaining power between couples (Beegle *et al.,* 2001a; Maitra, 2004; Nikièma *et al.,* 2008) are identified as important factors in promoting the use of health services and child health outcomes.

In the context of resource constraint developing countries, it is difficult to ascertain why take-up of existing health care programmes is very low. In this case, policy-makers in developing countries face a critical challenge in designing new health care policies. For instance, even when reproductive health services are heavily subsidised or made free, take-up in most developing countries is far from universal (Beegle *et al.,* 2001a). Acton (1975a) highlighted that in the absence of user fees, non-monetary factors, such as waiting and travel time, could explain the unequal access to health care. In addition, the utilisation of reproductive health services may be constrained by the non-market environment (Ajakaiye & Mwabu, 2007; Mwabu, 2009a). The non-market environment is characterised by personal and household

characteristics, as well as the information people have about the quality of health services. In line with this, studies have shown that both price and non-price factors are *sine qua non* for health care demand (Bolduc *et al.,* 1996; Dor *et al.,* 1987; Eme Ichoku & Leibbrandt, 2003; Sahn *et al.,* 2003). Following Becker (1996) and Deri (2005)[2], this thesis argues that information externalities through social networks and women's ability to participate (or cooperation) in household decision making process can promote the use of maternal health services and child health outcomes.

The literature on social networks and intra-household bargaining in health economics is, as mentioned above, rather limited but growing. In Sub-Saharan Africa (SSA), unlike other regions, empirical literature on health care utilisation has overlooked the effects of social interaction. In Tanzania, in particular, we are not aware of any study that has examined the health care utilisation effects of social networks and bargaining within couples. While social interaction creates awareness about the availability of these services and health care policies, the level of negotiation within couples may determine the extent to which these services are used. Seemingly, cooperation between couples results in efficient allocation of household resources (Rasul, 2008) and is likely to improve child health as women devote a larger portion of their time and income on children's needs (Gupta, 1996; Kabeer, 1994; Thomas, 1993). Despite these concerns and given that cooperation between couples in Tanzania is more likely in urban than rural households, little is empirically known about the contributions of intra-household bargaining to the rural-urban gap in child health. This thesis sets out to separately investigate these issues and, in the process, contribute to a currently small body of empirical evidence on health care enhancing effects of social networks and bargaining within couples in Tanzania.

[2] According to Becker (1996), women's decision to use reproductive health services occurs within the context of a marriage, a household or a family; and to Deri (2005), networks reduce search costs as it provides information to peer friends about the appropriate health providers and detail information about the functioning of the national health care system and hence the likelihood to promote health care use.

## 1.2 Objectives of the Thesis

The purpose of this thesis is to identify the influence of social networks and intra-household bargaining on maternal health care utilisation and child health outcome. The thesis contributes to the debates on health care utilisation and health outcomes in the Tanzanian health care system by pursuing the following specific objectives:

i. To investigate the effect of social networks on antenatal care utilisation in Tanzania.
ii. To examine the role of bargaining power within couples on health care provider choice at delivery.
iii. To explore the effect and relative contribution of intra-household bargaining to the rural-urban gap in child health.

## 1.3 Data

The data used in this thesis comes from the Tanzania Demographic and Health Survey (TDHS) conducted by the Tanzania National Bureau of Statistics (NBS) and funded by the Tanzanian government in collaboration with other international agencies like World Health Organisation (WHO), United Nations International Children's Emergency Fund (UNICEF); United Nations Fund for Population Activities (UNFPA); and United Nations Development Programme (UNDP). The TDHS is a nationally representative cross-sectional survey. The first TDHS was released in 1992 and subsequent surveys have been conducted after every five years. The surveys are independent, because each is based on a different set of individuals or households (samples). The sample consider numerous, but wide-ranging households over all the 26 regions (Arush, Dar-es-Salaam, Tabora, Shinyanga, Kigoma, Kilimanjaro, Tanga, Manyara, Dodoma, Singida, Mbeya, Iringa, Rukwa, Kagera, Mwanza, Mara, Pwani, Morogoro, Lindi, Mtwara, Ruvuma, Unguja North, Unguja South, Town West, Pemba North and Pemba South) of Tanzania.

The survey is designed to provide a comprehensive picture of reproductive health outcomes, household background characteristics, and general living conditions in the country. While the survey provides an opportunity for a detailed empirical analysis of social networks and bargaining within couples in maternal health care choices, it should be noted that the survey design changed overtime and indicators of household bargaining power were not included in earliest surveys. Although pooling all the TDHS or analysis based on all the TDHS data would have provided richer empirical findings, inconsistencies (no bargaining indicators in earliest

surveys) across the surveys rule out this possibility. Therefore, the 2010 TDHS, as the latest data available at the inception of this thesis, is utilised for all empirical estimations in Chapters Two to Four. The survey was conducted between December 2009 and May 2010, and comprises 10,300 household from all the 26 regions of Tanzania. The survey is limited in that it doesn't provide information on the price as well as the quality of health services provided.

The sample interviewed was selected in two stages. In the first stage, clusters were selected from a list of enumeration areas in the 2002 Population and Housing Census. In the second stage, a complete list of households was selected from all the identified clusters. Households were then systematically selected for participation in the survey. In all the regions, 22 households were selected from each cluster, with the exception of Dar-es-Salaam, where 16 households were selected from each cluster.

## 1.4 An Overview of the Tanzanian Health System

The variety of ethnic groups and the different religions in Tanzania make it a multicultural society. The majority of communities in Tanzania are patriarchal whereby traditional norms, practices, and attitudes are concentrated on male power, with limited legal protection of women (World Bank, 2013a). This section provides a brief overview of the Tanzanian health care system and the maternal and child health status of the population. This overview forms a background that enables the reader to gain a snapshot understanding of the economy, and the health system upon which this thesis is based.

### 1.4.1 The Tanzanian Health Care System

In 1961, the government of Tanzania inherited a health system that was characterised by mainly traditional healers, a few clinics, and missionary health centres (see, Kwesigabo *et al.,* 2012). During this period, the major health care intervention was characterised by the objective of universal access to care, and by 1978, about 90 percent of all Tanzanians lived within 10km of a health facility (Dominicus & Akamatsu, 1989). Within this period, and up to the early 1990s, the government maintained the objective of universal access to care, ensured free access to care in public health facilities and in 1977, actively discouraged, and banned the activities of for-profit private sector (see Tibandebage *et al.,* 2001). However, the worsening economic performance, particularly in the 1980s, that led to fiscal crisis reduced the ability of the health

sector to deliver basic health services to the majority of the population. This adversely affected health outcomes and prompted the need for policy reforms, not only at the macroeconomic policy level, but inclusive of the health sector in the early 1990s (see, Kwesigabo *et al.,* 2012).

In early 1993, the implementation of user fees became a centrepiece of the health sector reform process. This reform was intended to ensure financial sustainability in the health sector and to improve the quality of care. In order to ensure that this policy does not negatively affect the poorest and the vulnerable groups in accessing basic health care, an exemption system was introduced (see Lambert & Sahn, 2002). In response to government policy change, primarily the removal of the ban on private for-profit practice in 1991, the size of the private health sector has increased tremendously over the past decades (see, White *et al*., 2012). Currently, the public and private health sectors are the main components of the Tanzanian health system. Both the public and private health sector comprises of non-for-profit and for-profit entities distributed throughout the country. These health facilities are understaffed and Tanzania has one of the lowest physician density of about 0.1 per 10,000 of the population in the world (World Health Organisation, 2013).

In terms of the distribution of health care facilities, over 70 percent of all the health facilities are publicly owned (see Table 1.1). A large number of the public health facilities are lower-level health centres and dispensaries, which are managed by Local Government Authorities (LGAs). A vast majority of health facilities at the higher level of the health system are privately owned, with 60 percent of all hospitals operated by private for-profit, private non-for-profit (mission hospitals) and parastatal organisations (MOHSW, 2008a). Urban areas have a good network of hospitals and referral facilities, while primary level facilities are predominant in rural areas (Mtei *et al*., 2012).

Table 1.1: Number of health facilities in Tanzania

| Facility Type | Government | Parastatal | Non-for-profit | For-profit | Total |
|---|---|---|---|---|---|
| Hospitals | 95 | 8 | 101 | 36 | 240 |
| Health centers | 434 | 10 | 134 | 55 | 633 |
| Dispensaries | 3,889 | 168 | 625 | 787 | 5,469 |
| Total | 4,418 | 186 | 860 | 878 | 6,342 |
| Percent of total | 70% | 3% | 14% | 14% | 100% |

*Source: Health Management Information System (2012)*

In general, and relative to the size of the population, there has been a persistent and significant decline in the absolute number of health workers in Tanzania. Between 2006 and 2012, there has been a tremendous increase in the number of physicians (over 2,210 generalist and specialist medical practitioners), but this is still low in relation to population growth. In addition, the increase in physicians between 2006 and 2012 favoured the urban population, with over 69 percent of all the medical doctors and 90 percent of all the medical specialists working in urban areas, while rural communities remain severely understaffed. The situation in rural areas is further worsened, as most of those present in the facilities put in fewer hours (Kwesigabo *et al.,* 2012; Manzi *et al.,* 2012). The poor health service delivery in rural areas relative to urban may also be a result of the acute shortage of health workers (MOHSW, 2009; Chomi *et al.,* 2014).

### 1.4.2 Health Care Expenditure and Financing in Tanzania

Internationally, it is argued that whether or not people obtain sufficient health care depends on the manner in which the health system is financed (Carrin *et al,* 2007). In Tanzania, the health care system is financed through a mixture of both public and private mechanisms. While household out-of-pocket payments, medical schemes, and private health insurance are the major sources of private expenditure on health care; general taxes and donor funds are the main sources for public expenditure on health care. In 2004/05, foreign resources contributed 31 percent of total expenditures in health, which increased to 37 percent in the 2008/09 budget year (Health Sector Performance Profile Report, 2009). Within the same period, the share of domestic recurrent expenditure in total health spending declined from 80 percent to 55 percent. Out-of-pocket payment became one of the major sources of health care expenditure between 1995 and 2004. Within this period, out-of-pocket spending accounted for 45 to 52 percent of total health care expenditure, and declined to 32 percent in 2011. Public expenditure on health was 4.4 percent whereas private expenditure was 2.9 percent of Gross Domestic Product (GDP) in 2011. Since 1999, health expenditure as percentage of GDP has been fluctuating continuously. For example, in 2006, total health expenditure was 6.5 percent of GDP. By 2009, it was reduced to 5.6 percent and was increased to 7.3 percent in 2011 (see World Development Indicators, 2013).

Following the Abuja Declaration in 2001[3], there has been an increase spending on health in Tanzania, with over 17 percent of the total budget in 2006 devoted to the health sector. From this period, there has been a steady decline with only 11 percent of the 2011 budget spent on health. Between the period 2011/2012, only 9 percent of the total budget was devoted to health and this figure further declined to 8.5 percent in the period 2012/2013 (Ministry of Finance, 2013). In 2012, public spending on health was $14 per person and private spending was $19 per person amounting to a total health spending of $33 per person per annum (Ministry of Finance, 2013). This amount is far below the required[4]. The out-of-pocket expenditure on health care (exclusive of insurance) has increased from Tshs. 3919 in 2009 to Tshs. 11822 in 2011 (Mtei *et al.,* 2012).

It is important to note that after independence, the Tanzanian health care system was mainly financed by the government. However, the economic crisis in the 1980s severely affected the financing of basic social services including the health sector (Wangwe *et al.,* 1998). The health system was underfunded, resulting in a shortage of medical supplies. This affected the quality and the provision of health care services, especially as the government was the main provider of health care. The very poor and vulnerable groups were severely affected as user fees were introduced and all treatment in both government and private facilities required out-of-pocket payment (Hussein & Mujinja, 1997). In order to avoid exclusion of the poor and the vulnerable groups, and to ensure equity in access to health care in the face of user fees, a public exemption and waiver system and Community Health Fund (CHF) and National Health Insurance Fund (NHIF) were introduced (see Mamdani & Bangser, 2004; (Chomi *et al.,* 2014).

### 1.4.3 Maternal and Child Health Indicators in Tanzania

Infant mortality is one of the major indicators of health for most developing countries. It reflects the effect of economic and social conditions and effectiveness of health systems on the health of mothers and their new-borns (Blaxter, 1981). Table 1.2 provides summary evidence of some of the maternal and child health indicators for Tanzania, Sub-Saharan Africa and the world averages in 2012. Generally, Tanzanian averages are better than Sub-Saharan African averages,

[3] All governments who signed the Abuja Declaration in 2001 committed to spending at least 15% of their total budget on health (see Govender *et al,* 2008).

[4] According to the World Health Organisation (WHO), for better health outcomes, the total health expenditure, both public and private spending per person, should amount to a minimum of $54 per annum (WHO, 2010).

but below global averages. For instance, the under-five mortality rate in Tanzania is 54 per 1,000 compared to 95 per 1,000 for Sub-Saharan Africa and 48 per 1,000 globally. In addition, the infant mortality rate in Tanzania is estimated at 38 per 1,000 live births. This has declined substantially by almost half in the last decade from 71 per 1,000 in 2002 (United Nations, 2013).

Table 1.2: Selected maternal and child health indicators for Tanzania, SSA and the world

| Health Indicators | Tanzania | SSA averages | Global averages |
|---|---|---|---|
| Infant mortality (per 1,000 live births) | 38 | 54 | 35 |
| Under-five mortality (per 1,000 live births) | 54 | 95 | 48 |
| Stunting, moderate and severe (%) | 42 | 40 | 25 |
| Wasting moderate and severe (%) | 5 | 10 | 8 |
| Underweight, moderate and severe (%) | 16 | 33 | 15 |
| Maternal mortality rate (100,000) live births | 410 | 500 | 210 |

*Source: World Health Organisation (2013)*

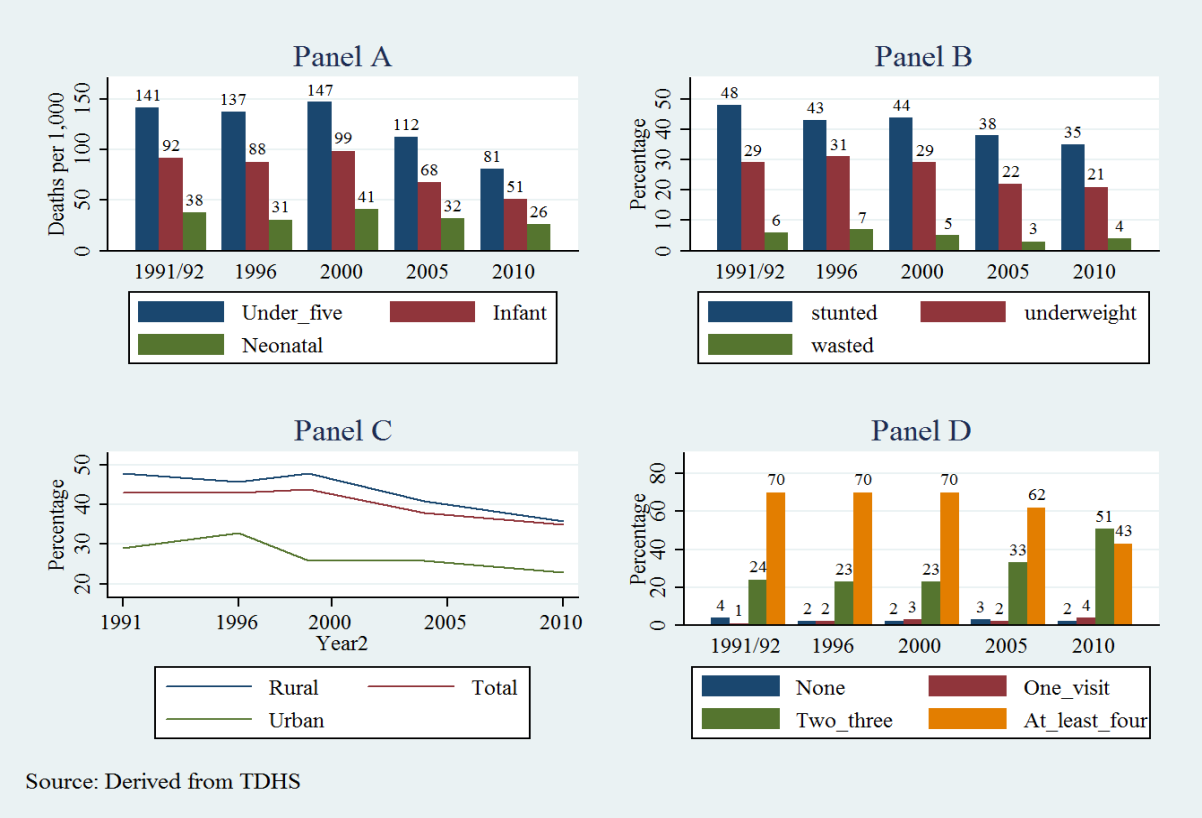
The trends and levels of neonatal, infant, and child mortality between 1992 and 2010 are presented in Panel A of Figure 1.1. The figures confirm to a significant reduction in child mortality outcomes within a decade (2000 and 2010), after the establishment of the Millennium Development Goals (MDGs). In the period before the year 2000, there was an increase in under-five mortality from 137 per 1,000 in 1996 to 147 per 1,000 in 2000. It is partly due to poor maternal and child health outcomes in developing countries that most of the health MDGs mainly focused on maternal, new-born and child health[5]. In Tanzania, and between 2000 and 2010, there has been a significant decline in both infant and under-five mortality of about 48 percent and 45 percent respectively. This may be attributed to government efforts and the post MDGs intervention policies towards child health outcomes. The trend indicates that the government is likely to achieve its 2015 targets of child mortality rate.

The figures in Table 1.2 suggest that in 2012, approximately 42 percent of all under-five children were malnourished (stunted) in Tanzania. This is far above global averages (25 percent), but slightly above SSA averages (40 percent). This confirms the fact that Tanzania is among the top 24 countries with high levels of child malnutrition in the world (World Health Organisation, 2013). The risk of morbidity, mortality and related impaired mental development among children increases with the level of malnutrition (Fawzi *et al.,* 1997; Pelletier *et al.,*

[5] Three of the eight MDGs are health related: reducing under-five mortality by two-third (4.3 percent per annum), improve maternal health by reducing maternal mortality by three-quarter (5.4 percent per annum) and combating diseases such as HIV/AIDS, malaria and others (Wagstaff *et al.,* 2006)

1995). In the context of Tanzania, Panel B of Figure 1.1 illustrates the trend in the various measures of child malnutrition status between 1992 and 2010. The results show consistent decline in the levels of child malnutrition over the period 2000 to 2010. For example, the number of stunted children declined from 44 percent in 2000 to 38 percent in 2005 and to 35 percent in 2010. A similar pattern is observed for underweight, but the prevalence of wasting has remained similar between 2000 and 2010.

Figure 1.1: Trends in child health and antenatal care use




Source: Derived from TDHS

In Panel C of Figure 1.1, the percentage of stunted children is presented by their residential type. Children from rural communities are more likely to be stunted than their counterparts in urban areas. In 2005, the percentage of stunted rural children (41 percent) was remarkably higher than the percent of stunted urban children (26 percent). There is ample evidence that rural children usually have worse nutritional outcomes relative to urban children (Hussain & Lunven, 1987; Ruel, 2000; Von Braun, 1993). It is also argued that the overall nutritional advantage of urban children, especially in developing countries, is likely to be decreasing both in absolute and in relative terms as a result of rural-urban migration (Haddad *et al.,* 1999). In Tanzania, the trend in the rural-urban gap in child malnutrition declined sharply between 2005

and 2010. This suggests an improvement in the nutritional status of rural children when compared to urban children. However, a gap of over 13 percent is still substantially high. Any further policy to ensure better nutritional status for Tanzanian children and to achieve the MDG4 needs a critical assessment of what explains the rural-urban gap in child nutrition.

Antenatal care, when sought early during pregnancy and is continued until delivery, can be more effective in avoiding adverse pregnancy outcomes. The World Health Organisation (WHO) recommends that pregnant women should start antenatal care before the 16$^{th}$ week of gestation, so that their general baseline health can be assessed and monitored regularly and, pregnant women without complications should have at least four antenatal care visits to provide sufficient care (World Health Organisation, 1995). The reason here is that it is possible to detect reproductive health risk factors during these visits. In line with this claim, a number of studies have established that regular and timely antenatal care visits reduce associated risk, educate women, and ensure better pregnancy outcomes (Gross *et al.,* 2012; Overbosch *et al.,* 2004). Consequently, women who initiate antenatal care late and/or have limited number of visits are less likely to deliver in a health facility, as opposed to at home (AbouZahr & Wardlaw, 2003; Bloom *et al.,* 1999; Rockers *et al.,* 2009). It is evident that most maternal and infant deaths resulting from pregnancy complications can be averted with early and frequent antenatal check-up (Campbell & Graham, 2006; Kamal, 2009; Reynolds *et al.,* 2006).

In the context of Tanzania, the trends in the number of antenatal visits over the period are presented in Panel D of Figure 1.1. Although more than nine in every ten pregnant women received at least one antenatal visit before childbirth, the percentage that received at least four antenatal care visits appear to be declining, from 70 percent in 2000 to 43 percent in 2010. In 2010, over 98 percent of all the pregnant women were attended to by a skilled health professional at least once before childbirth. Since the likelihood of detecting reproductive health risk factors increase with the number of visits, more need to be done to ensure antenatal completion. The rationale for up to four antenatal visits is to prevent, alleviate or treat health problems that are known to have an unfavourable outcome on pregnancy. In order to do so, it is important to understand why uptake is low despite numerous government interventions.

## 1.5 Structure of the Thesis

This thesis is divided into five chapters. The first chapter has served as an introduction, establishing the area of focus, research issues and the objectives of the thesis. It has provided an overview of the Tanzanian health care system, the key child health and maternal health care indicators in Tanzania. This chapter has only provides a summary of the issues that are important for understanding the analysis contained in this thesis. The research issues are dealt with in the three subsequent essays that follow in chapter 2, 3, and 4.

The first essay (presented in Chapter 2) investigates the effect of social networks on antenatal care utilisation. This chapter begins with a brief introduction on social networks and demand for health care, followed by a theoretical model on which the analysis in this chapter is built. Subsequently, the econometric technique used to investigate the effect of social networks on antenatal care use is presented. The chapter shows that the prospect of a pregnant woman to fully utilise antenatal care services is positive and significantly associated with the quality of her network membership. It further shows that the effect of social networks is overstated, if personal and household related characteristics are not controlled for; and understated, if omitted variable bias is not accounted for. The analysis in this chapter suggests that social networks increase the probability of antenatal care completion between 6 percent and 35 percent, and at times as high as 59 percent. The results confirm that irrespective of the definition of social networks, having a high quality of network increases the probability of utilising maternal health services.

The second essay (presented in Chapter 3) examines the role of bargaining power within couples on choice of health care provider at childbirth. The level of cooperation in household decision making, female discretion over household wealth, domestic violence, differences in education, and differences in age between spouses, are considered as indicators of bargaining power within couples. This chapter starts with a discussion on parental bargaining and demand for health care, followed by a theoretical model of choice decisions and a description of the empirical model. The decision whether or not to deliver in a health facility, as opposed to home, is empirically examined using a binary logit model; and the provider choice decision is empirically examined with a multinomial nested logit. It shows that cooperation within couples in decision making, female discretion over resources, and freedom from domestic violence increase the probability of childbirth in a facility, as opposed to home. It also shows that while couples' cooperation in decision-making and low incidence of domestic violence strongly raise the probability of using a private facility, female discretion over resources is significant for

public care. Finally, maternal empowerment in terms of education and employment among others, and household wealth significantly increase the probability of facility use, as opposed to home birth.

The third essay (presented in Chapter 4) extends the analysis in Chapters 2 and 3, by exploring the rural-urban gap in child health outcomes, resulting from differences in intra-household bargaining process. First, the chapter analyses the effects of parental bargaining indicators (cooperation in household decisions, domestic violence and discretion over household resources) on the probability of child stunting in both rural and urban areas. Second, it argues that the rural-urban gap in child health can be exacerbated by differences in intra-household bargaining between these areas. After a background review and presentation of a theoretical framework, the rural-urban gap is empirically scrutinised using a detailed Oaxaca-Blinder, Oaxaca decomposition with Heckman, and a non-linear decomposition approach. The results suggest that the significant effects of household bargaining indicators, on child stunting in Tanzania, are mainly from the rural, but not the urban population. It provides evidence that low bargaining power within couples in rural areas account for 5 percent of the rural-urban gap in child nutrition. The results further suggest that failure to adequately correct for selection bias would lead to a substantial underestimation of the overall rural-urban gap in child nutrition by 11 percent (from 0.45 to 0.50). While observable characteristics account for over 62 percent of the gap, the low household wealth in rural communities account for over 32 percent of the gap.

Finally, the results from the preceding chapters are discussed in Chapter 5. Specifically, attention is given to the key issues arising from the analysis. It attempts to provide policy implications on how to improve the utilisation of reproductive health services (particularly maternal health services) and child health in Tanzania. In concluding, the chapter highlights some areas for future research, the limitations of the study, and a summary of the major contributions of the thesis to the body of knowledge.

# Chapter 2

## Social Networks and the Utilisation of Maternal Health Care Services in Tanzania[6]

### 2.1 Introduction

Uncertainty about health outcomes is a key feature that distinguishes the demand for health services from the demand for standard goods and services in consumer theory. It is due to this uncertainty that individuals demand preventive health care to ensure better health outcomes in the future (Chang, 1996; Dardanoni & Wagstaff, 1990; Picone *et al,* 1998; Selden, 1993). Empirical evidence on what hinders or drives the use of maternal health services in both developed and developing countries has been well documented (Gabrysch & Campbell, 2009; Gage, 2007; Kamal, 2009). However, focus has been mainly on household socioeconomic and community level factors. Social interactions between network members facilitate information spill overs and learning, transmit norms and values, and may matter in explaining economic and social outcomes (Banerjee, 1992; Bikhchandani *et al.,* 1992; Bikhchandani *et al.,* 1998).

In the context of health economics, there are numerous channels through which social networks can influence health care seeking behaviour[7]. While social networks have been shown to significantly influence most individual and economic outcomes (Bertrand *et al.,* 2000; Burns *et al.,* 2010; Deri, 2005; Webster *et al.,* 2014), little is known about the maternal health care use effect of social networks. The study by Deri (2005) illustrates the association between social networks and health care utilisation. While this study makes important contribution in this area, the effect of social networks in the care utilisation decision of pregnant women is still relatively unexploited. Similarly, the effect of social networks on health care utilisation in the context of Africa is relatively unexploited. This chapter examines how information externalities through social networks affect women's decision to seek maternal health services. The primary objective of this chapter is to present unique evidence on the effect of social networks on antenatal completion and timing of first antenatal check-up in Tanzania.

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[6] In this chapter, maternal health care and antenatal care will be used interchangeably. Social networks are the fabric of many of our interaction and include the relationships among friends and relatives with whom they share information (information externalities) and favours on regular basis through interaction (social interaction) that reach as far as influencing decision (Jackson *et al*. 2008).

[7] Network reduces search costs as it provides information to peers about the appropriate health care providers and details about the functioning of the national health system. In addition, networks can affect the utilisation of health care services through its effects on desirability of the available care (Deri, 2005).

A number of studies have established that regular and timely antenatal care visits reduce associated risk, educate women, and ensure better pregnancy outcomes (Gross *et al.,* 2012; Overbosch *et al.,* 2004). Consequently, women who initiate antenatal care late and/or have limited number of visits are less likely to deliver in a health facility as opposed to home birth (AbouZahr & Wardlaw, 2003; Bloom *et al.,* 1999; Rockers *et al.,* 2009). For better pregnancy outcomes, the WHO recommends that women with uncomplicated pregnancies should visit or consult with a health professional at least four times before childbirth (WHO, 1994). It is evident that most maternal and infant deaths resulting from pregnancy complications can be averted with early and frequent antenatal check-up (Campbell & Graham, 2006; Kamal, 2009; Reynolds *et al.,* 2006). While researchers have shown how household and community characteristics determine the decision to utilise these services (Duong *et al.,* 2004; Gabrysch & Campbell, 2009; Glei *et al,* 2003), this study argues that information externalities through social networks also matter. Social networks is shown to increase the probability of antenatal care completion between 6 to 35 percent and in some instances, may be as high as 59 percent.

It is only in the recent decades that economists have become interested in examining how information spill over through networks and learning between network members can explain individual choices and economic outcomes. Focus has been mostly in labour market decisions (Burns *et al.,* 2010; Oreopoulos, 2003), education (Sacerdote, 2001; Parker, 2012; Vardardottir, 2013; Chou *et al.*, 2015), welfare participation (Bertrand *et al.,* 2000; Dahl *et al.*, 2014), and health outcomes (House *et al.,* 1988; Fowler and Christakis, 2008; Christakis and Fowler, 2013; Webster *et al.,* 2014; Shakya *et al.*, 2014, 2015) among others[8]. In the context of health care, contacts may provide more information about the importance of care utilisation than just the availability of health care services themselves. In terms of health care, the pioneer work of Deri (2005) identified that health care utilisation among immigrants in Canada increases with the number of doctors that speak their language in their neighbourhoods. However, very little is known about this link in other parts of the world, most especially in SSA. Studying social network effects on health care decisions, especially in the context of developing countries where most people acquire information through informal sources, is imperative.

Arguably, information and norms are the major ways through which individual choices are affected by the behaviour of others. In terms of information, the awareness of an individual

[8] See Case & Katz (1991) who examined the effects of networks on drug use and crime.

depends, to some extent, on the behaviour or how knowledgeable his/her friends or neighbours (contacts) are. With regards to norms, individual preferences may be influenced directly through taste and indirectly through social pressure (Bertrand *et al.,* 2000). In addition, and in the context of health Berkman *et al.* (2000) added that social support, social influence, on social engagement and attachment, and access to resources and material good are primarily the behavioural pathways through which networks operate[9]. In health economics, it has been shown that individuals whose neighbourhoods are healthier are more likely to experience better health outcomes and lower exposure to diseases (Katz *et al.,* 2001; Ludwig *et al.,* 2001). However, not much is known concerning the use of health care services. Yet reliance on networks to utilise health services reduces patient's uncertainty about physician's action, improves patient and physician relationship, may enhance physician royalty, and hence service satisfaction[10]. In the absence of the media and other formal sources of information, it is obvious that the patient's awareness about the availability of modern health services is relative to the quality of his/her contacts. For instance, if one's contacts rely on traditional healers for treatment, the likelihood of being informed about the benefits of modern health services through such contacts reduces, thereby reducing benefits from such contacts.

Within the context of very low and declining levels of antenatal care utilisation in Tanzania (see Panel D of Figure 1.2), understanding the effects of social networks on antenatal care use is arguably critical, especially as it influences the amount of medical care consumed. It is also part of the puzzle that the decline in utilisation of these services in Tanzania does not synchronise with the targets of government policies highlighted in the previous chapter. The media is likely to be one of the major means or formal channels through which information regarding health care policies among others is disseminated to the general public (Sharma *et al.,* 2007). According to the 2010 TDHS, it is rather unfortunate that over 76 percent of the population do not watch television (TV), 30 percent do not listen to radio at all, and 71 percent do not read newspapers. Thus, awareness about the availability of health services and the existing policies towards these services may rely heavily on informal sources. Although attempts have been made to explore the determinants of maternal health care utilisation in

[9] Social support is defined in form of instrumental and financial, informational, appraisal and emotional whereas social influence is define in terms of constraining, norms, peer pressure and social comparison processes.
[10] Interacting with others that have faced similar health related problems in the past, increases patient's awareness and reduces the chances for physician inducement or exploitation in case of free or subsidised health services.

Tanzania[11], a comprehensive explanation of the importance of social networks to the use of health services is lacking. This has been exacerbated by the fact that in Tanzania, most studies on maternal health care use had limited coverage of the health care system. For example, Kowalewski *et al.,* (2002) focused on rural residence, while Gross *et al.,* (2012) on adolescent women. There is, therefore, a huge gap in the literature which must be addressed in order to provide a broader picture of the health care situation in Tanzania.

### 2.2 Theoretical Framework

Two approaches are suggested for the theoretical analysis of health care utilisation (Deb & Trivedi, 1997). The one approach is the traditional consumer theory that looks at health care demand as primarily determined by the patient (Grossman, 1972; Jacobson, 2000; Muurinen, 1982). Estimates on the demand for medical services in this tradition have been established (Cameron *et al.,* 1988; Duan *et al.,* 1983; Wagstaff, 1986), ranging from the effects of income, health insurance and individual characteristics. The other approach is the physician-agent method where the physician determines the amount of health care utilisation on behalf of the patient once they come into contact (Zweifel & Wirtschaftswissenschafter, 1981). Such a method has been analysed empirically and suggests the existence of supplier induced demand for medical services (see Manning *et al.,* 1987; Pohlmeier & Ulrich, 1995).

Based on these theoretical approaches, this chapter uses a standard health care demand model developed from the basic neoclassical theory. The theory states that health care is a composite of myriad goods and services that maintain, improve, or restore a person's physical and mental well-being (Neun & Santerre, 2007). The specification of the model follows the philosophies of Grossman (1972) and Acton (1973). According to Grossman (1972), individuals use medical care and their own time to produce health. The health status of individual $i$ depends on the amount of health care consumed $(hc)$, time (t) and other determinants of health $(z)$[12].

$$H_i = f(hc, t, z) \qquad (2.1)$$

[11] Health care demand studies in the context of Tanzania include (Boller *et al.,* 2003; Gross *et al,* 2012; Kowalewski *et al.,* 2002; Mpembeni *et al.*, 2007; Mrisho *et al.,* 2009; Rockers *et al.,* 2009 Alderman *et al,* 2006; Adhvaryu and Nyshaham, 2010).

[12] The subscript $i$ could as well represent household if the unit of analysis is household.

Health care, therefore, enters an individual or household's utility function directly and indirectly through improvement in health status. This framework serves as a guide in the selection of variables for the analysis of health care utilisation. The analysis of this study is based on the structural demand model by Grossman (1972), and the framework by Andersen & Newman (1973). The relationship between health care utilisation and the utility function is given as:

$$U_i = u\big(X_i, hc_i, H_i(hc, t, z)\big) \tag{2.2}$$

Where $hc_i$ is the amount health care consumed, $X_i$ is a composite of all other goods and services in the individual consumption basket. Equation 2.2 shows that medical care is a source of utility through better health outcomes, and a source of disutility through the resulting side effects (this enters through $hc$) during the consumption of health care (Evan, 1984). Based on this, Acton (1973) assumed that an individual's utility is a function of two goods: medical services, $m$, and a composite $x$, for all other goods and services. To re-iterate, following Acton (1973), a single provider of care and a fixed proportion of money and time to consume $m$ $and$ $x$ is considered. Thus, an individual chooses $m$ $and$ $x$ to maximize utility specified in equation 2.3 below;

$$U_i = u_i(m_i, x_i) \tag{2.3}$$

Subject to a budget constraint in equation 2.4;

$$(p + wt)m + (q + ws)x \leq Y = y + wT \tag{2.4}$$

Where $p$ and $q$ are money prices for $m$ and $x$ respectively, $t$ and $s$ are own time spent in consuming $m$ and $x$, $w$ is earnings per hour, $y$ is non-earned income, $T$ is total amount of time available for market and the production of goods and services, and $Y$ is total income. Given this, the Grossman structural demand for medical care can be derived given by:

$$m_i = f(H_i,\ w_i,\ P,\ t,\ s,\ x,\ Y,\ Z_i) \tag{2.5}$$

Where $H_j$ is the stock of health, and $Z_i$ the individual/household socioeconomic and societal characteristics, which include information spill-over. In line with equation 2.5, Andersen and Newman (1973) outline a framework for health service utilization that takes into consideration societal and individual characteristics.

Societal consideration is mainly about how formal health care services are provided in the society through the health care system. The formal services include the availability and distribution of health care resources, as well as the organization of the health care system. The resources include the total volume of physician care, hospital care, dental care, drugs and other health care practitioners. These are distributed geographically, relative to the population within a country. As the ratio increases, the health services consumed by the population rises and vice versa. However, this study is mainly interested in the individual and household characteristics.

Considering that the health care system is well coordinated to satisfy the entire population of a given locality, the level of health care an individual consumes is dependent on the predisposition to health services, ability to secure the services, and the level of illness. For each of these components, Andersen and Newman (1973) briefly described and suggested variables that can be used to operationalize them. Predisposition components exist prior to the incidents of sickness; they determine the level of health services used, although they are not directly related to health care use. The predisposing components are classified into demographic, social structure, and belief variables. Demographic characteristics include age, sex, and marital status. For instance, individuals in different age cohorts are faced with different types of illnesses and consequently require different patterns of medical care. The social structure comprise of education, occupation, household size, residential type, ethnicity and religion, whereas beliefs include values about health and illness, attitudes towards health services, and health knowledge.

Household attributes and the community in which the household lives can affect the ability of the individual to secure health services. Enabling components are, therefore, classified into both household and community attributes. Household enabling conditions are measured by resource endowments such as wealth, health insurance coverage, or third-party payment, and whether or not the source of care is accessible. The characteristics of the community include the ratio of health facilities and health personnel to population, price of health services and whether or not the individual reside in a rural or urban community. With the predisposing and enabling components, the use of health services occurs when the individual perceives sickness or the probability of sickness. The measures of perceived illness include number of disability days and experienced symptoms of illness. In addition to our social network variable, this framework acts as a guide for selecting other controls both individual and household level factors. Social network is neither an enabling factor nor an illness level factor. This study

argues that it is a predisposing factor and falls under the belief component, since it has to do with knowledge about service availability and its importance.

### 2.3 Why might social networks matter for health care use?

The importance of social networks on individual behaviour has long been documented in the sociological literature. An example is the work of Granovetter (1985), who stresses the inclusion of individual behaviour into social structure. Following the insights from this literature, economists have developed considerable interest in the recent decades, and there is growing evidence of network effects in many areas of economic research. The literature basically points to two channels through which networks operate. The one channel is the information channel which argues on the supply of information on service availability, eligibility and procedure of application, and the other channel is the norm channel that provides peer pressure and alters the use of services.

The effects of social pressure on economic outcomes have been studied both at the micro and macro level. From the micro perspective, most of the research on social networks and economic outcomes relate to labour and public economic outcomes, such as program participation, fertility, crime and education (Bertrand *et al.,* 2000; Burns *et al.,* 2010; Ellison & Fudenberg, 1993, 1995; Glaeser, 1999; Goolsbee & Klenow, 1999; Sacerdote, 2001). At the macro level, economists have shown that human capital spill overs are essential for economic growth and inequality (Benabou, 1996; Durlauf, 1996)

The major challenge in studying the effect of networks is the lack of information on individuals' actual social contacts. In order to deal with this problem, empirical studies assume that individuals mainly interact and learn from geographically close people of the same ethnicity. This is referred to as a potential measure of one's network. Manski (1993, 2000) argued that with this measure, the identified positive correlation between an individual outcome and the average behaviour of their reference group does not provide conclusive evidence of network effects, unless the identification problem is addressed. This identification problem emanates from omitted unobservable characteristics. Based on this argument, Bertrand *et al.* (2000) developed an approach that can be used to circumvent many of the omitted variable biases that plague estimates of network effects. Recent studies then rely on this approach to draw conclusions on the relationship between individual outcomes to the average behaviour of their group.

While the effects of social networks on most individual and economic outcomes have been researched, very little evidence is available on the effect of social networks on the use of health services (Deri, 2005; Devillanova, 2008). This section presents international evidence on the effect of information externalities through social networks on the utilisation of health services. The generalisation of the findings to the Sub-Saharan African context and Tanzania in particular is however still to be determined.

In health economics, there has been much progress in understanding the dimensions through which the supply of health services can be improved, but there is limited evidence on how the utilisation of health care varies across social groups (Luke & Munshi, 2007). However, sociology and public health literature have illustrated how individual and group characteristics influence health seeking behaviour. With regard to community effects, a number of studies have identified a significant difference in health care utilisation across race, ethnicity, religion, and region (Basu, 1990; Burgard, 2002; Stephenson & Tsui, 2002). These differences are attributed to differences in health beliefs, and practices across communities, as well as government policies towards specific social groups.

The pioneering work of Deri (2005) is the first to provide an insight into the effects of social network on health care utilisation decisions. The study explains several ways through which networks can influence the demand for health care. First, it states that networks can disclose detailed information about the functioning of the health care system, and can provide information on appropriate health care providers, thereby reducing search costs. In addition, networks can affect the perceived efficacy or desirability of the available services, and then alter the demand for services. Deri (2005) finds that the utilisation of health services by immigrants in Canada increases with the number of doctors that speak their language in their neighbourhood. The study also finds that the network effects are likely to be underestimated in the presence of omitted variable bias.

Following this conclusion, Devillanova (2008) used a dataset that contains direct indicators of information spill over to study the effect of networks on health care utilisation. Individuals were asked whether or not they were referred to health care opportunities by friends or relatives. With this measure, the identification issues in network effects literature are overcome, and the channel through which networks operate is identified. Devillanova (2008) focuses on the time an immigrant spent before seeking care from a medical professional. The study finds that network effects are stable across alternative specifications. Again, after controlling for

individual characteristics and ethnic heterogeneity, the results show that networks foster health care utilisation, and reliance on a strong social tie reduces the delay to seek care by 30 percent.

The review shows that there is increasing attention to understand the effects of social networks on health care demand. However, there is little evidence to support the role of social interaction on the use of health services in Sub-Saharan Africa. Again, recent studies of network effects focussed on how to handle the hurdles emanating from the potential identification problem. Admittedly, such works have identified numerous ways for quantifying one's actual and potential contacts. In terms of potential contacts, networks have been considered to act through language groups and geography. This study argues that this approach is not applicable in societies such as Tanzania, where language is not a medium of social grouping.

While health economists have made progress in understanding the supply and demand side of the health care market, there is limited emphasis on how utilisation varies across social groups (Luke & Munshi, 2007). Evidence regarding the importance of social networks on individual choices and economic outcomes is further limited as recent literature relies mostly on language and geography as a measure of network size. It is important to note that in a society where language may not be a good measure of network size, information spill over through other forms of social groupings can still influence individual outcomes. In a society where everyone speaks the same language or with high degree of inter-tribal marriages, ethnic language may not necessarily be a medium for socialisation, and hence language may not be an effective measure of the quantity of one's network. The high level of inter-tribal marriages in Tanzania, and the fact that one of its official language – (Swahili) has dominated and displaced many tribal languages, makes the use of languages as a measure of quantity of one's contacts difficult and inappropriate. This study argues that in such a scenario, and in the context of maternal health care utilisation, female's age-marital status or her age-fertility cohorts and geography can provide more appropriate measures of the quantity of her networks.

This is because it has been shown that women are more likely to associate with other women of the same marital status cohort (D'Abate, 1994; Lin & Westcott, 1991; Rands, 1988a). In order to strengthen a couple's new combined network, the couple selectively dissolves former relationships (D'Abate, 1994; Lin & Westcott, 1991; Rands, 1988a). In the context of developing countries, especially in Africa, networks of couples during marriage are based on ties with other couples or with the husband's network. The wife's friendships in her single days

rarely develop into a relationship with both partners or are maintained during marriage (Albeck & Kaydar, 2002a; Lin & Westcott, 1991; Rands, 1988a).

The social bridges that exist during marriage collapses in periods of divorce. Women, in particular lose a significant percentage of the network of shared friends (Duffy, 1993; Wilcox, 1986). Again, in periods of divorce, women's constellation of friendships may collapse entirely within a very short time (Duffy, 1993; Rands, 1988a). The damage of her social network is extensive if she depended heavily on her husband's network (Daniels-Mohring & Berger, 1984; Gerstel *et al.,* 1985; Wallerstein, 1986). Even the friends she had before and during the marriage may dissolve due to conflict of loyalty (Rands, 1988a), social norms that project negative attitudes towards divorced women, and the absence of recognised social behavioural codes towards divorced (D'Abate, 1994; Gerstel, 1987; Wiseman, 1975).

Finally, the social status of married women depends on their husbands' status. The social activity of married women differ considerably from unmarried and divorced women, but fits better with the activity of other married women (Albeck & Kaydar, 2002a; Duffy, 1993). Given this argument, and the fact that all women in our analysis have given birth, a woman's age-marital status cohort is used as a possible measure for quantity of contacts. To further explore other possible ways of social cohesion between women, age-fertility cohort is also considered. Quantity of networks and quantity of contacts are used interchangeably.

### 2.4. Empirical Strategy

The empirical analysis adopts Bertrand *et al.'s* (2000) methodological approach. The probability that a pregnant woman completed the required number of antenatal care visits and/or initiated antenatal care early is represented as:

$$Pr(Use_{ijk}) = Netw_{ijk}\alpha^* + X_i^*\beta^* + Y_j^*\delta^* + Z_k^*\tau^* + \varepsilon_{ijk} \qquad (2.6)$$

Where $i$ represents individuals, $j$ represents geography (clusters), and $k$ is age-fertility cohort. $Use_{ijk}$ is a dummy variable equal to one, if the individual woman utilised the required number of antenatal visits, and zero otherwise. $Netw_{ijk}$ is a measure of information the pregnant woman receives from her female contacts; $X$ is a set of observed and unobserved individual and household characteristics; $Y$ is a set of observed and unobserved characteristics from her locality (for instance, urban areas may have abundant health care facilities that increase accessibility and may increase the probability of health services utilisation); and $Z$ is a set of observed and unobserved age-marital status or age-fertility cohort characteristics.

Several empirical studies have shown that individual outcomes are directly associated with friends, neighbours and ethnic group outcomes. Before the identification of the `reflection problem[13]' by Manski (1993), the average neighbourhood outcome was the basis for measuring social network (see Jencks & Mayer, 1990). Bertrand *et al.* (2000) developed a methodological approach for handling such hurdles. Social network studies in the recent periods have made use of this approach (Burns *et al.,* 2010; Deri, 2005). This study adopts this methodological approach to identify the effects of social network to antenatal care utilisation in Tanzania. The estimation of this model is difficult given that actual information concerning individual's contacts and the extent of her network hardly exist in many datasets.

In the recent literature, Bertrand *et al.* (2000) and Deri (2005) used language while Burns *et al.* (2010) used age-language cohort as a way of defining social networks. The idea is that speaking a mutual language is an essential channel for information externalities and individuals around the same age cohort in a given geographic area are more likely to spend time together and obtain information from each other. However, as highlighted earlier, this study argues that in Tanzania, language may not be a good measure for network quantity as one of its official languages (Swahili) along with the degree of inter-tribal marriages have dominated and displaced most ethnic languages (Legère, 1992; Mekacha *et al.,* 1993; Yoneda, 2010).

Nevertheless, it is evident that social networks equally can be categorised in the dimensions of race, ethnicity, age, and religion (Albeck & Kaydar, 2002a; Lin, 2004; Waldinger, 1996). Consequently, Arai (2007) showed that beside relatives, other forms of socialisation are important determinants of fertility. High fertility enhances experience about the available and important use of reproductive health services and can be viewed as a source of information spill over about the importance of these services to pregnant women. The analysis in this chapter follows Bertrand *et al.*'s (2000) methodological approach, but proposes some new plausible measure for the size of network[14].

[13] Manski (1993) highlighted that causal statements between social networks and individual outcomes cannot be established due to two related omitted variable biases. First, omitted individual characteristics could be correlated with average group outcome. For instance, individuals residing where the incidence of care use is low may be less motivated to demand care services. Second, omitted neighbourhood characteristics may be correlated with mean incidence of non-user of health services in that locality. For instance, urban areas may have abundant health care facilities that increase accessibility and may increase the probability of health services utilisation. Even if information on actual contacts existed, individuals select their contacts. Individuals with many contacts may be qualitatively different from those with few contacts. Estimates derived in this manner may suffer from omitted variable bias.

[14] Given the peculiarity of language set up in Tanzania and the fact that our data limits the use of other highlighted measures of social network, age-marital status and age-fertility cohort are the most plausible and available

In this chapter, age-marital status and age-fertility cohorts are used as proxies for network size for women of reproductive age within a given cluster. Because there is no information on the number of pregnancies, the number of children ever born is considered as a measure of fertility. The fertility levels are categorised as follows: 0-3 children, 4-6 children, and 7+ children. The age brackets ranges from 15–24, 25-34, 35-44, 45-54, and the span of 9 years in the age bracket and the fertility cohorts are large enough to reduce the bias that may result from social ties (Burns *et al.,* 2010). The age-fertility cohorts consider all the likely age-fertility combinations that may result from these two variables. For age-marital status, women are grouped into the various age groups and into their respective marital status. For example, all women between the age of 15 and 24 who are married and live within a particular cluster are regarded as members of the same network. Such network would be distinct from that of women aged 15 – 24 who are unmarried or divorced but reside in the same area. The number of women in one's locality who are of the same age-marital status or age-fertility cohort measures the quantity of contacts available. Consequently, a woman who resides in an area with more women of her age-marital status or age-fertility category will have a large number of available contacts. The number of women in one's contact group that uses antenatal care services measures the quality of that network. As there is no explicit information about peer network, this network proxy should be viewed as potential rather than actual contacts. In order to minimise biases resulting from omitted variable bias at the geographic area and age-marital status, the area fixed effects as well as age-marital status fixed effects are included in the estimation.

In order to resolve the biases resulting from omitted neighbourhoods and age-marital status or age-fertility cohort characteristics, the study follows Bertrand *et al's* (2000) approach in which the network measure is taken to be the interaction between `quantity' (the number of people in one's cohort) and `quality' (the attitude and knowledge of these people towards the use of antenatal services)[15]. That is, $Netw_{jk} = V_{jk} * \overline{use_k}$ where $V_{jk}$ represents the density of age-marital status or age-fertility group $k$ residing in area $j$ a measure of potential number of contacts available to an individual (quantity)[16], $\overline{use_k}$ is the mean frequency of antenatal care

measures of network in this case. Focus is on age-fertility cohort and use the age-marital status measure as robust check.

[15] See (Bertrand *et al.,* 2000; Deri, 2005; Burns *et al.,* 2010)

[16] Based on Bertrand *et al.* (2000), $V_{jk}$ is the proportion of individuals in area $j$ that are in age-marital status or age-fertility cohort $k$ as a ratio of the proportion of individuals from Tanzania in that group. The available measure for contact is therefore $ln\left(\frac{V_{jk}/A_j}{L_k/T}\right)$, where $V_{jk}$ measures the number of individuals in area $j$ in the age-marital status or age-fertility group $k$; $A_j$ is the number of individuals who reside in area $j$; $L_k$ is the total number of individuals in Tanzania belonging to the same age-marital status or age-fertility group; and $T$ is the total

users from age-marital status or age-fertility group $k$ in the population. This provides a measure of the level of service utilisation in one's network (quality)[17]. The estimated equation is then written as:

$$Pr(use_{ijk}) = (V_{jk} * \overline{use_k})\varphi + X_i\beta + \pi_j + \omega_k + dist_{jk}\theta + reloc_{jk}\delta + V_{jk}\gamma + \mu_{ijk} \qquad (2.7)$$

Where $\pi_j$ and $\omega_k$ are respective fixed effects for geography and age-marital status or age-fertility cohort. Their inclusion captures any unobserved differences between regions, such as availability of health care facilities and age-fertility group effects; $X_i$ is individual and household level characteristics; $dist_{jk}$ is distance to a health care facility (supply side influence); and $reloc_{jk}$ is a relocation variable that indicates whether or not an individual relocated away from her network. To deal with biases resulting from any omitted individual characteristics correlated with $V_{jk}$, the variable $V_{jk}$ is included as an independent variable in the regression. This would appear as an estimate of $\gamma$ which does not affect $\varphi$. Since the age-fertility group fixed effects, $\omega_k$ is included in the equation, the direct effect of $\overline{use_k}$ is therefore excluded. The potential exogenous and endogenous biases are accommodated in equation 2.7[18].

The remaining potential bias may result from the correlation between omitted individual characteristics and the network variable ($V_{jk} * \overline{use_k}$). This arises if people self-select away from their age-fertility cohort. The idea is that individuals living in areas of high density of their age-marital status/age-fertility group are different in some unobserved way from those living in low density areas. Differential selection biases the estimates because leaving from a group with low level of utilisation to a group with high level of service use might increase the care use for that individual and vice versa. However, Bertrand *et al.,* (2000) and Deri, (2005) showed that the network effect cannot be completely explained by differential selection.

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population. It is the case that small groups will have small available contacts even if there is full concentration and the fact that individuals self-segregate could be misleading. Using proportions resolve these problems and prevent the underweighting of small age-marital status or age-fertility groups.

[17] Using the frequency of care use from age-fertility group $k$ in cluster $j$, excluding individual $i$ as a measure of $utilise_{k,}$ introduces bias, since it may reflect the unobserved characteristics this individual has in common with others from the same age-fertility group living in the same cluster. To avoid such biases, the mean care users of the age-fertility group in the entire population is used. Precisely, it is measured as the mean deviation the group's level of care use relative to the mean care use of the entire sample used in the analysis Bertrand *et al.,* (2000)

[18] First, the fixed differences in utilisation resulting from differences in service availability between areas are removed by geography fixed effects. Second, fixed age-fertility or age-marital status group specific differences in utilisation such as differing levels of experience and beliefs are eliminated by age-fertility or age-marital status fixed effects. The omitted reasons for individuals choosing to reside in high/low density area of their age-fertility group are eliminated by the direct effect of the density of age-fertility group in her locality. Finally, distance to health facility in one's locality deals with bias resulting from differences in the supply of health services.

In addition, Burns *et al.* (2010) argued that this might not be a significant source of bias given the high level of aggregation in districts and further proposed the use of a relocation variable. A variable equivalent to whether or not an individual relocated is therefore included to control for the probability of individuals moving away from their network, in the intervening periods. This study employs a Linear Probability Model (LPM) to identify the effects of social network on the probability of completing the required number of antenatal visits and timing of antenatal care. Even though the LPM is well known for heteroscedastic standard errors, the use of the LPM is not entirely problematic, since robust standard errors can commonly be used (Scott Long, 1997). Likewise, the LPM is preferred to the logit or probit models, since the latter suffer computational difficulties in the presence of fixed effects[19] (Bertrand *et al.,* 2000; Burns *et al.,* 2010; Deri, 2005). Furthermore, a logit model is estimated and the estimates are compared to those obtained from the LPM.

### 2.5. Data and Descriptive Statistics

As indicated earlier in the previous chapter, the Tanzanian Demographic and Health Survey data for 2010 is used to empirically examine the effect of social networks on the probability of antenatal care utilisation. In this chapter, the sample is limited to women aged 15–49 years. In order to obtain the social network variable, women are categorised into their respective age-fertility or age-marital status cohort and area of residence. Notably, the entire sample of women is used to construct the contact availability (quantity of contact) variable. The measure of mean utilisation (quality of contacts) by age-fertility or age-marital status cohort is also based on the entire sample. This is because excluding women who did not give birth within the period of the survey, but who had done so before, may underestimate the potential quantity and quality of contacts available to each individual woman. Getting the direct costs (user charge for supplies) for health services is difficult and has made the use of prices in health care demand literature limited (Booysens & Visser, 2005; Brown & Theoharides, 2009; Sahn *et al.*, 2003). However, these limitations do not undermine our analysis.

The empirical analysis is limited only to women who gave birth during the survey period. In constructing the contact availability measure, women are categorised into four age groups, three fertility cohorts and six marital status cohorts. The grouping of individuals into various

[19] Adding fixed effects to any binary outcome model that is based on maximum likelihood estimation induces bias in the coefficient and standard errors (incidental parameter bias). In addition, it is near certainty that any probit incorporating a nontrivial number of fixed effects will produce bias results (Baltagi, 2008). For the use of fixed effects in social sciences, there have been a switch from a standard normal probit to a logit model. The logit fixed effects is not dissimilar to multiple linear regression in that it filters out the fixed effects.

age categories is guided by previous literature on network (see, Burns et al., 2010). 'Maternal health care utilisation,' in this chapter refers to antenatal care utilisation (timing of antenatal care and antenatal completion). Finally, the available sampling weight for these datasets is used to correct for the over and under representation of certain households.

It is surprising that almost all the women attended at least one antenatal visit before childbirth, but less than half of all the women completed the required four visits. It is equally surprising that only 15 percent of all the women went for antenatal care within the first four month of pregnancy (see Table 2.1). As demonstrated in Table 2.1, up to 98 percent of all the women had at least one antenatal visit, while only 43 percent completed the recommended number of visits. The average age of the women in the sample is 36 years.

Table 2.1: Antenatal care utilisation Rates by women 15 – 49 years

| | Percentage |
|---|---|
| At least one antenatal visit | 98 |
| At least four antenatal care visits | 43 |
| Early antenatal care (within first 16 weeks) | 15 |
| Average age of women in the sample (years) | 36 |

*Source: Extracted from TDHS2010 reports*

Table 2.2 reports summary statistics for the sample by antenatal care use,[20] revealing the interesting differences between early antenatal care check-up and antenatal completion. Individuals residing in the southern highlands, the lake, the central and the western zone have a lower percentage of those who attended at least four antenatal visits relative to their share of the sample. In contrast, individuals from the northern, southern and eastern have a higher proportion of those with at least four visits. While the eastern zone records the highest proportion of individuals that completed the number of visits, Zanzibar records the highest number of under users. Individuals in lower wealth quintiles have a higher proportion of those with incomplete antenatal care. The converse holds true for those in the upper wealth quintiles. These results are consistent with the timing of antenatal check-up.

[20] An individual is considered to have completed the required number of antenatal care visits if she indicated to have had at least four visits for every childbirth between 2005 and 2010. An individual is considered to have initiated antenatal care late if her antenatal care visit for every childbirth is not within the first four months of pregnancy. In the regression analysis, we control for number of children ever born to deal with learning.

Table 2.2: Mean statistics for sample by antenatal care visit

| Variables | Obs | All | | At least four visits | | Less than four visits | | Early care check-up | |
|---|---|---|---|---|---|---|---|---|---|
| Household size | 29777 | 7.14 | (4.05) | 6.57 | (3.87) | 7.27* | (4.46) | 6.09 | (3.33) |
| Number of under-five per woman | 29777 | 1.13 | (0.91) | 1.37 | (0.56) | 1.56* | (0.65) | 1.34 | (0.54) |
| Number of children ever born | 29777 | 5.44 | (2.65) | 3.56 | (2.37) | 3.91* | (2.46) | 3.26 | (2.11) |
| First wealth quintile | 5995 | 0.21 | (0.41) | 0.17 | (0.38) | 0.22* | (0.41) | 0.17 | (0.37) |
| Second wealth quintile | 6374 | 0.23 | (0.42) | 0.18 | (0.38) | 0.25* | (0.44) | 0.18 | (0.39) |
| Third Wealth quintile | 6301 | 0.22 | (0.42) | 0.20 | (0.40) | 0.22* | (0.42) | 0.19 | (0.39) |
| Fourth wealth quintile | 6386 | 0.20 | (0.40) | 0.22 | (0.42) | 0.19* | (0.39) | 0.21 | (0.41) |
| Fifth wealth quintile | 4721 | 0.14 | (0.35) | 0.23 | (0.42) | 0.12* | (0.33) | 0.25 | (0.43) |
| Individual years of schooling | 29773 | 4.82 | (3.43) | 5.68 | (3.44) | 4.73* | (3.33) | 5.88 | (3.42) |
| Individual has no formal education | 8258 | 0.27 | (0.44) | 0.19 | (0.40) | 0.27* | (0.44) | 0.17 | (0.37) |
| Individual completed primary | 18301 | 0.68 | (0.47) | 0.70 | (0.46) | 0.68 | (0.47) | 0.71 | (0.45) |
| Individual completed at least secondary | 3218 | 0.05 | (0.22) | 0.11 | (0.32) | 0.05* | (0.21) | 0.12 | (0.32) |
| Age at first birth (15 – 19 years) | 368 | 0.01 | (0.12) | 0.06 | (0.23) | 0.08‡ | (0.27) | 0.06 | (0.25) |
| Age at first birth (20 – 34 years) | 11758 | 0.42 | (0.49) | 0.70 | (0.46) | 0.66† | (0.47) | 0.72 | (0.45) |
| Age at first birth (35 – 49 years) | 17651 | 0.57 | (0.50) | 0.24 | (0.43) | 0.26‡ | (0.44) | 0.22 | (0.42) |
| Individual lives in the northern zone | 3586 | 0.14 | (0.35) | 0.17 | (0.37) | 0.12* | (0.33) | 0.13 | (0.34) |
| Individual lives in the central | 2460 | 0.10 | (0.30) | 0.09 | (0.28) | 0.09 | (0.29) | 0.09 | (0.28) |
| Individual lives in the southern highland | 3105 | 0.14 | (0.35) | 0.10 | (0.29) | 0.17* | (0.38) | 0.15 | (0.36) |
| Individual lives in the lake | 4080 | 0.19 | (0.40) | 0.18 | (0.39) | 0.19 | (0.39) | 0.12 | (0.32) |
| Individual lives in the Eastern zone | 2613 | 0.12 | (0.33) | 0.20 | (0.40) | 0.09* | (0.28) | 0.21 | (0.41) |
| Individual lives in Zanzibar | 6853 | 0.03 | (0.17) | 0.03 | (0.17) | 0.02* | (0.15) | 0.03 | (0.17) |
| Individual lives in the southern zone | 2847 | 0.09 | (0.29) | 0.10 | (0.29) | 0.09 | (0.29) | 0.16 | (0.36) |
| Individual lives in the western zone | 4233 | 0.19 | (0.39) | 0.15 | (0.35) | 0.22* | (0.42) | 0.12 | (0.32) |
| Age bracket 1: 15 – 24 years | 2723 | 0.11 | (0.31) | 0.30 | (0.46) | 0.32‡ | (0.47) | 0.30 | (0.46) |
| Age bracket 2: 25 – 34 years | 9403 | 0.33 | (0.47) | 0.45 | (0.50) | 0.42* | (0.49) | 0.47 | (0.50) |
| Age bracket 3: 35 – 44 years | 12236 | 0.40 | (0.49) | 0.22 | (0.42) | 0.24 | (0.43) | 0.21 | (0.40) |
| Age bracket 4: 45 – 54 years | 5415 | 0.16 | (0.37) | 0.02 | (0.15) | 0.02 | (0.15) | 0.02 | (0.13) |
| Fertility cohort 1: 0 – 3 children | 7134 | 0.27 | (0.44) | 0.57 | (0.49) | 0.52* | (0.50) | 0.63 | (0.48) |
| Fertility cohort 2: 4 – 6 children | 11294 | 0.39 | (0.49) | 0.29 | (0.45) | 0.33* | (0.47) | 0.29 | (0.45) |
| Fertility cohort 3: 7+ children | 11349 | 0.34 | (0.48) | 0.13 | (0.33) | 0.16* | (0.37) | 0.08 | (0.28) |
| Distance to facility is problematic | 12118 | 0.46 | (0.50) | 0.39 | (0.48) | 0.46* | (0.50) | 0.36 | (0.48) |
| Male headed households | 23584 | 0.78 | (0.41) | 0.80 | (0.40) | 0.82* | (0.38) | 0.82 | (0.37) |
| Individual relocated in the intervening period | 3900 | 0.12 | (0.32) | 0.16 | (0.37) | 0.12* | (0.32) | 0.14 | (0.35) |
| Participated in health care decision | 14868 | 0.62 | (0.49) | 0.64 | (0.48) | 0.56* | (0.50) | 0.64 | (0.48) |
| knowledge of pregnancy complication | 2906 | 0.54 | (0.50) | 0.60 | (0.49) | 0.51* | (0.50) | 0.65 | (0.48) |

Notes: Standard deviation are in parentheses. ‡, † and * indicates that the difference in characteristics between those who completed and those who did not complete the number of antenatal visits is statistically significant at 10%, 5% and 1% respectively, otherwise they are not significant. Obs = Number of observations

Another difference between those who completed the number of visits and those who did not lies in their potential educational attainment and health knowledge. Individuals with primary and secondary education have higher proportion of those with complete number of visits and early antenatal check-up relative to their share in the sample. The contrary holds for those with

less than primary education or with no health knowledge. Over 70 percent of women that completed the required number of visits had their first birth between the ages 20–34 years. Similarly, over 72 percent of women that initiated antenatal care early had their first birth between the ages 20–34 years. These percentages are far higher than their relative share in the sample. This suggest that women who gave birth at an adolescent age (15–19 years) and at an older age (35–49 years) are less likely to initiate for early care, or complete the required number of antenatal visits. Adolescent mothers have the lowest rate of utilising antenatal care services.

To some extent, the differences in care use may reflect an age-fertility cohort difference. First, only 27 percent of the sample have between 0-3 children, but over 57 percent of all women within this fertility cohort completed the number of antenatal visits. In fact, to put it more starkly, over 34 percent of all women in the sample have at least seven children, but only 13 percent of all women with complete check-up are from within this fertility cohort. Similarly, women with 4 to 6 children have a lower proportion of those with complete antenatal check-up, compared to their share in the sample. Intuitively, this indicates that women gain experience that is likely to reduce their utilisation rates in subsequent births. Considering the respective fertility levels, it is identified that the probability of early antenatal check-up, and antenatal care completion reduces with fertility rate (see Table A2.1 in the appendix). The differences in early care check-up and antenatal completion may also reflect an age cohort difference. Just about 2 percent of women in the age group 45 and 54 years who gave birth within this period completed the required number of visits, and over 2 percent of their counterpart with less than required number of visits, compared to their share in the sample.

It is interesting that the majority (64 percent) of individuals that completed or went for early antenatal care live in household where both partners cooperate in decision-making towards care use, relative to 56 percent for those with less than required number of visits. Those from male headed households are significantly less likely to complete the number of visit. Just over 39 percent of those who completed the number of visits and 36 percent of those with early care check-up are those who had problems accessing a health facility. Approximately 16 percent of those with complete care had relocated in the intervening period compared to 14 percent of those with early care check-up. On average, there are about 8 persons per household, and about 2 under-five children per woman. Finally, the fertility rate (average number of children ever born) is 6.

Since the network variable used in this study defines contact availability in terms of age-fertility and age-marital status cohorts, Table 2.3 and 2.4 present antenatal care utilisation figures by age cohorts, fertility and marital status grouping. These statistics are quite similar to the results in Table 2.2. More than half of the individuals in all the respective fertility and age cohorts (Table 2.3) underutilise antenatal services and the incidence of underutilisation is high amongst those in (4 to 6) and 7+ fertility cohorts. Except for widows, over half of all individuals in the respective marital status used less than the recommended number of visits (Table 2.3).

Table 2.3: Mean statistics for fertility, age and marital status cohorts by antenatal care visit

| Fertility group/ age group | Observations | At least four visits | Less than four visits | Early care visit |
|---|---|---|---|---|
| 0 - 3 children | 7134 | 46.16 | 53.84 | 17.57 |
| 4 - 6 children | 11294 | 40.09 | 59.91 | 14.56 |
| 7+ children | 11349 | 37.56 | 62.44 | 09.00 |
| 15 - 24 years | 2723 | 41.64 | 58.36 | 14.98 |
| 25 - 34 years | 9904 | 44.77 | 55.23 | 16.85 |
| 35 - 44 years | 12236 | 41.49 | 58.51 | 13.61 |
| 45 - 54 years | 5415 | 45.02 | 54.98 | 12.28 |
| Never married | 580 | 44.83 | 55.17 | 18.03 |
| Married | 23838 | 42.02 | 57.98 | 14.57 |
| Living together | 1222 | 48.28 | 51.72 | 21.11 |
| Widow | 1209 | 53.54 | 46.46 | 17.73 |
| Divorced | 1050 | 43.31 | 56.69 | 16.27 |
| Separated | 878 | 45.91 | 54.09 | 16.44 |

Table 2.4 categorised women into their respective age-fertility and age-marital status cohorts, and identify their respective utilisation rates. These are women who all gave birth in the last five years before the survey. On average, underutilisation rates varies significantly across the various age cohorts. For example, over 76 percent of all individuals between the ages 15 and 24 who are in the 4 to 6 fertility cohort, and over 73 percent of all individuals between the ages 45 and 54 in 0 to 3 fertility cohort, attended less than four antenatal visits. This incidence is however not consistent across all fertility and marital status cohorts. For instance, younger individuals (15-24 years) in the 0 to 3 fertility cohort have the lowest underutilisation rate, whereas oldest individuals (45-54 years) have the highest utilisation rate in the 4 to 6 fertility cohort. Similar statistics are obtained for marital status (see Table 2.4).

Table 2.4: Mean statistics for age-fertility and age-marital status cohorts by antenatal care visits

| Fertility/marital status | Observations | Age cohort | At least four visits | Less than four visits | Early care check-up |
|---|---|---|---|---|---|
| 0 - 3 Children | 2445 | 15 - 24 years | 42.32 | 47.68 | 15.09 |
| | 3446 | 25 - 34 years | 50.83 | 49.17 | 20.40 |
| | 999 | 35 - 44 years | 51.51 | 48.49 | 22.05 |
| | 244 | 45 - 54 years | 26.81 | 73.19 | 23.19 |
| 4 - 6 Children | 278 | 15 - 24 years | 23.47 | 76.53 | 12.03 |
| | 5129 | 25 - 34 years | 38.41 | 61.59 | 13.75 |
| | 4671 | 35 - 44 years | 44.06 | 55.94 | 16.22 |
| | 1216 | 45 - 54 years | 61.39 | 38.61 | 16.26 |
| 7+ Children | 0000 | 15 - 24 years | | | |
| | 828 | 25 - 34 years | 36.23 | 63.77 | 04.76 |
| | 6566 | 35 - 44 years | 37.15 | 63.85 | 09.46 |
| | 3955 | 45 - 54 years | 41.30 | 48.70 | 10.66 |
| Never married | 261 | 15 - 24 years | 43.92 | 56.08 | 16.39 |
| | 197 | 25 - 34 years | 48.47 | 51.53 | 20.87 |
| | 113 | 35 - 44 years | 41.22 | 58.78 | 25.34 |
| | 9 | 45 - 54 years | | | |
| Married | 2090 | 15 - 24 years | 39.76 | 60.24 | 13.18 |
| | 7664 | 25 - 34 years | 44.24 | 55.76 | 16.25 |
| | 9999 | 35 - 44 years | 40.76 | 59.24 | 13.07 |
| | 4085 | 45 - 54 years | 40.75 | 59.25 | 15.25 |
| Living together | 128 | 15 - 24 years | 53.31 | 46.69 | 28.38 |
| | 445 | 25 - 34 years | 46.09 | 53.91 | 18.10 |
| | 445 | 35 - 44 years | 42.89 | 57.11 | 17.13 |
| | 204 | 45 - 54 years | | | |
| Widow | 17 | 15 - 24 years | 38.82 | 61.18 | 05.16 |
| | 177 | 25 - 34 years | 43.70 | 56.30 | 34.83 |
| | 575 | 35 - 44 years | 60.68 | 39.32 | 12.27 |
| | 440 | 45 - 54 years | 68.44 | 31.56 | |
| Divorced | 157 | 15 - 24 years | 44.59 | 55.41 | 17.30 |
| | 592 | 25 - 34 years | 44.44 | 55.56 | 14.46 |
| | 769 | 35 - 44 years | 39.57 | 60.43 | 19.11 |
| | 532 | 45 - 54 years | 50.60 | 49.40 | |
| Separated | 70 | 15 - 24 years | 47.45 | 52.55 | 22.31 |
| | 328 | 25 - 34 years | 50.11 | 49.89 | 18.47 |
| | 335 | 35 - 44 years | 34.93 | 65.07 | 08.67 |
| | 145 | 45 - 54 years | 49.53 | 50.47 | |

## 2.6. Empirical Results

The network coefficient estimates from the baseline regression for the respective measures of network quantity are presented in Table 2.5 and Table 2.6. In Table 2.5, age-fertility cohort is used as a measure of network quantity, while age-marital status is a measure of network quantity in Table 2.6. The use of these two measures is to check for robustness of the effect of

social networks. The specifications demonstrate how the network coefficient estimates change as fixed effects are included for age-fertility cohort, age-marital status cohort and geographical location. The inclusion of distance to facility in the baseline regression is to net out biases resulting from differences in the supply of services across regions. Likewise, the relocation variable is included at this stage to control for the probability that an individual relocated away from her network within the intervening period, whereas the number of children ever born is included to account for experience. To re-iterate, the variable 'antenatal completion' is a dummy variable equal to one, if an individual woman received at least four antenatal visits from a health professional before childbirth, and zero, if she received less than four visits. The variable 'early antenatal care use' is a dummy variable equal to one, if the individual had at least one antenatal care visit within the first four months of her pregnancy, zero otherwise.

Table 2.5: Regression estimates of network coefficient as additional fixed effects are included

| | Probability of antenatal care completion | | | Probability of early antenatal care use | | |
|---|---|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.10*** | -0.19*** | -0.22*** | -0.14*** | -0.17*** | -0.16*** |
| | (0.02) | (0.03) | (0.04) | (0.01) | (0.01) | (0.01) |
| Network effects | 0.39*** | 0.65*** | 0.74*** | 1.27*** | 1.36*** | 1.36*** |
| | (0.07) | (0.09) | (0.10) | (0.09) | (0.09) | (0.10) |
| Individual relocated in the intervening period | 0.13*** | 0.13*** | 0.12*** | -0.01 | -0.00 | -0.01 |
| | (0.04) | (0.04) | (0.04) | (0.03) | (0.03) | (0.03) |
| Distance to health facility is problematic | -0.05* | -0.04* | -0.02 | -0.03** | -0.03** | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.01) | (0.01) | (0.01) |
| Number of children ever born | -0.00 | -0.03*** | -0.02** | 0.00 | -0.02*** | -0.02*** |
| | (0.00) | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) |
| Constant | 0.43*** | 0.40*** | 0.32*** | 0.15*** | 0.14*** | 0.02 |
| | (0.02) | (0.03) | (0.02) | (0.01) | (0.02) | (0.01) |
| **Observations** | **5,310** | **5,310** | **5,310** | **5,249** | **5,249** | **5,249** |
| **R-squared** | **0.02** | **0.04** | **0.20** | **0.19** | **0.21** | **0.33** |
| Age-fertility cohort fixed effects | No | Yes | Yes | No | Yes | Yes |
| Cluster fixed effects | No | No | Yes | No | No | Yes |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.
The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$.
The means of the variables that make up the network variable are presented in Tables 2.1 – 2.4
Age-fertility cohort is a measure of the quantity of one's contact

For the antenatal completion regression, the network effect rises from 0.39 after controlling for distance, experience and relocation, to 0.65 when age-fertility cohort fixed effects are included, and to 0.74 once areas fixed effects are added. Similar results are obtained when age-marital status cohort is used (see Table 2.6). Similar findings are identified in the work of Deri (2005) and Devillanova (2008). More importantly, the network coefficient remains positive and highly

significant. The network effects on the probability that an individual pregnant woman initiate's antenatal care early as opposed to late antenatal check-up increases consistently and remains significant, after controlling for various fixed effects. Based on this consistency, one can conclude that, the network effects on care use will be underestimated if the omitted variable bias is not adequately controlled[21]. However, network effects are higher for early antenatal check-up than in antenatal care completion.

Table 2.6 looks at an alternative source of information externalities, by classifying individual women according to their age-marital status cohort. The results reveal that irrespective of the various ways of social groupings, individuals with high quality contacts are more likely to utilise antenatal care services, relative to their counterparts with low quality contacts[22]. Similar results are obtained after switching the measure of contact availability from age-fertility cohort to age-marital status cohort. Results obtained from these two measures are consistent in signs and significant, but differ only in terms of magnitude. Though binary choice models in the presence of large fixed effects face computational challenges, a logit model is further estimated using the same sample. The results obtained from the logit model are presented in Table A2.2 and Table A2.3 of the appendix. Compared to the LPM, the signs and significance of the network coefficients are the same.

Results from both specifications show that increased distance to health facilities is likely to reduce the probability of completing the number of antenatal visits and/or early initiation of antenatal care. The effect of distance is consistently significant in the presence of age-fertility/age-marital status fixed effects, but insignificant as location fixed effects are included. Interestingly, individuals who relocated away from their network significantly increased the probability of completing the number of antenatal care visits, but not the probability of early care use. The positive effect of relocation is possible if the quality of their new network is higher than the quality of their previous network, or if they relocated to areas where health services are more readily available. This relationship is consistent in both measures of the quantity of network. The negative coefficients for contact availability indicate that the positive effect of social networks are mainly due to quality and not the quantity of network. Finally, the number of children ever born by an individual woman is included to control for experience. The study finds that antenatal care utilisation declines significantly with experience. Again,

[21] The network estimates will be interpreted in detail in section 2.6.1

[22] 'High quality' refers to groups with high utilisation rates and 'low quality' refers to groups with low utilisation rates

this relationship is consistent in both measures of network, with higher magnitudes in the age-fertility measure.

Table 2.6: Regression estimates of network coefficient as additional fixed effects are included

| | Probability of antenatal care use | | | Probability of early antenatal care use | | |
|---|---|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.06*** | -0.29*** | -0.29*** | -0.09*** | -0.10*** | -0.09*** |
| | (0.02) | (0.03) | (0.03) | (0.01) | (0.01) | (0.01) |
| Network effects | 0.19*** | 0.86*** | 0.85*** | 0.52*** | 0.67*** | 0.66*** |
| | (0.04) | (0.07) | (0.08) | (0.03) | (0.04) | (0.04) |
| Individual relocated in the intervening period | 0.13*** | 0.12*** | 0.11*** | -0.02 | 0.02 | 0.01 |
| | (0.04) | (0.04) | (0.04) | (0.03) | (0.03) | (0.03) |
| Distance to health facility is problematic | -0.06** | -0.05* | -0.02 | -0.04*** | -0.03*** | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.01) | (0.01) | (0.01) |
| Number of children ever born | -0.01* | -0.03*** | -0.01** | -0.00 | -0.02*** | -0.02*** |
| | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) | (0.00) |
| Constant | 0.45*** | -0.00 | -0.18*** | 0.17*** | 0.05** | -0.08*** |
| | (0.02) | (0.05) | (0.06) | (0.01) | (0.02) | (0.02) |
| **Observations** | **5,310** | **5,310** | **5,310** | **5,231** | **5,231** | **5,231** |
| **R-squared** | **0.02** | **0.06** | **0.22** | **0.16** | **0.21** | **0.32** |
| Age-marital status cohort fixed effects | No | Yes | Yes | No | Yes | Yes |
| Cluster fixed effects | No | No | Yes | No | No | Yes |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.
The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$
Age- marital status cohort is a measure of the quantity of one's contact

Table 2.7 presents regression estimates of network effects after controlling for individual and household characteristics. There are no major changes in the magnitude of network effects on the probability of antenatal completion after controlling for individual and household characteristics. First, when age-fertility is used, the effect of network on antenatal completion remained at 0.74 after controlling for individual and household characteristics, but reduced to 0.69 after controlling for early antenatal check-up[23] (see the network effect in column 1 and column 2 of Table 2.7 for comparison). Second, when age-marital status is used, network effect remained at 0.85, but reduced to 0.72 after controlling for early antenatal check-up (see network effect in column 4 and column 5 of Table 2.7 for comparison). The effects are still highly significant (see the network effect in column 3 of Table 2.5 and 2.6 and the one in column 1, 2, 4 and 5 of Table 2.7 for comparison).

[23] Women who initiate antenatal care early are most likely to complete the number of visits. It is there important to identify the effect of early care seeking on care completion and how the effect of networks changes after controlling for early care seeking.

Table 2.7: Regression estimates of network coefficient including individual and household characteristics

| Variables | Using age-fertility cohort | | | Using age-marital status cohort | | |
|---|---|---|---|---|---|---|
| | Antenatal Completion | Antenatal Completion | Antenatal care early | Antenatal completion | Antenatal completion | Antenatal care early |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.22*** | -0.21*** | -0.16*** | -0.28*** | -0.24*** | -0.09*** |
| | (0.04) | (0.04) | (0.01) | (0.03) | (0.03) | (0.01) |
| Network effects | 0.74*** | 0.69*** | 1.36*** | 0.85*** | 0.72*** | 0.66*** |
| | (0.10) | (0.10) | (0.10) | (0.07) | (0.07) | (0.04) |
| Early antenatal check-up | | 0.37*** | | | 0.35*** | |
| | | (0.02) | | | (0.02) | |
| **Individual characteristics** | | | | | | |
| Individual relocated in the intervening period | 0.11** | 0.12*** | -0.00 | 0.10* | 0.11*** | -0.01 |
| | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.03) |
| Individual age at first birth (20 – 34 years) | 0.08** | 0.08** | -0.01 | 0.08** | 0.08** | 0.01 |
| | (0.04) | (0.04) | (0.02) | (0.04) | (0.04) | (0.02) |
| Individual age at first birth (35 – 49 years) | 0.36 | 0.55*** | 0.16 | 2.12*** | 1.90*** | 0.41*** |
| | (0.23) | (0.13) | (0.11) | (0.15) | (0.14) | (0.09) |
| Individual years of schooling | 0.01*** | 0.01*** | 0.00 | 0.01** | 0.01*** | 0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Knowledge of pregnancy complication | 0.05*** | 0.04** | 0.03** | 0.05*** | 0.04** | 0.02* |
| | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) | (0.01) |
| Distance to health facility is problematic | -0.01 | -0.00 | -0.01 | -0.02 | -0.01 | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) | (0.01) |
| Number of children ever born | -0.00 | 0.00 | -0.01 | -0.00 | 0.00 | -0.01** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.00) |
| Number of under-five per woman | -0.08*** | -0.07*** | -0.03*** | -0.08*** | -0.07*** | -0.03*** |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| **Household Characteristics** | | | | | | |
| Getting money for care is problematic | -0.06* | -0.05* | -0.02 | -0.05* | -0.05* | -0.02 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Male headed household | 0.04* | 0.04** | -0.02 | 0.05* | 0.05** | -0.01 |
| | (0.02) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Household asset index | 0.05*** | 0.04** | 0.01 | 0.05** | 0.04** | 0.03* |
| | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) | (0.01) |
| Household size | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00* |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Individual lives in the central | 0.21*** | 0.27*** | -0.01 | 0.11*** | 0.16*** | -0.00 |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| Individual lives in the southern highlands | 0.57*** | 0.64*** | 0.03 | 0.40** | 0.48*** | -0.05** |
| | (0.03) | (0.03) | (0.02) | (0.03) | (0.03) | (0.02) |
| Individual lives in the lake | -0.01 | 0.12*** | 0.11*** | -0.07*** | 0.00 | 0.11*** |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.01) | (0.02) |
| Individual lives in the eastern | 0.60*** | 0.64*** | -0.03* | 0.54*** | 0.58*** | -0.05*** |
| | (0.03) | (0.03) | (0.02) | (0.03) | (0.02) | (0.02) |
| Individual lives in Zanzibar | 0.18*** | 0.26*** | -0.07*** | 0.15*** | 0.23*** | 0.10*** |
| | (0.03) | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) |
| Individual lives in the southern | 0.03 | 0.41*** | 0.36*** | -0.15*** | 0.28*** | 0.46*** |
| | (0.053) | (0.03) | (0.02) | (0.03) | (0.04) | (0.01) |
| Individual lives in the western | 0.23*** | 0.29*** | -0.00 | 0.16*** | 0.22*** | 0.02 |
| | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) | (0.03) |
| Constant | 0.14*** | 0.06 | 0.08* | -0.25*** | -0.27*** | -0.03 |
| | (0.04) | (0.04) | (0.04) | (0.07) | (0.07) | (0.04) |
| **Observations** | **5,147** | **5,146** | **5,162** | **5,147** | **5,146** | **5,144** |
| **R-squared** | **0.22** | **0.28** | **0.33** | **0.24** | **0.29** | **0.33** |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.

The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$

All regressions include district fixed effects age-fertility and age-marital status cohort fixed effect

Column 1, 2, 4 and 5 are for antenatal care completion regression, column 3 and 6 are estimates for timing of antenatal visit. In column 2 and 5 timing of antenatal check-up is included, since women who initiate antenatal care early are likely to complete the number of visits.

Similarly, inclusion of these additional controls to the early antenatal care use specification have no major effect on the magnitude of network effects and the significant level is unaltered (see the estimates of network in column 6 of Table 2.5 and 2.6 and the one in column 3 and 6 of Table 2.7 for comparison). The coefficient estimates of network remain positive and highly significant after controlling for other explanatory variables and the likely biases. This suggests that social interaction among women of reproductive age is an important source of information externalities regarding the use of reproductive health services.

Concerning the additional controls, it is identified that maternal age at first birth, years of schooling, knowledge about pregnancy complication and household wealth are positive and significantly associated with antenatal care completion. For antenatal care completion, results in column 1 are discussed and compared with results in column 4. Specifically, women who gave birth at the age 20 to 34 years are 8 percent more likely to complete the required number of antenatal visits, compared to their counterparts who gave birth at an adolescent age (15–19 years). An additional year of maternal education increases the probability of completing their antenatal visits by 0.8 percent. As expected, women aware of risks associated with pregnancy outcomes increased the probability of completing the recommended antenatal care visits by 5 percent. Interestingly, timing of antenatal visit strongly explains the probability of antenatal completion. Seeking antenatal care within the first trimester increases the probability of completing the number of visits between 35 and 37 percent.

It has been shown that the number of under five children in the household reduces the demand for maternal health care (Duong *et al.,* 2004). Using the number under-five children born to an individual woman, this study confirms the inverse association between the number of under-five children and the utilisation of antenatal care. Precisely, an increase in the number of under-five children per woman reduces the propensity to complete antenatal visits by 8 percent. The probability of completing the number of antenatal care visits is lower in household in which the woman had difficulty getting money to seek care. An increase in household wealth raises the probability of antenatal care completion by 5 percent. The magnitudes of these estimates are consistent in both specification (see column 1 and column 4). It is surprising that the probability of antenatal completion is higher in male than in female headed households. It is equally observed that the probability of completing the required number of visits varies with the zone of residence. For instance, residing in the central, the southern highland, Zanzibar, the

western and eastern zones, significantly increase the probability of completing antenatal visits relative to those who reside in the northern zones.

In the case of timing of antenatal care, maternal age at birth, household assets and health knowledge significantly increase the probability of early antenatal check-up. As is the case with completing the number of visits, timing of antenatal visit is inversely related with the number of under-five to an individual woman. While residing in Zanzibar and the eastern zones significantly reduce the probability of early antenatal check-up, residing in the lake and the southern zones raises the likelihood of early antenatal check-up relative to their counterparts from the northern zone. It is identified that overall, the results are consistent, irrespective of the measure of one's contacts (compare the significance of the estimates in column 1 and 4 for antenatal care completion regression in Table 2.7)

### 2.6.1 Interpreting the Network Coefficients

It is worth noting that the interpretation of the real magnitude of the network estimates from these specifications is not straightforward. The way the network variable is computed makes it difficult to interpret its actual magnitude. However, Bertrand *et al.* (2000) suggest an approach for obtaining the real measure of the magnitude of the network effects. Following this approach, this study seeks to answer the question, "to what extent would social interaction broaden a policy shock that affects the probability of antenatal care use"? The argument is based on the assumption of linearity of the policy shock. The conclusion is that, if the effects resulting from the policy shock is removed from the equilibrium outcome, the remaining marginal change is attributed to social networks.

This study adopts the experimental approach, as specified in Bertrand *et al.* (2000) to identify the actual magnitude of network on antenatal care utilisation. First, it assumes a policy € which linearly affect antenatal care utilisation outcomes. The policy variable is included in the estimation, with the assumption that in the absence of network effect, this variable is scaled such that a one percentage point rise in € will leads to a one percentage point rise in the probability of antenatal care use.

$$use_{ijk} = € + \left(V_{jk} * \overline{use_k}\right)\varphi + X_i\beta + \pi_j + \omega_k + dist_{jk}\theta + reloc_{jk}\delta + V_{jk}\gamma + \mu_{ijk}.$$

Inclusion of the network variable generate a multiplier effect, such that in equilibrium, the increase care use probability owing to the rise in € is higher. To illustrate this, we take the mean

on both sides of the equation for each age-fertility cohort and each age-marital status cohort and differentiate with respect to €. In so doing we have, $\frac{d\overline{use_k}}{d€} = 1 + \bar{V}_k * \frac{d\overline{use_k}}{d€}\varphi$ where $\bar{V}_k$ is the average number of contact ($V_{jk}$) in each age-fertility/age-marital status cohort. The responsiveness of each age-fertility cohort's probability to utilisation of antenatal care services, owing to the policy change, can be obtained by solving the derivation above for $\frac{d\overline{use_k}}{d€}$. In order to obtain the marginal change, resulting purely from social interaction, we net out the direct effects of the policy change (note that it is equal to one). Hence, the actual magnitude of social networks is given by $\frac{1}{(1-\varphi\bar{V}_k)} - 1$. Where, $\frac{1}{(1-\varphi\bar{V}_k)} - 1$ is used to compute the indirect network effect for each age-fertility/age-marital status cohort, and $\varphi$ represent the respective network estimated coefficients in row 2 of Table 2.7. It should be noted that we had already controlled for the fixed effects and the possible observable characteristics.

Using this approach, the indirect network impact on the probability of completing the number of antenatal care, as well as the timing of antenatal care by age-fertility cohort and age-marital status cohort are presented in Table 2.8 and Table 2.9 respectively. With age-fertility as a measure of contact availability, antenatal care completion prospects, owing to social networks only, range between 0.06 and 0.35 (see panel A of Table 2.8). The overall network effect for all age-fertility groups is 0.24. The highest effect is observed among older women aged (35–44 years) with fertility rates of at least 7 children, and the lowest is found among the youngest mothers aged (15–24 years) with fertility rates of 4 to 6 children. Panel B of Table 2.8 reports the indirect network effects on seeking care early. The overall network effects for all age-fertility cohorts is 0.35, with the network impact to the probability of early care to individual age-fertility cohorts ranging between 0.08 and 0.54. It is interesting to observe that the network impact for different groups is consistent across the various measures of antenatal care utilisation. This means that age-fertility groups with the lowest network effect to the probability of completing antenatal visits also have the lowest network effects to the probability of timing of antenatal care use. It is essential to note that these indirect network effects are highly significant across all age-fertility cohorts.

Table 2.8: Indirect network impact on completing and timing of antenatal care visits (using age-fertility cohort)

| Panel A: Indirect network effects on completing the required antenatal care visits | | | | |
|---|---|---|---|---|
| All | 0.241 (0.006) | | | |
| | 15 - 24 years | 25 34 years | 35 - 44 years | 45 - 54 years |
| 1 - 3 Children | 0.160 (0.009) | 0.227 (0.017) | 0.118 (0.009) | 0.061 (0.006) |
| 4 - 6 Children | 0.060 (0.005) | 0.243 (0.011) | 0.249 (0.011) | 0.166 (0.015) |
| 7+ Children | | 0.108 (0.011) | 0.354 (0.023) | 0.230 (0.011) |
| Panel B: Indirect network effects on seeking care early | | | | |
| All | 0.351 (0.013) | | | |
| | 15 - 24 years | 25 34 years | 35 - 44 years | 45 - 54 years |
| 1 - 3 Children | 0.225 (0.016) | 0.352 (0.052) | 0.160 (0.014) | 0.080 (0.008) |
| 4 - 6 Children | 0.079 (0.007) | 0.343 (0.019) | 0.355 (0.018) | 0.231 (0.023) |
| 7+ Children | | 0.144 (0.015) | 0.540 (0.045) | 0.325 (0.017) |

Table 2.9 reports the indirect network impact on the use of antenatal care services when age-marital status cohorts are considered as the bases for forming social groups. The impact of networks on antenatal care use prospects ranges between 0.03 and 0.59 (see panel A of Table 2.9). The overall network effect for all age-marital status cohorts is greater than the overall network of the age-fertility groups. The highest effect is observed among married women of age 35-44 years and is consistent across all age groups. The lowest is among divorced women of age 15–24 years. The indirect network impact on the timing of antenatal care check-up is presented in panel B of Table 2.9. The overall network impact for all age-marital status cohorts is again greater than that of age-fertility cohorts. The network impact on the probability of early care to individual age-marital status cohorts ranges between 0.03 and 0.38. Social networks have a higher impact on the completion of antenatal care services than on timing of antenatal care visit when age-marital status is used as a measure of quantity of network. These results are identical to those presented in Table 2.8.

It is interesting to observe that the network impact for different age groups is consistent across the various measures of antenatal care utilisation. That is, groups with the lowest network effect to the probability of completing care services have the lowest network effects to the timing of care prospects irrespective of the measure of quantity of contact used. It is also interesting to note that network has the strongest effect among married women of age 35-44 years, and the weakest impact among divorced women age 15-24 years. This could be possible as social ties are likely to be weaker among divorced women. Several studies have shown that women are more likely to associate only with women within their marital status. For instance, it has been

argued that during marriage, most networks (friendship) are based on ties with other couples (Rands, 1988a) and women's friendships in her single days are rarely maintained (Albeck & Kaydar, 2002a; Lin & Wescott, 1991). The social bridges that exist during marriage collapses in periods of divorce. In most developing countries especially in Africa, the social status of married women depends on their husbands' status, and the social activity of married women differ considerably from unmarried and divorced women, but fits better with other married women (Duffy, 1993; Albeck & Kaydar, 2002a). Compared to the results in Table 2.8, it is clear that irrespective of the bases for forming social groups, individuals with high quality contacts are more likely to fully utilise antenatal care services in Tanzania.

Table 2.9: Indirect network impact on completing and timing of antenatal care visits (using age-marital status cohort)

| Panel A: Indirect network effects on completing the required antenatal care visits | | | | |
|---|---|---|---|---|
| All | 0.359 (0.012) | | | |
| | 15 - 24 years | 25 - 34 years | 35 - 44 years | 45 - 54 years |
| Never married | 0.076 (0.018) | 0.059 (0.007) | 0.075 (0.007) | 0.089 (0.012) |
| Married | 0.139 (0.008) | 0.407 (0.018) | 0.588 (0.029) | 0.248 (0.012) |
| Living together | 0.050 (0.006) | 0.133 (0.017) | 0.178 (0.039) | 0.149 (0.015) |
| Widow | 0.036 (0.008) | 0.060 (0.004) | 0.129 (0.013) | 0.149 (0.016) |
| Divorced | 0.033 (0.003) | 0.081 (0.006) | 0.138 (0.017) | 0.164 (0.022) |
| Separated | 0.053 (0.012) | 0.094 (0.015) | 0.096 (0.009) | 0.126 (0.012) |
| Panel B: Indirect network effects on seeking care early | | | | |
| All | 0.243 (0.007) | | | |
| | 15 - 24 years | 25 - 34 years | 35 - 44 years | 45 - 54 years |
| Never married | 0.050 (0.008) | 0.044 (0.004) | 0.056 (0.005) | 0.068 (0.009) |
| Married | 0.102 (0.006) | 0.278 (0.009) | 0.384 (0.016) | 0.177 (0.008) |
| Living together | 0.038 (0.005) | 0.097 (0.012) | 0.129 (0.026) | 0.110 (0.011) |
| Widow | 0.027 (0.006) | 0.046 (0.003) | 0.095 (0.009) | 0.110 (0.012) |
| Divorced | 0.025 (0.002) | 0.061 (0.004) | 0.102 (0.012) | 0.119 (0.015) |
| Separated | 0.040 (0.009) | 0.070 (0.011) | 0.072 (0.006) | 0.094 (0.009) |

Table 2.10 reports network estimates and the indirect impact of network on the probabilities of completing the number of antenatal visits and early initiation of antenatal care for specific subgroups. The results are based on age-fertility cohort as a measure of the quantity of one's contact or quantity of network. The estimates on antenatal care completion are presented in column 1 and 2, while the estimates on timing of visit are in column 3 and 4.

The network estimated coefficient on completion of number of visits is slightly higher in male than in female headed households, with the indirect effect suggesting that social networks increases antenatal care utilisation for male headed households by 0.01 higher than female headed households. The network estimate for employed women is greater than that of

unemployed women, with the indirect effect indicating that networks raises antenatal care use prospects for employed women by 0.13 relative to 0.10 for unemployed women. The network estimates for urban residence is greater than that for rural residence, with the indirect impact for urban dwellers almost four times higher than for rural dwellers.

Table 2.10: Marginal effects of network and indirect network impacts on completion and timing of antenatal care (age-fertility)

| Specification by group | Probability of completing antenatal care | Indirect effects on antenatal completion | Probability of early antenatal care | Indirect effects on early care |
|---|---|---|---|---|
| Variables | $\varphi$ | | $\varphi$ | |
| Male headed household | 0.371*** (0.052) | 0.103 (0.002) | 1.057*** (0.044) | 0.462 (0.044) |
| Female headed household | 0.355** (0.115) | 0.094 (0.002) | 0.876*** (0.091) | 0.288 (0.009) |
| Household asset index below average | 0.137 (0.116) | 0.034 (0.001) | 0.868*** (0.075) | 0.299 (0.014) |
| Household asset index is average | 0.299*** (0.109) | 0.078 (0.003) | 0.809*** (0.109) | 0.269 (0.018) |
| Household asset index above average | 0.448*** (0.071) | 0.129 (0.003) | 1.133*** (0.053) | 0.399 (0.083) |
| Individual has no formal education | 0.204** (0.097) | 0.052 (0.001) | 0.741*** (0.095) | 0.234 (0.010) |
| Individual has completed primary | 0.408*** (0.059) | 0.115 (0.002) | 1.123*** (0.048) | 0.031 (0.001) |
| Individual has completed secondary | 0.300*** (0.132) | 0.080 (0.010) | 0.804*** (0.105) | 0.276 (0.023) |
| Individual is employed | 0.457*** (0.112) | 0.133 (0.005) | 1.058*** (0.045) | 0.438 (0.029) |
| Individual is unemployed | 0.351*** (0.053) | 0.096 (0.002) | 0.900*** (0.081) | 0.334 (0.020) |
| Individual lives in rural area | 0.177*** (0.057) | 0.045 (0.001) | 0.782*** (0.054) | 0.252 (0.008) |
| Individual lives in urban areas | 0.604*** (0.089) | 0.201 (0.009) | 1.339*** (0.056) | 0.770 (0.175) |
| Individual relocated | 0.582*** (0.121) | 0.165 (0.010) | 0.797*** (0.084) | 0.248 (0.012) |
| Individual did not relocate | 0.324*** (0.051) | 0.088 (0.002) | 1.099*** (0.045) | 0.307 (0.152) |

Robust standard errors in parentheses, significance: *** p<0.01, ** p<0.05, * p<0.1

Interestingly, the network coefficient on antenatal care use is larger for those with primary education relative to those with no education and those with at least secondary education. Antenatal care completion prospects due to social networks for those with no education increased by 5 percent and those with secondary education by 8 percent compared to 12 percent for those with primary education. The network estimate for those who relocated within the intervening period almost double that for those who did not relocate. The completion prospects for those who relocated increased by 17 percent relative to 9 percent for those who did not relocate. Finally, the social network estimate on antenatal care utilisation increases with the level of household asset index. The network coefficient for women from poorer (asset index below average) household is not significantly different from zero. The indirect effect suggests that social network would improve utilisation prospects for those in the middle wealth quintile by 8 percent and 3 percent for those in the lower quintile compared to 13 percent for those in the upper wealth quintile.

In contrast, the results for the impact of social networks on the timing of antenatal check-up are much stronger than the completion of the number of antenatal visits. It is evident from Table 2.10 that the estimated network coefficients, the magnitude of its impact, and the level of significance are higher on timing rather than completion of antenatal visits. While the network coefficient of women from poor households on antenatal completion are insignificant, that for timing of antenatal visit is highly significant. In addition, while the impact of network on antenatal care completion ranges from 0.03 for women from poorer households to 0.20 for those in urban areas, the impact on the timing of antenatal visit ranges from 0.03 to 0.77. The network coefficient of female headed households and no formal education on the timing of antenatal check-up is highly significant, relative to antenatal care completion.

Table 2.11: Estimates of network and indirect network impacts on completion and timing of antenatal care

| Specification by group | Probability of completing antenatal care | Indirect effects on antenatal completion | Probability of early antenatal care | Indirect effects on early care |
|---|---|---|---|---|
| Variables | $\varphi$ | | $\varphi$ | |
| Male headed household | 0.305*** (0.041) | 0.103 (0.003) | 0.575*** (0.033) | 0.186 (0.019) |
| Female headed households | 0.125* (0.049) | 0.023 (0.001) | 0.499*** (0.023) | 0.127 (0.013) |
| Household asset index below average | 0.104 (0.080) | 0.029 (0.001) | 0.508*** (0.043) | 0.170 (0.014) |
| Household asset index is average | 0.104*** (0.029) | 0.030 (0.003) | 0.518*** (0.041) | 0.282 (0.019) |
| Household asset index above average | 0.219*** (0.072) | 0.066 (0.002) | 0.723*** (0.052) | 0.180 (0.065) |
| Individual has no formal education | 0.130* (0.075) | 0.037 (0.004) | 0.454*** (0.048) | 0.238 (0.017) |
| Individual has completed primary | 0.201*** (0.039) | 0.060 (0.001) | 0.644*** (0.054) | 0.177 (0.016) |
| Individual has completed secondary | 0.193** (0.076) | 0.052 (0.003) | 0.515*** (0.022) | 0.137 (0.016) |
| Individual is employed | 0.259*** (0.074) | 0.086 (0.003) | 0.533*** (0.021) | 0.174 (0.037) |
| Individual is unemployed | 0.210*** (0.034) | 0.061 (0.002) | 0.469*** (0.037) | 0.181 (0.015) |
| Individual lives in rural areas | 0.154*** (0.038) | 0.045 (0.001) | 0.450*** (0.028) | 0.148 (0.013) |
| Individual lives in urban areas | 0.241*** (0.054) | 0.072 (0.003) | 0.580*** (0.025) | 0.206 (0.083) |
| Individual relocated | 0.210*** (0.077) | 0.062 (0.003) | 0.499*** (0.020) | 0.172 (0.023) |
| Individual did not relocate | 0.208*** (0.033) | 0.055 (0.002) | 0.623*** (0.049) | 0.196 (0.041) |

Robust standard errors in parentheses, significance: *** p<0.01, ** p<0.05, * p<0.1

In Table 2.11, the age-marital status cohort is used as a measure of the quantity of one's network, to illustrate how the impacts of network for specific groups vary with the criteria of measuring the quantity of one's contacts. The magnitude of the effects of social network on both antenatal care completion and timing of antenatal care visit vary significantly with the criteria of network formation. However, it is noted that the significant importance of network on both antenatal care completion and timing of antenatal care visit do not depend on the criteria for network formation. Thus, as identified earlier, groups with high quality of contacts are more likely to utilise antenatal care, irrespective of the criteria for network formation.

## 2.7 Conclusion

This chapter sought to examine the impact of social networks on the probabilities of completing the required number of antenatal visits and early antenatal check-up. The various channels through which omitted variable bias could possibly affect the magnitude of these estimates are controlled using a linear probability fixed effect model. Two measures of the quantity of networks are used to identify whether or not the impact of networks varies with the way through which social groups are formed. Two broad groups of controls were included in the empirical analysis. They include individual effects proxy by maternal age, educational attainment, health knowledge; number of children ever born and number of children under the age of five, and household effects proxy by distance to a facility, household wealth, household size and location.

The study reveals several important findings. Firstly, social networks have a significant positive effects on antenatal care use, over and above the typical individual and household level variables. This implies that antenatal care may be especially sensitive to network effects. The analysis demonstrate that the impact of social networks is underestimated if the possible omitted variable bias is not probably controlled. After controlling for various fixed effects, the inclusion of individual and household characteristics reduce the magnitude of the network effects. The impact of networks is substantially higher for timing of antenatal visits than for completion of the number of visits probabilities. The network estimates remain positive and highly significant after controlling for age-fertility/age-marital status cohort fixed effects, geography fixed effects and other controls. The study established that irrespective of the way through which women form their social groups, members from high quality groups are more likely to complete the number of antenatal visits, or go for early antenatal check-up. The findings indicate that the criteria for social interaction only matters if concerns are on the magnitude of the impact, rather than the direction of the effects.

In addition to the effect of social networks, observed individual and household characteristics influence the probability of completing the number of antenatal visits and timing of antenatal check-up. For example, the probability of completing the number of visits reduces with the number of children under the age of five years. On the other hand, it increases with the years of schooling, maternal age at first birth and household assets. The probability of completing the number of visits is significantly higher for those with health knowledge and in male headed

households than their respective counterparts. Older women (35-49 years) are significantly more likely to complete the required number of visits than younger women (15-19 years).

The level and extent to which social networks impact on utilisation rates vary with the inclusion of observable characteristics. The utilisation of antenatal care services among pregnant women may vary with the quantity and quality of their contacts. However, the magnitude of the effects of social network on antenatal care utilisation outcomes is dependent not only on the quantity and quality of one's contact, but also whether she is able to access her network effectively. For instance, social networks have a higher effect on antenatal care use probabilities for women who relocated within the intervening period. This suggest that those who relocated may have high access to high quality network, or they may have relocated to areas with better services. The magnitude is also dependent on her socioeconomic status. Social networks have a higher impact on care use for wealthy and educated women than the poor and uneducated women. This may imply that the quality of networks between these social groups vary significantly, with wealthy and educated women having higher quality of contacts. These findings are similar when employment status, type of place of residence and household head are considered.

These findings are essential for policies that are designed to target under-users of antenatal care services. As governments design policies to promote the utilisation of health care services, there is need to sensitise the population not only through the media, but through other channels that reaches community groups or religious centres directly. This will have a multiplier type effect. First, it will affect the behaviour of people that receive this information directly, and second many others in their network are more likely to benefit indirectly.

Finally, the study acknowledged that the effectiveness of social networks is contingent on differences in the characteristics of care users, the characteristics of their contacts, or their relationship with their contacts and the nature of the health care system. This study does not ascertain the various channels through which the effectiveness of networks is contingent on. It simply illustrates the actuality of the social network effects for respective social clusters. Justification as to why the magnitude of network effects varies significantly across groups remain difficult, unless there is more detailed information on the functioning of the health care system, relationship between health care users and their contacts, and the patient-physician relationship. A further understanding of the dynamics and complexities of social networks in the Tanzanian health care system hinge critically on a robust data set on social networks, possibly on actual rather than potential contact

# Chapter 3

## Bargaining Power within Couples and Health Care provider Choice in Tanzania

### 3.1. Introduction

Even in contexts where reproductive health services are heavily subsidised or made free, take-up in most developing countries is far from universal (Beegle *et al.,* 2001a). One of the reasons is that in most circumstances, a woman's decision to use these services happens within the context of a marriage, a household or a family (Becker, 1996). The level of negotiation within couples over the use of these services depends on the extent to which they differ in the valuation of reproductive health care. The outcome of their negotiation is determined by the way each member perceives the value of the services in relation to costs, and given their relative power in decision-making (Beegle *et al.,* 2001a). This chapter examines a number of indicators of relative bargaining power within couples and ascertains their effect on the use of reproductive health services in Tanzania. Specifically, it focuses on health care use at delivery and health care provider choice at childbirth. The study in Tanzania is interesting as maternal health services are costly in private health facilities, but free in public facilities, yet only about 50 percent of all childbirth occur in a health facility, as opposed to home.

As the out-of-pocket money price declines due to increased health insurance coverage and the likely national health policy legislation, non-monetary factors gain an important role in explaining the demand for health services. Even in the absence of user fees, non-monetary factors, such as waiting and travel time, help to explain the unequal access to health care (Acton, 1975a). In line with this argument, studies have shown that both price and non-price factors are *sine qua non* for health care demand (Bolduc *et al.,* 1996; Dor *et al.,* 1987; Mwabu *et al.,* 1993; Eme Ichoku & Leibbrandt, 2003; Sahn *et al.,* 2003). On the one hand, several studies have identified the importance of individual and household characteristics (Adamu & Salihu, 2002; Andersen & Newman, 2005; Bhatia & Cleland, 1995; Currie & Gruber, 1996) and other non-price factors such as waiting and travel time (Wagle *et al.,* 2004). On the other hand, few studies have shown that women's power relative to that of their partners explain the use of reproductive health care services (Beegle *et al.,* 2001a; Maitra, 2004; Maitra & Pal, 2007).

The channel through which gender empowerment affects health care demand is crucial in developing economies, given the relatively low female participation in economic activities and

in household decision making process (Mammen & Paxson, 2000; Nikièma *et al*, 2008). Female education and maternal autonomy increases awareness about the availability of health care services as well as utilisation (Obermeyer, 1993). In addition to this, the ability of a woman to control household resources has a significant effect on health care usage (Allendorf, 2007; Maitra & Pal, 2007). Weaker maternal autonomy is associated with higher fertility, lower contraceptive use (Gage, 1995; Govindasamy & Malhotra, 1996; Morgan & Niraula, 1995) and poor child and maternal health (Bloom *et al.,* 2001a). Therefore, the economic and social dimensions of the distribution of power between spouses matter in determining the use of reproductive services.

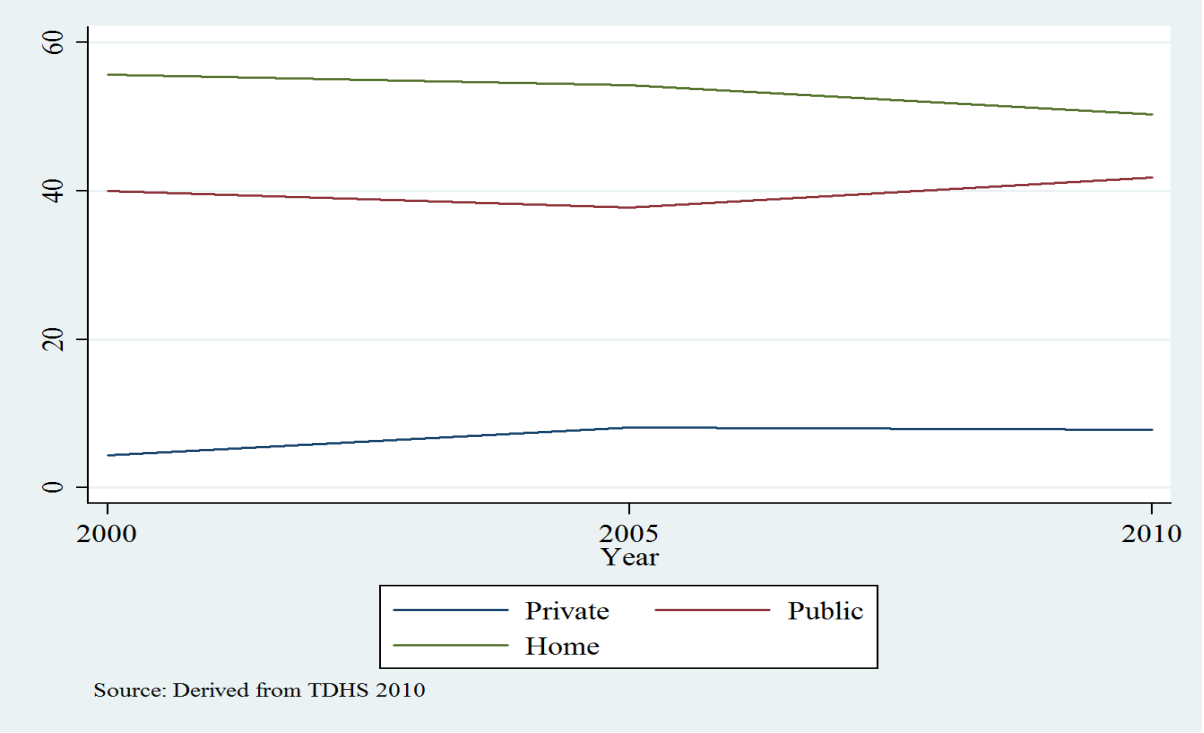
In Sub-Saharan Africa, women's access to health care may be affected by decision making mechanisms of intra-household resource allocation as well as traditional norms (Arhin-Tenkorang, 2001; Stierle *et al*, 1999). The demand for health care by women is not only dependent on household resource endowments, but also on the way resources are allocated between household members (Nikièma *et al*, 2008). Therefore, the underlying household decision-making process co-determines if, when, and the extent to which women consume modern health services (Nikièma *et al.,* 2008). Relative to men, women usually have fewer resources, limited access to education, paid work, inheritance and credit. In addition to these constraints, the under-utilisation of reproductive health services may equally be attributed to uneven gender relationships and inequities in power within the household.

In most aspects, and because household resources are mostly controlled by men in most SSA countries, women typically depend on their husbands' consent to seek care (Blackden *et al.,* 2006; Kevane, 2004; King & Mason, 2001). The high level of gender discrimination in Africa may constrain African women's ability to mobilise resources for health care (Grün, 2004; Rogers, 2005; Tuwor & Sossou, 2008). While the role of women's autonomy on health care use has been documented in both developed and developing countries, this evidence is not clear in the context of Tanzania. Household dynamics differ between societies, especially in Africa where cultural norms and traditional beliefs still play a vital role. This makes country specific case studies important for policy intervention. This chapter examines how cooperation between couples in decision making and how empowerment of women can influence health care use at childbirth as well as health care provider choice in Tanzania.

Compared to some Sub-Saharan African countries, Tanzania has a well-developed network of health facilities which are distributed evenly through the entire economy. Approximately 90

percent of its citizens live within 5 kilometres of a primary health care facility. In addition, the government of Tanzania has authorised the removal of user-fees in public facilities for all women during pregnancy and at childbirth (Mosha *et al.,* 2006). Given this and other interventions identified in the introductory chapter, it is surprising why up to about 50 percent of children are delivered at home when the risk of mortality is higher[24] (See Figure 3.1). Delivery in a health care facility, therefore, still remains one of the most important challenges facing reproductive health care utilisation in Tanzania.

Figure 3.1: Trends in delivery by facility type




Source: Derived from TDHS 2010

With the low level of physician density in most developing countries and the inability to own private medical professionals, home deliveries are less likely to be attended to by a trained health professional. In the context of developing countries, it has been shown that the majority of all neonatal mortality between 1995 and 2003 emanated from home delivery, without a trained health professional (Lawn *et al.,* 2005; Lawn *et al.,* 2006). In terms of effectiveness of health service delivery, there is no clear distinction between the private and public providers. However, understanding people's preferences between these providers can help direct policy.

[24] It is evident that home births contribute a high rate of infant and maternal mortality relative to facility births in Australia (Bastian *et al.,* 1998). Equally, Wax *et al.,* (2010) showed that in developed Western nations, planned home births relative to planned hospital births are associated with high neonatal mortality rate.

It has been highlighted in the literature that individuals from affluent households are more likely to access private care, whereas the poor rely on public care and, at times, opt for self-treatment (Booysens & Visser, 2005; Havemann & Van der Berg, 2003; Booysen, 2003). It is important to clarify the factors that hinder individuals' ability to deliver in a health facility. In particular, a distinction between what drives their decision to choose between alternative health care providers is important as the benefits and costs obtained from different providers vary significantly.

In the case of Tanzania where public health care for all pregnant women is free and private health care is costly, the public/private divide in access to health care remains stark. Bargaining power between couples affects the choice to use reproductive health care, and even once choice is made, it may influence public-private facility choice. This study adds to previous literature by introducing the role of household bargaining dynamics in accessing health care during delivery, particularly, how it affects pregnant women's choice between public and private care. This may be of importance in the context of Tanzania where most communities are basically patriarchal, whereby traditional norms, practices and attitudes are concentrated on male power and legal protection of women is limited (World Bank 2013a).

### 3.2 Bargaining Power and Health Care Usage Literature

While the association between household bargaining, and fertility and family planning has been carefully researched (Bankole, 1995; Freedman *et al.,* 1980; Rasul, 2008; Thomson *et al.,* 1990; Thomson, 1997), very little evidence is available on its association with health care usage (see Beegle *et al.,* 2001a; Maitra, 2004). According to Maitra (2004), the literature on the issue was surprisingly scarce before 2003. However, in the last decade, there has been growing evidence on how household bargaining, most especially women's autonomy, influence the use of reproductive health services. While there is well documented evidence especially in developing countries, much is not known in most SSA countries, particularly in Tanzania. This section presents international evidence on the effects of bargaining between couples on the use of health care services. It also presents any available evidence in the context of Tanzania.

In an attempt to understand health care use barriers, Becker (1996), highlighted that though women are the main point of contact for reproductive health services, their decision to use these services is limited, as it occurs within the context of marriage or a household. If the way couples

value reproductive health services differ, then the use of these services will be subjected to negotiations within couples. The resulting outcome of the negotiation will depend on each person's perception, costs and relative power in the household. Based on this argument, the pioneer work of Beegle *et al.* (2001a) investigated the role of bargaining power of couples to the use of prenatal and delivery care in Indonesia. The study showed that a woman's influence over the use of these services increases if she owns some share or has discretion over household resources, and if she is more educated than her husband.

While the study by Beegle *et al.* (2001a) was limited to differences in educational attainment and ownership of assets as a measure of bargaining power, Bloom *et al.* (2001a) used three indicators to measure women's autonomy in the household, in a study in India. This included control over finances, decision making power and freedom of movement. After controlling for maternal characteristics and the household structure, the study found that greater freedom of movement of women increases the probability of using antenatal and safe delivery care.

Maitra (2004) followed a similar approach but expanded the work of Beegle *et al.* (2001a) and Bloom *et al.* (2001a) by identifying additional indicators of bargaining within couples. This study examined the effects of parental bargaining on prenatal and hospital delivery in India. The attributes of bargaining considered here include, female ownership of assets, decision making power; freedom of movement and incidence of domestic violence. With these indicators, the study further constructed an index of bargaining power for women using a principle component analysis. It is evident from the study that a unit rise in the bargaining index increases the probability of prenatal care by 40 percent and that of hospital delivery by 25 percent. Results from the study indicate that the gap between a women's educational attainment relative to that of their husband has stronger effects on health care use, and her control over household resources significantly increase the use of prenatal and delivery care services.

Allendorf (2007) examined the health care use effects of female autonomy in Nepal. The study argued that education and employment are two most important sources for female autonomy. In addition to education and employment, it finds that if spouses agree to female autonomy in the household, the use of health care services is likely to be stronger than when they disagree. In a qualitative study, Nikièma *et al.* (2008) argued that in a restrictive socio-cultural setting, social norms are likely to shape resource negotiation for women to seek health care. Women are shown to suffer delays or sometime exclusion to seek care.

A number of studies in the recent period have focused on the above listed indicators to explain the autonomy or bargaining power of women in relation to the use of reproductive health care (see Mullany *et al.,* 2005; Danforth *et al.,* 2009; Sharma *et al.,* 2007; Mbweza *et al.,* 2008; Doss, 2013). Only one of these studies, Danforth *et al.* (2009), attempted to investigate the role of women in household decision-making on facility delivery in the Kasulu district of Tanzania. The study confirmed that when partners agree on the importance of delivery in a facility and the use of a doctor rather than a traditional birth attendants (TBAs), the probability of delivery in a facility increases. Their study is limited as it focused only on a single district. Also, the literature highlighted above failed to show how bargaining power between couples explain health care provider choice at childbirth. This study covers all the districts in Tanzania and further extent previous literature by identifying how bargaining power affect the probability of alternative provider choice.

### 3.3. Theoretical Model

The modelling of health care demand emerged in the early 1960s as economists saw the need to estimate the demand for health care services. These models were reduced-form equations obtained from the utility maximisation assumptions. The demand for a particular health service was assumed to depend on its price, prices of alternative providers, household resources and taste. Factors like time costs for consuming health services and demographic factors of the patient, such as age and education, were ignored. The health care equation was reformulated in the 1970s to allow for the inclusion of these factors (see Acton, 1975b; Christianson, 1976; Grossman, 1972).

With the limited resource endowment of most households, decision choices are made with a view of household utility maximisation. The opportunity cost of paying for medical care is the consumption of other goods and services forgone. If a household member is ill, he/she seeks treatment if and only if the individual or household utility gain from medical care is at least as good as the forgone utility from other non-health goods (Acton, 1975a; Grossman, 1972). However, should the household decides to seek medical care for its sick member, the question is which alternative care provider is to be used. If the household is rational, they choose the provider with the highest net benefits.

The health care provider choice theory builds on the theoretical insights of Grossman's (1972) demand for health model, which in itself builds on the neoclassical microeconomic fundamental assumptions (Wagstaff, 1986). In this chapter, the probability that an individual pregnant woman chooses a particular health care provider at delivery is modelled. The specification follows the philosophies of Gertler *et al.* (1987) which state that an individual has a well behaved[25] utility function defined over his consumption of both health and non-health related goods and services. Thus, the direct utility function of an individual woman for choosing a specific health care provider is specified as follows:

$$U_{jk} = U_{jk}(h_{jk}, Z_{jk}) \tag{3.1}$$

Where, $U_{jk}$ is the direct utility that individual $j$ expects to get conditional on choosing provider, $k$, $h_{jk}$ is the expected health outcome of individual $j$ for obtaining care from provider $k$, and $Z_{jk}$ is consumption of non-health related goods. The relative amount of $Z_{jk}$ consumed depends on provider choice $k$, since the monetary and non-monetary costs of care differs between providers. The resulting improvement in health status ($h_{jk}$) depends on individual characteristics $v_{j,}$ such as age, education and wealth as well as characteristics of the provider $w_k$, which include quality, price and availability of services. The improvement in health status is given as:

$$h_{jk} = Q(v_j, w_k) + \varepsilon_k \tag{3.2}$$

The amount of income available to be spent on other goods and services after expenditure on medical care services depends on gross income $Y_j$ and the price $P_k$, paid for $k's$ services. The expenditure on medical care $P_k$ are both direct (monetary costs of services) and indirect costs (travel time to and waiting time in the facility). After paying for health services in a given facility $k$, the remaining amount to be spent on other goods and services is given by:

$$Z_{jk} = z(Y_j - P_k) \tag{3.3}$$

Where $P_k$ is total amount, both direct and indirect, spent on health care for choosing provider $k$. The direct utility obtained for selecting an alternative provider $k$ then becomes:

$$U_{jk} = z(Y_j - P_k) + Q(v_j, w_k) + \varepsilon_k \tag{3.4}$$

[25] The utility functions are a real valued, continuous, differentiable and quasi-concave.

Where $(Y_j - P_k)$ is income net payment for utilising health services of provider $k$, and $Q(v_j, w_k)$ is the quality of the preferred provider $k$. Consider that $k = 1$ if an individual $j$ chooses a public facility, and $k = 2$ if the individual chooses a private facility, for utility maximization, individual $j$ will prefer a private provider to a public provider if and only if $u_{j2} > u_{j1}$. The probability for the choice of private over the public provider is given by:

$$P(y_j = 1/x) = Prob(\varepsilon_{j1} - \varepsilon_{j2} \prec u_{j2} - u_{j1}) \quad (3.5)$$

If the sample is random, then the probability that households or individuals with similar characteristics prefer $u_{j2}$ over $u_{j1}$ is given by:

$$P(y_j = 1/x) = Prob(u_{j2} \succ u_{j1}) \quad (3.6)$$

Where $y_j = 1$ is equivalent to the probability that the utility the individual or household obtains for using private care is more than the utility they get for using public care, given the individual or household socioeconomic status. In probabilistic models, the stochastic term $\varepsilon = (\varepsilon_{j1} - \varepsilon_{j2})$ is assumed to be independently and identically distributed with mean zero and a variance that depends on the type of the probabilistic model used. The consistency of the distribution of the errors to the random utility maximization depends on this property.

### 3.4. Estimation Strategy

At the time of delivery, a woman is assumed to seek medical care from a system characterised by many health care providers. The woman, or any of her relatives, is assumed to choose the provider that yields the maximum expected utility. The probability that the utility from a given provider of care is higher than the utility from any of the other alternative providers determines the health care demand function of that provider. This study assumes that provider choice decision can best be estimated using a nested logit.

Until recently, most of the health care provider choice literature has assumed that health care demand functions take on a multinomial or conditional logit form (Booysens & Visser, 2005; Ntembe, 2009; Qian *et al.,* 2010). These models place unrealistic restrictions on individual behaviour. They make strong assumptions that the error terms are independently and identically distributed and that the Independence of Irrelevant Alternative (IIA) assumption is satisfied. The Independence of Irrelevant Alternative assumption implies the conditional utility functions

are uncorrelated across alternative providers. The multinomial logit further imposes the restriction that cross-elasticities of demand across alternatives are constant.

These methods could be applicable if, and only if, the various alternative providers of care are completely dissimilar, or the error terms of the choices are completely independently distributed (see Domencich & McFadden, 1975). Otherwise, the estimates generated are inconsistent (Amemiya, 1985). The cross-substitution effects observed between pairs of alternatives are unequal in the presence or absence of other alternatives in the model once the assumptions are violated (Hensher *et al.,* 2005). Hence multinomial and conditional logit models are inappropriate in modelling health care provider choice as their inherent assumptions are likely to be violated (Dor *et al.,* 1987; Mwabu *et al.,* 1993; Eme Ichoku & Leibbrandt, 2003; Sahn *et al.,* 2003; Brown & Theoharides, 2009).

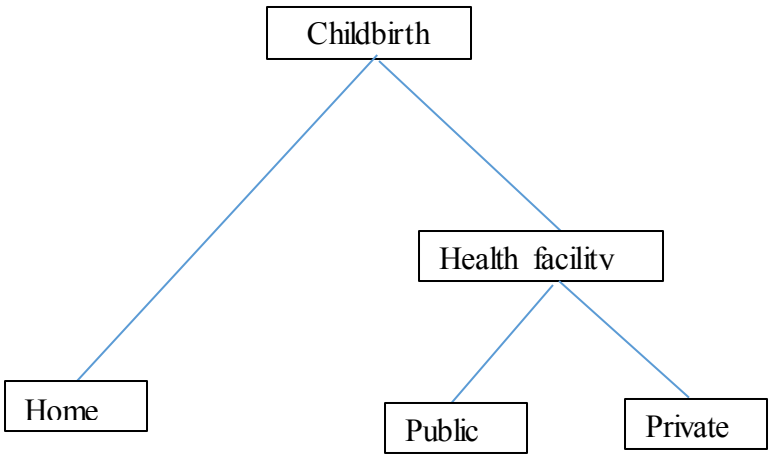
The nested logit model is identified as the most analytically tractable generalisation of the multinomial logit model and is the most advanced in terms of studies of choice (Cameron, 2005; Hensher *et al.,* 2005; Manski & McFadden, 1981). Although not all multinomial choices have the obvious nesting structure, the nested multinomial logit is an ideal model to be used when there is a well-defined and identified nested structure (see Figure 3.2 for the case of this chapter). It handles the challenges of the multinomial and conditional logit, but retain the identically and independently distributed error term assumption at each decision node. While the within category errors maybe correlated, the between errors are uncorrelated[26].

This chapter is concerned with both the decision to seek health care during childbirth and the decision to choose between alternative health care providers. The estimated nested structure can be best illustrated in a tree in which decisions are made in each distinct nest (Brown & Theoharides, 2009). To re-iterate, the nested logit is appropriate in that it allows for the estimation of the covariance between the errors and cross-elasticities to vary between options. This study adopts the multinomial nested logit type approach used by Sahn *et al.,* (2003)[27]. The nesting structure estimated is presented in Figure 3.2

[26] In our case, the errors within the health care facilities (private and public) may tend to be correlated, but the errors between no care and choosing between public and private care are uncorrelated.

[27] An alternative to this approach is the multinomial probit model. However, the multinomial probit model is similar to the multinomial logit model, just like the binary probit is similar to the binary logit model. The only difference is that the multinomial probit uses a standard normal cumulative density function.

Figure 3.2: Estimated nested structure




Since this is based on the choices that individual women or households make conditional on being pregnant, women who did not give birth within the period of the survey are not included. Based on Sahn *et al.* (2003), the probability of choosing option $k$ is:

$$\pi_k = \frac{\left[exp\left(\frac{H_k}{\delta_{j(k)}}\right)\right]\left[\sum_{i\in j(k)} exp\left(\frac{H_i}{\delta_{j(k)}}\right)\right]^{(\delta_{j(k)}/\tau_{h(k)}-1)}\left[\sum_{j\in h(k)}\left[\sum_{i\in j(k)} exp\left(\frac{H_i}{\delta_{j(k)}}\right)\right]^{(\delta_{j(k)}/\tau_{h(k)})}\right]^{(\tau_{h(k)}-1)}}{\sum_h\left(\sum_{j\in h}\left[\sum_{i\in j} exp\frac{H_i}{\delta_j}\right]^{\delta_j/\tau_h}\right)^{\tau_h}} \quad (3.7)$$

Where $i$ represents health care options available, $j$ is the lower level nests (public and private), and $h$ is the upper level nest (home and health facility). The indirect utility from each chosen health provider is given by $H_i$. The inclusive value parameters are $\delta_j and\ \tau_k$. While $\delta_j$ is the inclusive value parameter for the lower level nests, $\tau_k$ is the inclusive value parameter for the upper level nests (known as the limbs). The lower and the upper level nests to which the option $h$ belong is given by $j(k)\ and\ h(k)$ respectively. It should be noted that if the inclusive value parameter of the upper level nest is constrained to one, the model reduces to a one-level nested logit probability, and finally to a multinomial logit model, if the inclusive value parameter for the lower nest is constrained to one. There are therefore three options (home, public and private), and can be estimated using a one-level multinomial nested logit presented in Figure 3.2, as opposed to the two-level nested logit (see Sahn *et al.,* 2003). This method is advantageous as it allows for the estimation of cross changes in probabilities and avoid the hurdles of the standard multinomial logit model.

### 3.5. Data and Sample Characteristics

The data used in this chapter is extracted from the 2010 Tanzanian Demographic and Health Survey. Since this chapter is interested in women who gave birth during the five years before the survey, the sample is limited to individual women who reported to have given birth within the five years prior to the survey. For the purpose of the empirical analysis in this chapter, this survey is limited in the lack of an accompanying community survey. With regard to cost, getting the direct costs (user charge for supplies) in each option is difficult and has made the use of prices in health care demand literature limited (Booysens & Visser, 2005; Brown & Theoharides, 2009; Sahn *et al.*, 2003). Similarly, most datasets have no information on the quality of care provided by each alternative provider. Again, these limitations do not undermine our analysis. Following Sahn *et al.* (2003) user charges are excluded, but the indirect or opportunity costs that is associated with distance to the health facility is included.

As Table 3.1 demonstrates, 50 percent of the sample delivered at home without a skilled health professional (though some were attended to by traditional Birth Attendants (TBA)), compared to 42 percent in the public health care facility, and 8 percent in a private health care facility. For individual characteristics, the average age of women in the sample is 36 years. The average years of schooling per woman is approximately five years, whereas the average years of schooling per male is approximately six years. Over 83 percent of all women in the sample are employed. This includes those employed in both skilled and unskilled jobs. The fertility rate measured by number of children ever born per woman is 5.4. Of the number of children per woman, at least 1.3 of them are of age five years and below. The awareness about pregnancy complications is used as a measure of reproductive health knowledge. Over 54 percent are aware of the risks associated with pregnancy.

Table 3.1: Mean statistics for variables used in the analysis

| Variable | | All | | Deliver in a facility | | Delivery at home | |
|---|---|---|---|---|---|---|---|
| Proportion of individuals that delivered at home | 11937 | 0.50 | (0.50) | | | | |
| Proportion of individuals that delivered in public facility | 9921 | 0.42 | (0.49) | | | | |
| Proportion of individuals that delivered in private facility | 1854 | 0.08 | (0.29) | | | | |
| **Characteristics of the individual woman** | | | | | | | |
| Age of individual women (years) | 24069 | 36.0 | (7.98) | 28.4 | (6.75) | 29.6* | (6.99) |
| Individual years of schooling | 24069 | 4.82 | (3.43) | 5.78 | (3.32) | 4.06* | (3.28) |
| Individual is employed | 19962 | 0.83 | (0.34) | 0.81 | (0.39) | 0.81 | (0.39) |
| Number of children ever born by the individual | 24069 | 5.44 | (2.65) | 3.46 | (2.22) | 4.59* | (2.46) |
| Number of under-five children by the individual | 24069 | 1.13 | (0.91) | 1.60 | (0.66) | 1.88* | (0.70) |
| Completed number of antenatal care visits | 7053 | 0.43 | (0.50) | 0.50 | (0.50) | 0.35* | (0.48) |
| Knowledge of pregnancy complications | 8718 | 0.54 | (0.50) | 0.63 | (0.48) | 0.42* | (0.49) |
| **Household characteristics** | | | | | | | |
| Distance to health facility is problematic | 9891 | 0.46 | (0.50) | 0.35 | (0.48) | 0.56* | (0.50) |
| Individual lives in urban areas | 4533 | 0.20 | (0.40) | 0.33 | (0.47) | 0.07* | (0.26) |
| Has health insurance | 795 | 0.05 | (0.23) | 0.06 | (0.24) | 0.02* | (0.15) |
| Household size | 24069 | 7.14 | (4.05) | 6.80 | (4.17) | 7.77* | (4.68) |
| First wealth quintile | 4830 | 0.21 | (0.41) | 0.14 | (0.35) | 0.29* | (0.45) |
| Second wealth quintile | 5445 | 0.23 | (0.42) | 0.17 | (0.38) | 0.30* | (0.46) |
| Third wealth quintile | 5145 | 0.22 | (0.42) | 0.21 | (0.40) | 0.24* | (0.43) |
| Fourth wealth quintile | 4968 | 0.20 | (0.40) | 0.23 | (0.42) | 0.14* | (0.35) |
| Fifth wealth quintile | 3681 | 0.14 | (0.35) | 0.25 | (0.44) | 0.03* | (0.17) |
| **Partners' characteristics and the differences** | | | | | | | |
| Years of schooling of the partner | 22884 | 5.68 | (3.49) | 6.56 | (3.36) | 4.81* | (3.20) |
| Husband/partner is more educated than wife | 7908 | 0.34 | (0.48) | 0.33 | (0.47) | 0.34 | (0.47) |
| Husband/partner and wife are equally educated | 10338 | 0.49 | (0.50) | 0.51 | (0.50) | 0.46† | (0.50) |
| Wife is more educated than husband/partner | 4638 | 0.17 | (0.38) | 0.16 | (0.37) | 0.20‡ | (0.40) |
| Average difference in education of partners | 22884 | 0.79 | (0.65) | 0.84 | (0.39) | 0.75 | (0.88) |
| Husband/partner is older than wife | 19359 | 0.93 | (0.25) | 0.94 | (0.24) | 0.94 | (0.24) |
| Husband/partner and wife are of same age | 621 | 0.03 | (0.16) | 0.03 | (0.17) | 0.04 | (0.19) |
| Wife is older than husband/partner | 693 | 0.04 | (0.20) | 0.03 | (0.17) | 0.02† | (0.15) |
| Average difference in age of partners | 20673 | 7.33 | (6.94) | 7.04 | (6.41) | 7.57 | (7.40) |
| **Indicators of bargaining** | | | | | | | |
| Wife beaten justify if she (violence) | | | | | | | |
| Goes out without telling her partner | 8943 | 0.41 | (0.49) | 0.38 | (0.49) | 0.45* | (0.50) |
| Neglects their children | 9336 | 0.44 | (0.50) | 0.41 | (0.49) | 0.47* | (0.50) |
| Argues with her partner | 8967 | 0.41 | (0.49) | 0.40 | (0.49) | 0.46* | (0.50) |
| Refuses to have sex with her partner | 7599 | 0.37 | (0.48) | 0.32 | (0.47) | 0.41* | (0.49) |
| Burns food | 4200 | 0.20 | (0.40) | 0.18 | (0.39) | 0.23* | (0.42) |
| Getting money for medical care is problematic | 10935 | 0.49 | (0.50) | 0.40 | (0.49) | 0.53* | (0.50) |
| Spouses cooperate in health care decision | 11412 | 0.62 | (0.49) | 0.62 | (0.49) | 0.52* | (0.50) |
| Spouses cooperate in household visit decision | 11307 | 0.51 | (0.50) | 0.51 | (0.50) | 0.42* | (0.49) |
| Spouses cooperate in household purchases decision | 5613 | 0.32 | (0.47) | 0.32 | (0.47) | 0.27* | (0.45) |

Notes: Standard deviation in parentheses. ‡, † and * indicates that the difference in characteristics between those delivered in a facility and those who delivered at home are statistically significant at 10%, 5% and 1% respectively, otherwise they are not significant.

In terms of household characteristics, the average number of children per household is five. Less than half (46 percent) of women who gave birth within this period viewed distance to the nearest facility as a hindrance for accessing maternal health care services. Over 80 percent of the sample are from rural areas, relative to 20 percent residing in urban areas. Only 5 percent of the sample is covered with health insurance. Finally, about 14 percent of all households in the sample belong to the uppermost wealth quintile, with 23 percent belonging to the second, 22 percent to the third, and 20 percent to the fourth wealth quintile. Over 21 percent of households are from the lowest quintile. This indicates that over 44 percent of the sample are in the low income class, 22 percent in the middle class, and 34 percent in the high income brackets. As is the case in the previous chapter, there are over 43 percent women in the sample that completed the recommended number of antenatal visits. In general, samples with favourable individual and household characteristics are more likely to deliver in a health care facility as opposed to delivering at home.

### 3.5.1. Measures of Bargaining

Several studies have used economic resources to analyse the bargaining power within couples. The main focus has been on current assets and those brought into marriage (Beegle *et al.,* 2001b; Quisumbing & Maluccio, 2000), unearned income (Schultz, 1990; Thomas, 1990), or remittances and welfare receipts (Lundberg *et al.,* 1997; Lundberg & Pollak, 1994). Recent literature has deviated from economic factors and rely on non-economic factors (domestic violence, decision making process, female education, employment and discretion over resources) that proxy the bargaining power or the status of women in a household (Ghuman, 2003; Maitra, 2004; Nikièma *et al.,* 2008). These non-economic factors are common in sociology and demography literature, and measure the degree of autonomy of women in the household. In this chapter, differences in age and education of couples and other indicators of the status of women in the household are used as measures of bargaining power, in addition to economics resources.

The level of education of women determines the probability of antenatal care use as well as institutional delivery (Overbosch *et al.,* 2004). It is generally argued that education of women increases their economic independence, access and control over resources, knowledge and exposure, autonomy and decision making power, and reduces the constraints to physical mobility (Maitra, 2004). Education of women is therefore a measure of their power in

household decision, and is likely to increase the use of reproductive health services, as these services are primarily at the domain of women. For the purpose of descriptive statistics, differences in education of couples is categorised into a set of dummies[28]. The dummies include: husband/partner is better educated than wife, partners are equally educated, and wife is better educated than husband.

The descriptive statistics in Table 3.1 shows that in 34 percent of all households, women are less educated than their partners; in 49 percent, they have the same level of education; and only in 17 percent are women more educated than their partners. A similar approach is used to categorise the dummies for differences in age between couples. In 93 percent of all households, women are younger than their partners, in 3 percent they are of the same age, and in 4 percent women are older than their partners. The average difference in education between partners is 0.79, whereas the average difference in age between partners is 7.33 years. This implies that on average, women are over 7.33 years younger than their partners and just about a year less educated than their partners.

For the sociological or demographic (non-economic) measures of power, two sets of criteria are used to describe the status of women in the household. The first measure is the degree of female autonomy in terms of freedom from domestic violence by her partner, and second is participation in household decision-making, in addition to differences in age and education (Caldwell *et al.,* 1992; Dyson & Moore, 1983). Following Ghuman (2003), to capture the effects of women's freedom from domestic violence, an index is constructed from five questions in TDHS using the Principle Component Analysis (PCA). That is, women were asked whether or not they were beaten if (1) they went out without telling their partner, (2) they neglected their children, (3) they argued with their partner, (4) they refused to have sex with their partner, and (5) they burnt food. A summary of the indicators of domestic violence reveals that on average, 41 percent of the women were beaten if they went out without informing their partner, 44 percent if they neglected their children, 41 percent if they argued with their partner, 37 if they refused to have sex with their partner, and 20 percent if they burnt food. The correlation between these factors is presented in Table B3.1 and the details of the PCA weighting factors are presented in Table B3.2 of the appendix.

In terms of decision making power of the woman, they were asked whether or not they cooperate with their partners on decisions regarding household health care use, household daily

[28] In the empirical analysis, the values of the raw difference is used.

purchases and relatives' visit to the household. Concerning discretion over household resources by the woman, they were asked whether or not getting money to seek health care was problematic. Likewise, employment status of the woman is used to proxy for her discretion over economic resources. Finally, educational attainment and knowledge about pregnancy complications are used as a proxy for access to information by the woman. The selection of these measures is guided by the literature on household bargaining power (Aizer, 2007; Friedberg & Webb, 2006; Garikipati, 2008; Ghuman, 2003; Panda & Agarwal, 2005).

On average, over half of all women in the sample live in household where couples cooperate in decision over relatives visit, 62 percent in household where couples cooperate in health care seeking decision, and only 32 percent in household where partners cooperate in daily purchases decision. About 49 percent of women in the sample reported that getting money from their partners to go for medical care is problematic, and over 43 percent reported to have completed the required number of antenatal care visits.

Finally, statistics in the last four columns of Table 3.1 show that on average, the characteristics of those who delivered in a health facility are significantly different from the characteristics of those who delivered at home. For instance, a lower proportion (18 – 41 percent) of those with domestic violence delivered in a facility and a higher proportion (23 – 47 percent) of those that experienced domestic violence delivered at home. Over 53 percent of those who had problems getting money for care delivered at home whereas only 40 percent delivered in a facility. A higher proportion (32 – 62 percent) of those who cooperate in decision-making delivered in a facility and a lower proportion (27 – 52 percent) delivered at home. The proportion of those who delivered in a facility increases as we move from lower to higher income quintiles.

Table 3.2 shows the average difference in the level of use of health care facilities at delivery across various bargaining indicators, individual characteristics and household socioeconomic factors. For instance, the first row indicates that only 47 percent of women who report beaten if they went without telling their partners actually delivered in a facility, whereas over 51 percent of those not beaten delivered in a facility. Women who are subjected to domestic violence by their partner are significantly less likely to deliver in a health facility than women who are free from violence. As expected, the use of health care is higher among couples that cooperate in household decision. On average, over 52 percent of households where couples cooperate in health care decision are likely to use a facility at delivery relative to 46 percent if

no cooperation in health care decision. Furthermore, health facility use is higher among households that cooperate on relatives visit and those that cooperate in purchase decisions.

Table 3.2: Mean comparison of health facility deliveries across various characteristics

| Deliver in a facility | | Mean | | Mean Difference |
|---|---|---|---|---|
| Variables | Obs. | Yes | Obs. | No | (Yes - NO) |
| Wife beaten justify if she (violence): | | | | | |
| Goes out without telling her partner | 8820 | 47.0 | 14703 | 51.3 | -0.042* |
| Neglects their children | 9216 | 47.6 | 14343 | 51.0 | -0.034* |
| Argues with her partner | 8832 | 46.0 | 14688 | 51.9 | -0.059* |
| Refuses to have sex with her partner | 7464 | 44.8 | 16032 | 52.0 | -0.072* |
| Burns food | 4119 | 46.5 | 19485 | 50.5 | -0.040* |
| Spouses cooperate in health care decision | 8160 | 51.5 | 12315 | 46.3 | 0.052* |
| Spouses cooperate in household visit decision | 7764 | 51.4 | 12669 | 46.5 | 0.049 * |
| Spouses cooperate in household purchases | 5538 | 51.2 | 14916 | 47.3 | 0.040* |
| Getting money for medical care is problematic | 10761 | 43.4 | 12924 | 54.9 | -0.115* |
| Completed number of antenatal care visits | 7002 | 61.9 | 8796 | 46.2 | 0.157* |
| Individual is employed | 19641 | 55.8 | 4647 | 48.4 | 0.074* |
| Has knowledge of pregnancy complications | 8610 | 61.9 | 6744 | 43.5 | 0.185* |
| Distance to facility is problematic | 9696 | 39.3 | 13959 | 57.0 | -0.177* |
| Has health insurance | 780 | 74.6 | 22920 | 48.8 | 0.258* |
| Individual lives in urban areas | 4488 | 81.4 | 19224 | 42.3 | 0.391* |
| Individual belongs to first wealth quintile | 4761 | 32.0 | 18951 | 54.1 | -0.221* |
| Individual belongs to second wealth quintile | 5349 | 37.2 | 18363 | 53.3 | -0.160* |
| Individual belongs to third wealth quintile | 5037 | 45.8 | 18675 | 50.7 | -0.049* |
| Individual belongs to fourth wealth quintile | 4917 | 58.6 | 18795 | 47.3 | 0.112* |
| Individual belongs to fifth wealth quintile | 3648 | 84.2 | 20064 | 43.4 | 0.408 * |

Notes: * Significantly different from zero. Obs. = number of observations, Yes = individual has such characteristics and No = individual does not have such attributes. The Yes and No columns shows the proportion of these individuals that delivered in a facility.

Turning to individual characteristics, the fraction of employed women who delivered in a facility is higher than the fraction of unemployed women who delivered in a health care facility. Up to 56 percent of all employed women gave birth in a medical facility, compared to about 48 percent of unemployed women. Birthing care is highest among women who completed the required number of antenatal care visits and those with knowledge about the risks associated with pregnancy. Among women who completed antenatal care, 62 percent used a medical facility during childbirth, relative to only 46 percent for those who did not complete the required antenatal care. Again, 62 percent of those who reported to have knowledge of pregnancy risk used a medical facility, compared to 44 percent for those with no knowledge.

Only about 43 percent of women who had problems getting money for medical care used birthing care, relative to 55 percent for those who had no problem getting money for care.

With regards to household characteristics, the difference is particularly stark for household wealth. While a substantial proportion of women from the uppermost wealth quintile (84%) uses a medical facility at childbirth, only a small proportion of those in the lowest wealth quintile (32%) use birthing care at delivery. The proportion of use increases as we move from the lowest to the highest wealth quintiles, with higher quintiles having higher used proportions. Interestingly, the greatest gap in the use of birthing care is among those in the highest wealth quintile (41%) relative to those in other quintiles. As expected, urban women are more likely to deliver in a medical facility than rural women. Over 81 percent of urban women used a medical facility at childbirth, compared to only 42 percent for the rural population. Among those women with access to health insurance, 75 percent received medical care during childbirth relative to 49 percent for those without health insurance. Finally, a substantial percent (61%) of those who reported distance to the nearest facility as problematic are less likely to use birthing care, compared to those who reported living close to a medical facility (43%). The differences in the use of birthing care resulting from differences in the characteristics reported here suggest that women with favourable individual or household characteristics have health care utilisation advantage over their counterparts.

Table 3.3 shows how bargaining indicators varies with household socioeconomic status. This is to identify whether or not bargaining outcomes are always worse in poor households or in rural communities. The results in Panel A reveal significant variation between various wealth quintiles and bargaining indicators (domestic violence and household decision-making). The first row illustrates the distribution of those who report being beaten if they go out without telling their partners across the various income quintiles. For example, of those who reported being beaten if they went out, a quarter are in the first quintile and 19 percent in the fifth quintile. Households in the first wealth quintile stand out with the highest level of domestic violence ranging from 25 to 28 percent. In contrast, households in the fifth wealth quintile stands out with the lowest incidence domestic violence ranging from 6 to 10 percent. A huge proportion of women subjected to violence are from rural areas. For instance, 85 percent of women who reported being beaten if they went out without telling their partners are from rural areas and only 15 percent are urban dwellers. The majority of women who reported that getting money for medical care is problematic are from the first wealth quintile. The proportion decreases as we move from lower to higher quintiles, ranging from 27 percent for the first

quintile to 8 percent for the fifth quintile. Over 87 percent of all women who had problems getting money for medical care are from rural areas, and only 13 percent from urban areas.

Table 3.3: Cross tabulation of wealth quintile and residential type by bargaining indicators

**Panel A: Percentage distribution of sample across wealth quintile levels and residential type**

| | Household wealth quintile | | | | | Residential type | |
|---|---|---|---|---|---|---|---|
| | First | Second | Third | Fourth | Fifth | Rural | Urban |
| Wife beaten justify if she (violence) | | | | | | | |
| Goes out without telling her partner | 24.91 | 22.61 | 23.68 | 18.94 | 9.86 | 85.43 | 14.57 |
| Neglects their children | 23.67 | 22.58 | 24.07 | 19.66 | 10.02 | 85.52 | 14.48 |
| Argues with her partner | 25.41 | 22.83 | 23.77 | 18.79 | 9.20 | 86.39 | 13.61 |
| Refuses to have sex with her partner | 26.49 | 22.54 | 24.73 | 18.83 | 7.41 | 87.78 | 12.22 |
| Burns food | 28.08 | 22.41 | 25.42 | 18.06 | 6.03 | 87.88 | 12.12 |
| Spouses cooperate in health care decision | 18.53 | 22.93 | 23.1 | 20.07 | 15.37 | 83.54 | 16.46 |
| Spouses cooperate in household visit decision | 18.34 | 22.62 | 22.29 | 20.35 | 16.4 | 82.75 | 17.25 |
| Spouses cooperate in household purchases | 19.14 | 22.83 | 21.83 | 20.34 | 15.86 | 81.45 | 18.55 |
| Getting money for medical care is problematic | 26.86 | 25.27 | 21.62 | 18.33 | 7.92 | 86.87 | 13.13 |

**Panel B: Percentage for the sample by household wealth quintile and residential type**

| | Household wealth quintile | | | | | Residential type | |
|---|---|---|---|---|---|---|---|
| | First | Second | Third | Fourth | Fifth | Rural | Urban |
| Wife beaten justify if she (violence) | | | | | | | |
| Goes out without telling him | 45.21 | 38.50 | 40.68 | 32.25 | 22.56 | 38.31 | 28.30 |
| Neglects their children | 44.10 | 39.42 | 42.43 | 34.33 | 23.51 | 39.33 | 28.87 |
| Argues with him | 44.86 | 37.72 | 39.74 | 31.74 | 20.57 | 37.64 | 25.86 |
| Have sex with him | 41.11 | 32.66 | 36.22 | 27.38 | 14.48 | 33.57 | 20.30 |
| Burns food | 23.93 | 17.81 | 20.40 | 14.34 | 6.45 | 18.42 | 11.01 |
| Spouses cooperate in health care decision | 39.10 | 43.07 | 43.53 | 37.02 | 38.88 | 41.11 | 37.21 |
| Spouses cooperate in household visit decision | 38.20 | 41.94 | 41.48 | 37.00 | 40.89 | 29.46 | 31.32 |
| Spouses cooperate in household purchases | 29.46 | 31.32 | 30.02 | 27.39 | 29.26 | 29.26 | 30.59 |
| Getting money for medical care is problematic | 63.78 | 56.47 | 48.85 | 40.86 | 23.89 | 51.07 | 33.62 |

Concerning cooperation in household decision, the fifth and the first quintiles have the lowest rates ranging from 15 to 16 percent for fifth quintile, and 18 to 19 percent for the first quintile. It is noticed that the high rates of cooperation in household decision are found in the second and third quintiles. Similarly, the higher rates of cooperation in decision making are in the rural than urban areas. These results are not surprising as the proportion in each quintile or in the rural-urban areas is likely to depend on the proportion of individuals in that particular quintile or area (see Table 3.1). In other words with unbalanced group size, larger clusters are likely to weigh more on the mean parameter estimates. To buttress this claim, in Panel B, individuals are categorised into their respective quintiles or location and in each category, the proportion that is subjected to violence or cooperate in household decision is identified.

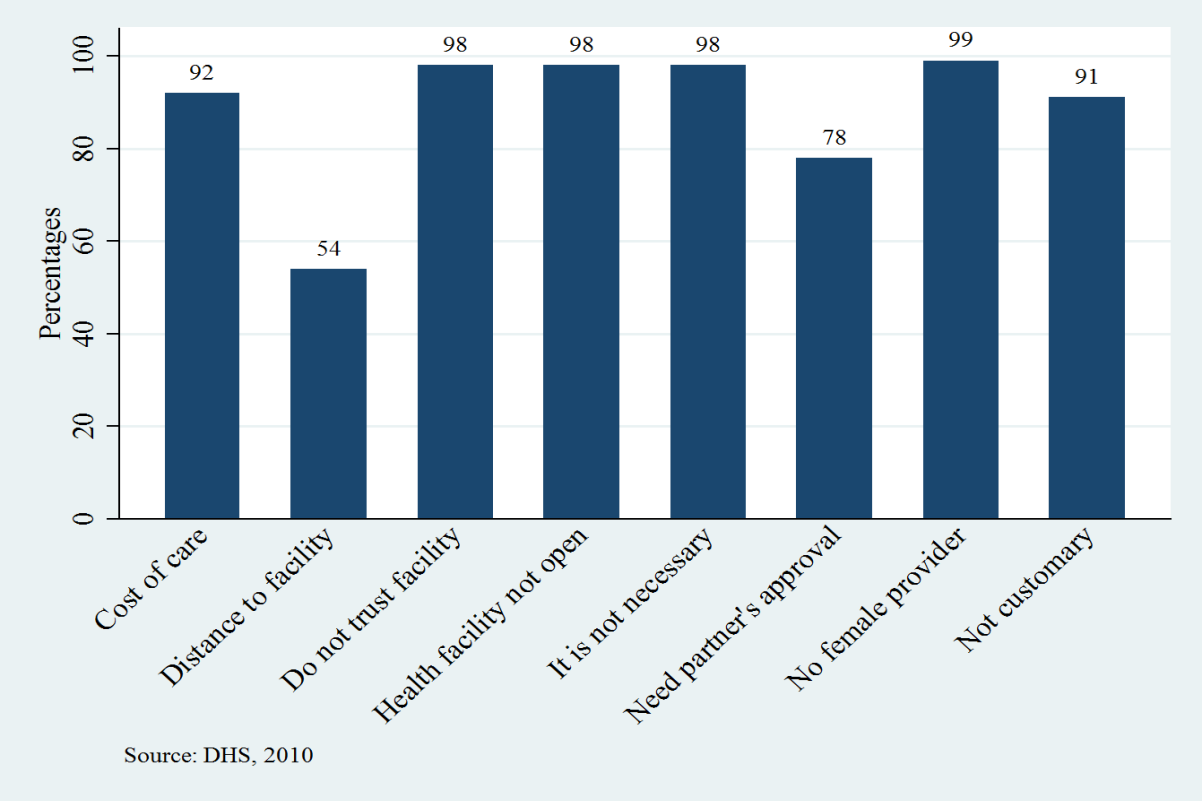
Unlike Panel A, in Panel B individuals are grouped into their respective wealth quintiles or residential type, and in each quintile or location the proportion that cooperates in decision-making or experience domestic violence is identified. For instance, the first row indicates that 23 percent of all individuals in the fifth quintile and over 38 percent of the rural sample reported being beaten if they went out. Individuals in the lower wealth quintile or in the rural areas are more likely to be subjected to domestic violence, and household are less likely to cooperate in decision making relative to their counterparts. For example, of all individuals in the first quintile, over 23 to 45 percent are victims of the various indicators of violence, whereas only about 6 to 23 percent in the fifth quintile are subjected to violence. Over 18 to 39 percent of all rural individuals are victims of violence, but only 11 to 28 percent of all urban individuals are likely to be subjected to violence.

While approximately 64 percent of all women in the first quintile had difficulty getting money for medical care, only about 24 percent in the uppermost quintile had such challenges. In the rural sample, 51 percent of the women had problems getting money for medical care, compared to only 34 percent for the urban sample. In terms of decision-making, only about 29 to 39 percent of all households in the first quintile are able to cooperate in any aspect of decision making in the household, relative to 29 to 41 percent in the fifth quintile. The figures are not surprising if compared to the differences in Panel A. This also indicates that the proportions in Panel A are driven by the proportion in each subsample. Hence, bargaining power is highly correlated with wealth and location, confirming the fact that most communities in Tanzania are patriarchal.

Figure 3.3 presents some of the potential personal barriers that may hinder the use of a health care facility at childbirth. With the exception of distance to facility, the rest of the other questions were specifically for women who did not give childbirth in a facility, and therefore cannot be included in the empirical analysis. Distance to the nearest facility appears to be the major constraint that prevented most women from delivery in a health care facility. For example, over 46 percent reported distance as a major constraint for not using a health facility at birth. Over 22 percent indicated that their inability to deliver in a health facility is because they had difficulties getting money or approval from their partners to seek care. This indicates that their limited discretion over household resources highly affect the chance of delivery in a health facility. Custom and tradition also hinder facility delivery. It is identified that 9 percent of those who did not give birth in a facility claim it is not customary. About 8 percent cited cost of care as a barrier for not using a health facility at delivery. Only 2 percent cited the

remaining barriers, such as quality of service and the absence of a female provider, as reasons for not delivering in a facility.

Figure 3.3: Reported barriers for not delivery in a facility




### 3.6. Empirical Results

Before discussing the results on health care provider choice, it is useful to present simple logit estimates on the decision to deliver in a health facility as opposed to home birth. Suppose individuals are divided into two groups: those who delivered at home and those who received care at childbirth (whether public or private). In this case, the outcome variable is binary and the empirical strategy translates into a logit estimation. The marginal effects estimates of the logit model are displayed in Table 3.4. Four different specifications are estimated. The first specification considers only individual characteristics, while the second model controls for spouse characteristics. The third model controls for other identified indicators of bargaining, and in model four, household demographic and socioeconomic variables are included. Note that only results from the fourth specification are discussed, and observed changes are reported.

Table 3.4: Marginal effects of bargaining including individual and household characteristics

| Variables | Probability of delivery in a facility | | | |
|---|---|---|---|---|
| | Model I | Model II | Model III | Model IV |
| | (1) | (2) | (3) | (4) |
| Individual age (in years) | 0.01*** | 0.01*** | 0.01*** | 0.005*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Individual years of schooling | 0.02*** | 0.04*** | 0.03*** | 0.02*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Individual is employed | 0.21*** | 0.18*** | 0.17*** | 0.02 |
| | (0.02) | (0.03) | (0.03) | (0.03) |
| Completed number of antenatal care visits | 0.07*** | 0.07*** | 0.07*** | 0.06*** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Knowledge of pregnancy complications | 0.13*** | 0.12*** | 0.12*** | 0.09*** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Number of children ever born by individual | -0.05*** | -0.04*** | -0.04*** | -0.03*** |
| | (0.00) | (0.00) | (0.00) | (0.00) |
| Number of under five children by individual | -0.07*** | -0.06*** | -0.06*** | -0.05*** |
| | (0.01) | (0.01) | (0.01) | (0.01) |
| Individual is younger than her partner | | -0.02 | -0.03 | -0.05 |
| | | (0.04) | (0.04) | (0.04) |
| Absolute difference in age between couples | | 0.00 | -0.00 | 0.00 |
| | | (0.01) | (0.01) | (0.01) |
| Absolute difference in age interacted with wife younger | | -0.00 | 0.00 | -0.00 |
| | | (0.01) | (0.01) | (0.01) |
| Absolute difference in education | | -0.05* | -0.04* | -0.06** |
| | | (0.03) | (0.03) | (0.02) |
| Individual less educated than her partner | | -0.03*** | -0.03*** | -0.02*** |
| | | (0.01) | (0.01) | (0.00) |
| Absolute education interacted with wife less educated | | 0.05*** | 0.05*** | 0.03*** |
| | | (0.01) | (0.01) | (0.01) |
| Domestic violence index | | | 0.00 | -0.005* |
| | | | (0.00) | (0.00) |
| Getting money for medical care is problematic | | | -0.05*** | 0.01 |
| | | | (0.01) | (0.01) |
| Spouses cooperate in health care decisions | | | 0.02 | 0.02 |
| | | | (0.01) | (0.01) |
| Spouses cooperate in household visit decisions | | | 0.03** | 0.04*** |
| | | | (0.01) | (0.01) |
| Spouses cooperate in household purchase decisions | | | -0.01 | -0.01 |
| | | | (0.01) | (0.01) |
| Distance to facility is problematic | | | | -0.08*** |
| | | | | (0.01) |
| Urban residence | | | | 0.12*** |
| | | | | (0.02) |
| Has health insurance | | | | 0.04 |
| | | | | (0.02) |
| Household asset index | | | | 0.14*** |
| | | | | (0.01) |
| Household size | | | | -0.00 |
| | | | | (0.00) |
| **Observations** | **5,099** | **4,258** | **4,164** | **4,158** |

Note: Robust standard errors in parentheses, level of significance:*** p<0.01, ** p<0.05, * p<0.1, Model I: Individual characteristics only. Model II: Individual and spouse characteristics. Model III: Individual and spouse characteristics and bargaining indicators. Model IV: Individual, spouse and household characteristics, and bargaining indicators.

The results indicate that favorable individual characteristics and cooperation in decision making within the household raises the probability of childbirth in a health facility. The educational attainment and employment status of women are used to measure their level of economic empowerment. In terms of education, increasing the years of schooling by one raise the propensity of facility delivery by 2 percentage point. While employed women's probability of delivery in a health facility is significantly higher than that of unemployed women in the first three models, the effects are insignificant in the fourth model. The effect of maternal employment on the probability of facility use reduces as spouse and bargaining indicators are controlled, but insignificant as we control for household characteristics. The probability of delivery in a facility, as opposed to home significantly increase with maternal age. Women aware of the risk associated with pregnancy are 9 percentage points more likely to deliver in a facility than their counterparts with no health knowledge.

Interestingly, individuals who completed the required number of antenatal care visit have a higher propensity of delivery in a medical facility. Precisely, those who completed the number of antenatal visits are 6 percentage point more likely to deliver in a medical facility, compared to those with incomplete number of visits[29]. The probability of delivery in a health facility decreases with the number of children ever born, and the number of children under the age of five to an individual woman. Specifically, increasing the number children for an individual woman by one reduces the probability of facility use by 3 percent, whereas raising the number of under-five children per woman reduces the probability by 5 percent. While the number of under-five children may constrain the willingness of facility use, the number of children ever born enhances experience, thereby limiting the chance of facility use in subsequent births.

A woman's inability to control household resources reduces the chance of using a health facility at childbirth. The significant effect of discretion over household resource is knocked out as we control for household characteristics (see Model IV). For example, in Model III, women who have problems getting money for medical care are 5 percentage points significantly less likely to deliver in a health facility, compared to their counterparts with discretion over household resources. Statistically, the probability of facility use at childbirth reduces significantly with the level of domestic violence. If there is cooperation in decision-

[29] It should be noted that the antenatal care variable could be further disaggregated to make a distinction between those who did not initiate antenatal care at all, and those who initiated but did not complete the recommended number of visits. This is impossible in our analysis as only 2 percent of the sample did not initiate antenatal care at all, reducing chances of variability.

making within couples, the likelihood of delivery in a health care facility increases. For instance, the probability of delivery in a health facility is 4 percentage points higher in households where both partners make decisions regarding relatives visit to the household. Contrary, Maitra (2004) showed that women's participation in health care decision has no significant influence on hospital delivery, but on prenatal care in India.

The absolute difference in education between spouses is inversely associated with facility delivery whereas the absolute difference in age is not significantly different from zero. If women are less educated than their partners, the probability of delivering in a facility reduces by 2 percentage point. The effect of absolute difference in education on facility use at childbirth decreased the more a woman is less educated than her spouse.

The addition of household characteristics to Model III affects the magnitude of both bargaining and individual covariates, but not the signs. While the estimate of decision on relative's visit increases from 3 percent to 4 percent, that of maternal education falls from 3 percent to 2 percent (see Model III and IV for comparison). For household factors, while distance to the nearest facility reduces the chance of seeking health care, being in urban areas, having health insurance and raising household wealth increase the propensity to seek care during childbirth. Urban dwellers are 12 percentage points more likely to deliver in a health care facility than their rural counterparts. Interestingly, the propensity to deliver in a facility increases with the level of household wealth. The propensity of delivery in a facility increases by 14 percentage points for every unit rise in household wealth. The propensity of delivery in a facility reduces by 8 percentage point for those with limited access facility. The major findings from the logit model is that cooperation in household decision-making process, the empowerment of women through the right to employment and education, and their discretion over household wealth significantly enhance their ability to use health services at delivery. In addition, these variables still play a significant role even after controlling for household characteristics.

Table 3.5 presents estimates of the multinomial nested logit model of health care provider choice. Four different models of health care provider choice during childbirth are estimated[30], as is the case with the logit estimates presented in Table 3.4. Note that seeking health care or not forms the first nest options of the model, followed by the choice between public and private

[30] It is important to note that we have attempted to further split the subsamples of the public and private care into hospital and non-hospital care. However, because of a limited number (8%) of the sample that actually made use of private health care, this disaggregation is not feasible.

if the individual decide to seek care, and home, if she decides not to seek care. Following Sahn *et al.* (2003), the inclusive value parameter on the base option, home care, is normalised to 1. The inclusive value parameter ($\tau$) is used to check whether or not the nested model is consistent with utility maximization. The inclusive value parameter helps identify options with high or low degree of substitutability. Options with lower inclusive values close to zero have a very high degree of substitutability, and vice versa. In this study, the inclusive value parameter for all specifications are consistent with random utility maximisation (are between 0 and 1). Again, the inclusive value parameter for all specifications are close to zero than one. The implication is that there is a very high degree of substitutability between alternatives. Similarly, Sahn *et al.* (2003) found a very high degree of substitutability between public and private non-hospital care in Tanzania.

The post-estimation analyses from model four indicate that the predicted probability of seeking care in a health facility or choosing a particular provider holding all covariates constant at their means is illustrated in Figure B3.1 of the appendix. The predicted probability for not using a health care facility is 48.3 percent of the total sample. The probability of seeking care from public provider is 43.3 percent, and about 8.3 percent for choosing a private provider. Conditional on seeking care in a facility, the probability of choosing a public provider is 84 percent, relative to 16 percent for choosing a private provider. In terms of individual characteristics, the results from the multinomial nested logit are similar to the logit model with regards to signs and significance. In order to show how health care provider choice within the household is affected by discrete changes in parental bargaining, and other covariates, parameter estimates from these variables are used to compute mean changes in probability of care use. The estimates presented in Table 3.5 allow us to determine the change in the probability of using a particular provider for discrete changes in each of the controls. As pointed out earlier, while the multinomial logit assume constant cross-elasticities, the multinomial nested logit is flexible in computing cross-elasticities (see Table B3.3 of appendix B).

Table 3.5: Multinomial Nest logit estimates for health care provider choice

| | The probability of delivery in public or private facility as opposed to home | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Model I | | Model II | | Model III | | Model IV | |
| Variables | Public | Private | Public | Private | Public | Private | Public | Private |
| Individual age (in years) | 0.03*** | 0.03** | 0.04*** | 0.02 | 0.03*** | 0.02 | 0.02** | 0.01 |
| | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.02) |
| Individual years of schooling | 0.11*** | 0.12*** | 0.16*** | 0.18*** | 0.15*** | 0.19*** | 0.08*** | 0.13*** |
| | (0.01) | (0.02) | (0.01) | (0.02) | (0.01) | (0.03) | (0.02) | (0.03) |
| Individual is employed | 0.75*** | 0.73*** | 0.67*** | 0.66*** | 0.65*** | 0.70*** | 0.22 | 0.28 |
| | (0.13) | (0.18) | (0.15) | (0.21) | (0.15) | (0.22) | (0.16) | (0.23) |
| Completed number of antenatal care visits | 0.33*** | 0.47*** | 0.31*** | 0.48*** | 0.30*** | 0.48*** | 0.27*** | 0.45*** |
| | (0.07) | (0.10) | (0.07) | (0.12) | (0.07) | (0.12) | (0.08) | (0.12) |
| Knowledge of pregnancy complications | 0.56*** | 0.52*** | 0.55*** | 0.46*** | 0.53*** | 0.48*** | 0.40*** | 0.33** |
| | (0.06) | (0.11) | (0.07) | (0.13) | (0.07) | (0.13) | (0.07) | (0.13) |
| Number of children ever born by individual | -0.19*** | -0.20*** | -0.19*** | -0.17*** | -0.18*** | -0.17*** | -0.14*** | -0.11** |
| | (0.02) | (0.04) | (0.03) | (0.05) | (0.03) | (0.05) | (0.03) | (0.05) |
| Number of under five children by individual | -0.40*** | -0.38*** | -0.39*** | -0.40*** | -0.39*** | -0.38*** | -0.37*** | -0.34*** |
| | (0.06) | (0.10) | (0.06) | (0.11) | (0.06) | (0.11) | (0.07) | (0.11) |
| Absolute difference in education | | | 0.05 | 0.32 | 0.07 | 0.22 | 0.04 | 0.15 |
| | | | (0.17) | (0.27) | (0.17) | (0.28) | (0.18) | (0.29) |
| Individual less educated than her partner | | | -0.11*** | -0.10* | -0.11*** | -0.11* | -0.09** | -0.09 |
| | | | (0.03) | (0.06) | (0.03) | (0.06) | (0.03) | (0.06) |
| Absolute education interacted with wife less educated | | | 0.17*** | 0.18*** | 0.17*** | 0.21*** | 0.10** | 0.14* |
| | | | (0.04) | (0.07) | (0.04) | (0.07) | (0.04) | (0.07) |
| Individual is younger than her partner | | | -0.05 | -0.52 | -0.14 | -0.56 | -0.16 | -0.55 |
| | | | (0.28) | (0.54) | (0.29) | (0.51) | (0.29) | (0.50) |
| Absolute difference in age between couples | | | -0.04 | -0.09 | -0.05 | -0.08 | -0.03 | -0.04 |
| | | | (0.07) | (0.12) | (0.07) | (0.12) | (0.07) | (0.12) |
| Absolute difference. in age interacted with wife younger | | | 0.04 | 0.07 | 0.05 | 0.07 | 0.03 | 0.02 |
| | | | (0.07) | (0.12) | (0.07) | (0.12) | (0.07) | (0.12) |
| Domestic violence index | | | | | 0.02 | -0.11** | -0.01 | -0.13*** |
| | | | | | (0.02) | (0.05) | (0.02) | (0.05) |
| Getting money for medical care is problematic | | | | | -0.21*** | -0.21 | 0.07 | -0.01 |
| | | | | | (0.07) | (0.13) | (0.08) | (0.14) |
| Spouses cooperate in health care decisions | | | | | 0.09 | 0.21 | 0.11 | 0.21 |
| | | | | | (0.09) | (0.15) | (0.09) | (0.15) |
| Spouses cooperate in household visit decisions | | | | | 0.09 | 0.32* | 0.13 | 0.36** |
| | | | | | (0.10) | (0.17) | (0.10) | (0.17) |

Continued on next page

Table 3.5 continued from previous page

| | The probability of delivery in public or private facility as opposed to home | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | Model I | | Model II | | Model III | | Model IV | |
| | (1) | (2) | (5) | (6) | (9) | (10) | (13) | (14) |
| | Public | Private | Public | Private | Public | Private | Public | Private |
| Spouses cooperate in household purchase decisions | | | | | -0.04 | -0.01 | -0.05 | -0.09 |
| | | | | | (0.10) | (0.16) | (0.10) | (0.17) |
| Distance to facility is problematic | | | | | | | -0.36*** | -0.02 |
| | | | | | | | (0.08) | (0.17) |
| Urban residence | | | | | | | 0.80*** | 1.21*** |
| | | | | | | | (0.13) | (0.22) |
| Has health insurance | | | | | | | 0.30 | 1.16*** |
| | | | | | | | (0.23) | (0.36) |
| Household asset index | | | | | | | 0.44*** | 0.28*** |
| | | | | | | | (0.06) | (0.10) |
| Household size | | | | | | | -0.00 | -0.03 |
| | | | | | | | (0.01) | (0.02) |
| Constant | -0.90*** | -2.76 | -1.47*** | -2.98 | -1.36*** | -3.33 | -0.63** | -2.68 |
| | (0.22) | (0.00) | (0.26) | (0.00) | (0.28) | (0.00) | (0.30) | (0.00) |
| Inclusive value parameter estimate (τ) | 0.19 | 0.19 | 0.13 | 0.13 | 0.13 | 0.13 | 0.19 | 0.19 |
| **Observations** | **5,099** | **5,099** | **4,258** | **4,258** | **4,164** | **4,164** | **4,158** | **4,158** |

Note: Robust standard errors in parentheses, level of significance: *** p<0.01, ** p<0.05, * p<0.1. In Model I only individual characteristics are considered, in Model II spouse characteristics are included, in Model III bargaining indicators are added and in Model IV household characteristics are included

Table 3.6 presents the change in probability of utilising a health care option for discrete changes in bargaining power within couples and other covariates computed from the multinomial nested logit estimates in Table 3.5. This shows the sensitivity of use for each provider's services to a change in these attributes. The results show that raising the level of cooperation in decision making on health care use from non-cooperation to cooperation reduces the home delivery option by 0.01 for the entire sample. The large increase in the use of health care as a result of this policy change is mostly found in the use of public facilities (0.004), with only 0.001 for private care. Similarly, raising the level of cooperation in household visit decision within couples from non-cooperation to cooperation reduces home delivery by 0.013 for the entire sample. There is an equal increase in the use of both public and private health option by 0.002 from this policy change. In general, the mean changes are economically small

Table 3.6: Mean change in probability of facility use associated with observable characteristics

| | Home delivery | Public care | Private care |
|---|---|---|---|
| **Individual characteristics** | | | |
| Age of respondent (years) | -0.003 | 0.002 | 0.000 |
| Individual years of schooling | -0.011 | 0.000 | 0.008 |
| Individual is employed | -0.075 | 0.058 | 0.002 |
| Completed antenatal visits | -0.035 | 0.022 | 0.002 |
| Knowledge about pregnancy complications | -0.054 | 0.044 | 0.001 |
| Number of children ever born | 0.019 | -0.014 | -0.001 |
| Number of under five children by individual | 0.040 | -0.031 | -0.001 |
| **Indicators of bargaining** | | | |
| Index of domestic violence | 0.005 | -0.000 | -0.001 |
| Getting money for medical care is problematic | 0.021 | -0.016 | -0.000 |
| Spouses cooperate in health care decisions | -0.011 | 0.004 | 0.001 |
| Spouses cooperate in household daily purchases | 0.003 | -0.004 | 0.000 |
| Spouses cooperate in household visit | -0.013 | 0.002 | 0.002 |
| **Household characteristics** | | | |
| Distance to facility is problematic | 0.030 | -0.032 | 0.002 |
| Reside in an urban area | -0.085 | 0.043 | 0.006 |
| Has health insurance | -0.043 | -0.002 | 0.008 |
| Household asset index | -0.041 | 0.000 | 0.034 |

Note: Whether these means changes are significant or not depend on the estimates in Table 3.5

Reducing cash holding for women to seek care (limiting their discretion over household resources) raises the probability of self-care (home delivery) seeking by 0.02. The negative effects are higher in public than private facilities. A unit rise in domestic violence increases the probability of home delivery option by 0.01, but reduces the probability health care facility use.

This exerts a negative effect on private facility delivery by just 0.001. In terms of maternal employment, changing the employment status of a woman from unemployed to employ reduces the probability of self-care option by 0.08, thereby raising the probability of health facility option. Most of the employment induced changes that raise the probability of care use for public care (0.06) and private care (0.002) comes at the expense of a decline in the use of self-care.

The other parameters in the model generally conform to our expectations. If an additional woman reports distance to a facility as problematic, the probability of seeking self-care increases by 0.03 and private care by 0.002, but reduces the use of public care option by 0.03. This indicates complete substitutability of public facility use to home for an increase in distance. Improving household living conditions (increase in wealth) by a unit, for example, reduces the self-care option by 0.04. The increase in care use resulting from an increase in household wealth is mainly in the private care option (0.03). In terms of residential type, a discrete change in the place of residence from urban to rural raises the overall probability of delivery in a health facility by 0.05. The rise in use of a health facility as a result of the change in location is larger in public than private facilities. In all, residing in urban areas has shown to have the highest effect in reducing the probability of home delivery option.

Interestingly, a discrete change in antenatal care usage from incomplete to complete visits reduces the probability of home delivery option by 0.04. The change in probability of care use with respect to knowledge of pregnancy complication is substantially stronger in public than private health facilities. A discrete change in health knowledge from not being aware, to being aware of risk associated with pregnancy, results to a 0.04 rise in the use of public care and 0.001 rise in the use of private care. An increase in years of schooling of an individual woman reduces the probability of home option by 0.01. The effect of the number of children ever born and the number of under-five per woman on the probability of care use are negative. The probability of self-care option increases by 0.04 for every additional under-five child per woman, whereas the probability of self-care option increases by 0.02 for every additional child per woman. As is the case with the logit model cooperation in household decision making process, freedom from domestic violence and women's empowerment through the right to employment and education, and discretion over household wealth, significantly enhance their ability to use both the public and private facilities at childbirth

### 3.7. Conclusion

This chapter sought to empirically examine the relationship between the status of women in the household and the use of health care at childbirth in Tanzania. It argues that over and above traditional household demography and socioeconomic factors, individual preferences within couples may differ, and the resulting outcome of reproductive health care decisions is likely to be subjected to a negotiation process between couples. The outcome of the negotiation depends largely on each couple's ability to exercise his or her preferences. The study identifies several features for measuring bargaining power within couples in the household. These include the power in decision making, discretion over household wealth, relative characteristics of couples and domestic violence. The analysis further shows how these features can influence women's decision to give birth in a public or private-based care facility. In line with previous literature on health care provider choice, the study considers that the decision to deliver in a health care facility and the choice between public and private care follow a nesting structure and can be modelled using a one-level multinomial nested logit model.

First, excluding household resources, the level of cooperation between couples in the household decisions raises the probability of delivery in a health care facility. Specifically, if couples cooperate in household health care seeking or in household daily purchase decisions, the probability of delivery in a health facility increases. The probability of using health care reduces if women have limited discretion over household resources for care. Interestingly, high values of domestic violence are found to significantly reduce the probability of care use. In terms of female empowerment, employed women significantly increase the probability of facility use at childbirth. Likewise, the probability of care use increases significantly with maternal years of schooling and difference in education between couples. The probability of facility use increases significantly with maternal age, but is insignificant with differences in age of couples.

Second, distance to the facility is included to control for the supply side influence as well as antenatal care completion to control for health care knowledge. Completing the number of antenatal care visits significantly increase the probability of health care use at childbirth. The effects are higher in private than public health facilities. On the other hand, the probability to seek care at childbirth significantly declines with distance to facility.

Third, household demographic and socioeconomic characteristics are included to control for household wellbeing. The probability of care use increases with household wealth, access to

health insurance and among households in urban households. The probability of health care use reduces with experience (number of children ever born) and with the number of under-five children per woman.

For effective public policies and other initiatives aiming to ensure full utilisation of reproductive health services, our findings suggest attenuation or elimination of constraints that limit cooperation within couples. Economic measures that improve women's access to autonomous resources may strengthen their bargaining power and offset unequal bargaining within couples. This brings more women in a better position, especially when bargaining over resources for health care. Based on these findings, this study argues that the provision of free maternal and child health care services to the community is a necessary but not a sufficient condition to ensure full utilisation. The indirect costs are also important and their negative consequences on reproductive care utilisation can be minimised if women have equal power in household decision process or if there is cooperation within couples in the household.

# Chapter 4

## Intra-household Bargaining and Rural-Urban Child Health Differential in Tanzania

### 4.1. Introduction

Bargaining with commitment within couples matters for household outcomes, since cooperation between spouses results in an efficient allocation of resources within the household (Rasul, 2008). As highlighted in the introductory chapter, women devote a larger portion of their time and income to children's needs and nutrition than men (Gupta, 1996; Kabeer, 1994; Thomas, 1993). The extent of cooperation within couples in most African societies is limited as women are typically the socially and economically disadvantaged group in terms of education, employment, inheritance, credit and control over household resources (Blackden *et al.,* 2006; Kevane, 2004; Nikièma *et al.,* 2008). While intra-household bargaining has been widely examined by economists as affecting fertility decisions (Hossain, 1998; Rasul, 2008), labour supply (Lim *et al.,* 2007), the use of health services (Maitra, 2004; Nikièma *et al.,* 2008; Beegle *et al.,* 2001), and child survival (Ghuman, 2003)[31]; this chapter focuses primarily on how the level of cooperation within couples in household decision and relative control over resources contribute to the rural-urban gap in child nutrition in Tanzania.

Economists and demographers have long focused attention on modelling child health outcomes in both developed and developing countries. Another growing concern has been the rural-urban child health differential in developing countries (Fotso, 2007; Smith *et al.,* 2005; Van de Poel *et al.,* 2009). Arguably, shrinking the rural-urban inequality[32] in child health is an important pathway for achieving national child health targets for most third world countries. There is sufficient evidence that rural children are generally more likely to be malnourished relative to

[31] Rasul (2008) and Hossain (1998) reported that if couples bargain with commitment, the outcomes of fertility takes account of each spouse's fertility preferences; otherwise, the influence of each spouse's fertility preference on fertility outcomes depends on the distribution of bargaining power. Lim *et al.* (2007) showed that preference heterogeneity between spouses and differences in bargaining power is inversely correlated with cash crop production in Ethiopia. Maitra (2004) and Nikièma *et al.* (2008) reported that domestic power imbalance may delay or exclude women from health care, whereas their control over household resources significantly increase health care usage. Considering differences in educational attainment of couples, Beegle *et al.* (2001) identified that there is better health service use if a woman is more educated than her husband. There exists a weak association between women's autonomy and child mortality (Ghuman *et al.,* 2003).

[32] Improving the health of rural children close to the prevailing urban standards is a pathway for achieving national targets.

their urban counterparts (Hussain & Lunven, 1987; Ruel, 2000; Von Braun, 1993; Fotso, 2007; Smith *et al.,* 2005; Van de Poel *et al.,* 2007). Understanding what drives the rural-urban gap in child nutritional outcome is essential for effective maternal and child health policy intervention, since the huge and persistent regional disparity is likely to affect national targets.

While some researchers examine the importance of household-level factors in explaining the rural-urban gap in child health (O'Donnell & Wagstaff, 2008; Sastry, 2004), others argue that community factors cannot be ignored (Fotso, 2007; Sastry, 1997; Van de Poel *et al.,* 2009). The focus has been on cross country studies (Fotso, 2007; Van de Poel *et al.,* 2007; Harpham, 2009; Smith *et al.,* 2005). Findings from such studies may be less informative to individual countries, as what explains this gap varies according to the level of development of countries, and their prevailing national health care policies. The effect and contribution of intra-household bargaining to explaining this gap is still underexploited. This chapter provides evidence that differences in intra-household bargaining between the rural and the urban households contribute positively to the rural-urban gap in child health. It further shows that failure to correct for the possible sample selection bias understate this gap[33].

It is a stylized fact that the allocation of investments in health capital and other household expenditures depend not only on individual preferences, but also on his/her position in decision-making within the household. For example, even if husband and wife value their health and the health of any other household member identically, it is not obvious that their preferences over investment in health capital will be identical (Bolin *et al.,* 2002)[34]. Since women tend to earn less than men in most developing countries, the opportunity cost of child upbringing (time devoted for child care) is lower for women than men (Ray, 1998). In addition, the economically disadvantaged women, rather than men, are directly involved in reproductive health practices (Rasul, 2008). Maternal health and their access to health care matters for child health outcomes. Empowering women economically and improving their bargaining power in

[33] While Van de Poel *et al.* (2009) and Sastry (1997) used child mortality to estimate the rural-urban gap in child health, Smith *et al.* (2005) and Fotso (2007) used child malnutrition. This study considers child malnutrition as a measure of child health and moves a step further to show that the child health gap is understated if Fotso (2007) and Smith *et al.* (2005)'s approach is used. The malnutrition sample might not be a random sample and might not reflect the birth history for these regions as nutritional information is available only for children alive.

[34] Jacobson (2000) argues that this is basically because of the conflicting interests of spouses. The amount of health capital the husband desires to hold may be different from the amount the wife prefers him to hold. Investments made by one spouse on the other's health capital cannot be realised by the investor should the family dissolve. Since the human capital cannot be shared in case of divorce or inherited at death, spouses then develop differing incentives in investing in each other's health capital (Bolin, 1994; King, 1982).

the household is better for maternal and child health. Caldwell *et al.* (1992) and Dyson & Moore (1983) identified female autonomy as essential in reducing child mortality. Ghuman (2003) found a weak association between women's autonomy and child mortality. These studies used women's freedom of movement, discretion over earned income, decision making in household matters, and domestic violence as indicators of bargaining within couples. This study makes use of some of these measures, but it differs in that it focuses on both their effect and their contribution to the rural-urban child health differential.

In addition to being economically disadvantaged, culture and more specifically gendered institutions (norms) in many developing societies overrule and limit women's bargaining power (Mabsout & Van Staveren, 2010; Van Staveren & Odebode, 2007). Female earnings, their level of education (Oreffice & Bercea, 2007) [35] and smaller age differences with partners (Friedberg & Webb, 2006) significantly improve their bargaining power in household decision making[36]. It is obvious that bargaining power within couples in urban and rural communities may be dissimilar, since the level of education, earnings, awareness of marital rights and gender institutions are likely unequal between these areas. While most studies focus on differences in household resource endowment as an important determinant of the rural-urban gap in child health[37], identifying the contribution of intra-household bargaining is crucial, as restrictions on women's power undermine their ability to secure better health care, for themselves and their children.

Within the context of Tanzania, there is very high rural-urban disparity in child nutritional outcomes. While only about 25 percent of urban children are malnourished (stunted), over 38 percent of rural children are malnourished (see Table 4.1). In addition, considering height-for-age (HAZ) and child survival rate[38], Tanzania national averages could have been better than

[35] However, Mabsout and Staveren (2010) argued that female bargaining power depends on individual, household and institutional variables. They also posited that institutional factors are most likely to reduce female bargaining power even if she has control over personal resources.

[36] The implication is that, excluding institutional bargaining with asymmetrical bargaining power (one partner having advantage over the other), the extent of bargaining between spouses is dependent on the relative control over income and assets, self-esteem, awareness of one's rights as well as age and education prior to marriage (Mabsout & Staveren, 2010; Nikièma *et al.,* 2008).

[37] There are two strands of literature regarding differences in community development and the rural-urban child health differential. For instance, Lalou and LeGrand (1997) and Smith *et al.* (2005) note that favourable socioeconomic status and the availability of modern health care systems in urban areas favour public policies on maternal and child health programs. In all, cities are endowed with better sanitation facilities and income earning opportunities that facilitate access to modern care (Haddad *et al.,* 1999).

[38] Based on literature, these are the preferred, better and most common used measures of child health.

the WHO recommended standards[39], if the percentage of stunted children in rural areas is similar to the percentage of stunted children in urban areas. Similarly, there exist lower levels of cooperation between spouses in rural compared to urban Tanzania (see Table 4.1). For example, over 64.7 percent of all households in urban communities cooperate on health care seeking decisions relative to 58.7 in rural areas. It is also shown in Table 3.3 of Chapter 3 that all indicators of bargaining power are weaker in rural than in urban Tanzania.

Table 4.1: Intra-household bargaining power and child health status 2010 (percentage)

| | Observations | Rural | Urban | Total |
|---|---|---|---|---|
| Child Survival | 26233 | 89 | 91* | 89 |
| Child Malnutrition (Stunted) | 2287 | 38 | 25* | 35 |
| Spouses cooperate in health care use decision | 14868 | 59 | 65* | 62 |
| Spouses cooperate in relative visit decision | 12457 | 50 | 52* | 51 |
| Getting money for health care is problematic | 14217 | 53 | 35* | 49 |
| Wife beaten if she goes out without telling him | 10753 | 43 | 33* | 41 |
| Wife beaten if she neglects children | 10059 | 46 | 36* | 44 |
| Wife beaten if she argues with partner | 10473 | 43 | 33* | 41 |
| Wife beaten if she refuses to have sex | 9178 | 39 | 26* | 37 |
| Wife beaten if she burns food | 5043 | 22 | 14* | 20 |

Source: Computed from 2010 TDHS, * indicates that the rural-urban difference is significant.

The rural-urban gap in child health owing to differences in household resource endowment may be exacerbated by differences in household bargaining power within couples, as non-cooperation results in inefficient resource allocation. The focus on Tanzania is therefore motivated by two reasons. First, studies of child nutrition and mortality have not comprehensively shown what might account for differences in child health outcomes across regions in Tanzania[40]. Finally, there exists no evidence as to how bargaining power within couples can explain child health outcomes in Tanzania. The prevailing rural-urban gap, and the lower female bargaining power in rural areas suggest a number of questions that demand insightful answers. Does bargaining power within couples explain child nutritional status in Tanzania, and if so, to what extent does it contribute to the rural-urban gap in child nutrition?

[39] According to the WHO (1995), a country is said to have very high levels of malnutrition if the percentage of under-five malnutrition measured by height-for-age z-score and weight-for-age z-score exceeds 30 percent of the population.

[40] While the study by Jakobsen (1987) was limited to the economic and geographical factors in explaining child nutritional status in the Highlands of Tanzania, Mbago and Namfua (1992) focused on the socioeconomic determinants of child malnutrition in low income urban areas in Tanzania. Similarly, the study by Howard (1994) was limited to childhood nutrition in Chagga Tanzania. In addition, while Mturi and Curtis (1995) investigated the determinants of child mortality at national level, the studies by Ainsworth *et al. (*2000) and Ng'weshemi *et al. (*2002) were limited to specific regions in Tanzania.

Hitherto, the Tanzanian literature on child health outcomes has focused on household characteristics, ignoring the possible influence of household bargaining process (constituted by domestic violence, female discretion over household resources, and decision making) on child health. The focus has been at national level and some specific districts, ignoring what may be responsible for the rural-urban differential. The literature on female autonomy indicates that freedom of movement, decision making, and relative control over resources determines their ability to obtain adequate health care (Beegle *et al.,* 2001a; Bloom *et al.,* 2001a). Consequently, female control over an independent income is important, as women devote a larger portion of their time and income to children's needs and nutrition than men (Thomas, 1993). As such, reduced disparity between husband and wife's decision making power allocates resources efficiently, be it on health or non-health related activities. In addition, better maternal and child feeding practices promote child health, and this partly depends on female control over household resources vis-à-vis the level of cooperation between spouses. This chapter therefore empirically examines the effect of intra-household bargaining on child nutrition and identifies the extent to which the bargaining contributes to the rural-urban gap in child nutrition in Tanzania.

### 4.2. Methodology

Economists have focused on explaining the microeconomic determinants of individual or household health outcomes. This chapter adopts the household production framework by Rosenzweig and Schultz (1983). This framework has been used by Kovsted *et al.* (2002), Mwabu (2009a) and Wagstaff *et al.* (2006) to analyse child health. In line with McElroy (1990), the study assumes that both parents make decisions concerning the quality of health outcomes of their children. The utility for each parent is a function of both health and non-health related market consumption goods ($G$), leisure ($l$), and child health quality ($h$). The production function for child health quality is as follows:

$$h = h(G, E; \Psi) \qquad (4.1)$$

Where $E$ represents environmental or health related inputs, and $\Psi$ is a parameter indicating the household's production efficiency. Parents (mother $(m)$ and father $(f)$) may have dissimilar utility functions denoted by $U_m$ and $U_f$. In general, each individual parent's utility is written as

$$U_i = U_i(G, h, l_i); \;\; i = m, f$$

There are outside options available to each parent in the household. Examples include the opportunities to re-marry, support from family and friends, and what is identifiable to the individual should the household dissolve (McElroy, 1990). The utility derived from such options is known as the individual reservation utility, denoted as $\overline{U}_m$ and $\overline{U}_f$. The reservation utility is a function of prices and other factors, such as education, age, income, and employment status that hinders, or promotes the ability of an individual to achieve his/her preferences within the household bargaining process. Based on McElroy (1990), and for the purpose of this study, the reservation utility for each parent is assumed to be contingent on a vector of prices $p$, wealth $W_i$, and an extra-household environmental parameter $\pi_i$, representing an unexpected increase in wealth from parents or welfare transfer.

$$\overline{U}_i = \overline{U}_i(p, W_i; \pi_i); \quad i = m, f \tag{4.2}$$

Given their reservation utility, each chooses the amount of market goods $(G)$, and the level of child health $(h)$ that maximise household utility given by:

$$\mathcal{V} = [U_m(G, h, l_m) - \overline{U}_m(p, W_m; \pi_m)] \; x \left[U_f\left(G, h, l_f\right) - \overline{U}_f\left(p, W_f; \pi_f\right)\right] \tag{4.3}$$

Subject to the household budget constraint and child health

$$pG = \omega_m(T_m - l_m) + \omega_f\left(T_f - l_f\right) + W_m + W_f \tag{4.4}$$

$$h = h(G, E; \Psi)$$

Where, $pG$ is household total expenditure on both health and non-health related commodities, $\omega_i$ is the market wage rate, and $T_i$ is the time available for each individual parent $i$. With respect to equation 4.1, 4.3 and 4.4, a reduced form demand function for child health is obtained. This demand function is contingent on household wealth, a household production efficiency parameter, health related goods, prices, and the bargaining power for each household member (Maitra, 2004). The child health demand function is therefore given as:

$$h = h\left(p,\ E,\ W_m,\ W_f;\ \pi_m,\ \pi_{f,}\ \varphi,\ \Psi\right) \tag{4.5}$$

Where $\varphi$ is a set of variables identifying each parent's relative bargaining power within the household that influence the purchase of goods and services. Equation 4.5 is an empirical version of the child health equation. Our measure of child health in this scenario is child nutrition (height-for-age Z-score)[41].

[41] The choice of this measure is guided by previous studies that examined the determinants of child health.

### 4.3 Intra-household Bargaining and Child Health Literature

As indicated in the previous chapter, a number of studies have investigated the health care use and fertility decision effects of bargaining power within couples. The various dimensions of classifying bargaining power indicators have also been presented in the previous chapter. In order to contextualise the analysis in this chapter, this section presents evidence on child health effects of intra-household bargaining and female autonomy. Studies of child health effects of parental bargaining are limited in that there is little evidence on how differences in bargaining within couples in rural, and urban households explain the rural-urban gap in child health. To the best of our knowledge and in the context of Tanzania, there is no evidence to support the child health effects of intra-household bargaining. This section therefore presents international evidence on the effect of intra-household bargaining on child health.

Since the 1980s, there has been growing concerns about the health status of women and their children, especially in a patriarchal kinship setting where male children are favoured and female autonomy is limited (Caldwell, 1986; Dyson & Moore, 1983). The work of Dyson and Moore (1983) is one of the first empirical studies to compare the demographic outcome of different kinship structures. Their findings suggested that infant and child mortality rates are likely to be high in structures where women's status is generally low. Subsequent studies have continued to empirically show a positive association between women's autonomy with their health status and the health of their children (Das Gupta, 1990; Doan & Bisharat, 1990; Castle, 1993; Murthi *et al.,* 1995).

In addition to these studies, Jejeebhoy (1998) investigated the association between domestic violence on infant mortality in rural India. The study showed that there exists considerable consequences of domestic violence on pregnancy loss and infant mortality. With these findings, they concluded that infant mortality is significantly conditioned by the strength of the patriarchal social system. Thomas *et al.* (2002) examined how the distribution of power between husbands and wives affects child health. The study argues that relative power measured by ownership of assets affects resource allocation within the household. The results suggest that the relative position of women in resource ownership at the time of marriage and current ability to retain resources under her control is essential for child health.

Ghuman (2003) considered several indicators of female power between Muslim and non-Muslim communities, and assessed their effects on the probability of child survival. The study confirmed that areas with less freedom of movement for Muslim women had higher child

mortality. There was no significant association between violence and child mortality in all religious groups. The results further suggested that limited power of women in decision making (afraid to disagree with partner) was associated with infant and child mortality. Lower discretion over earnings was found to be highly associated with infant and child mortality.

Specifically, child nutritional status has been shown to rely heavily on female status in the household (Brunson *et al.,* 2009; Casale, 2003; Dancer & Rammohan, 2009; Desai & Johnson, 2005; Doan & Bisharat, 1990; Pierre-Louis *et al.,* 2007; Shroff *et al.,* 2009; Simon *et al.,* 2002; Smith, 2003; Allendorf, 2007; Shroff *et al.,* 2011). Of these studies, Shroff *et al.* (2009; 2011) stated that low female autonomy compromises her health outcome and affects the quality of infant care and nutrition. In other words, maternal autonomy in decision making, permission to travel, attitude to domestic violence and financial autonomy influences child care and child health outcomes. More specifically, the studies show that women with higher autonomy were less likely to have a stunted child. Most of the studies listed above rely on these four dimensions of female autonomy and provide similar evidence of positive association with child national status.

In line with female autonomy, there is growing evidence on child health effects of maternal specific characteristics. Most of these characteristics include maternal education, employment status, maternal health and age at first birth. This chapter therefore estimates child stunting effects of the indicators of bargaining and maternal specific characteristics in rural and urban communities and identify the contribution of each to the rural-urban gap in child nutrition.

### 4.4. Estimation Strategies

Child nutritional status (height-for-age) is a continuous variable with high values indicating better child nutritional outcomes. The effects of bargaining on child health can be estimated using an Ordinary Least Square (OLS) technique. However, most studies have used binary choice models to identify the determinants of under-five nutritional outcomes. In order to use binary choice models, children are categorized into two groups: the child is malnourished (stunted), otherwise the child is not stunted. In this study, a probit model is used to estimate the probability of child malnutrition. In addition to this, and for the purpose of sensitivity, this study augments the probit model with an OLS technique. Concerning the probit model, the underlying unobserved latent variable $Y_i^*$ is defined for a vector of observable explanatory variables $X$ by a statistical model.

$$Y_{it}^{*} = X_{it}\beta + \varepsilon_i \quad (4.6)$$

So that:

$$Y_i = \begin{cases} 1 \; if \; Y^{*} > 0 \\ 0 \quad otherwise \end{cases} \quad (4.7)$$

Where $Y_{it}^{*}$ is the underlying latent variable of whether or not an individual child $i$ at time $t$ is stunted, and $X_{it}$ is a vector of observable characteristics of the individual and the household at time $t$. The probability that a child is stunted is represented as:

$$Pr(y_{it} = 1/x_{it}) = \Phi(X_{it}\beta) \quad (4.8)$$

Where $y_{it} = 1$ implies the child is malnourished (stunted), $\beta$ is a vector of parameters to be estimated, and $\Phi$ represents a standard normal cumulative density function.

### 4.4.1 Decomposition Technique

To understand the prevailing inequality in child health outcomes in Tanzania, this chapter considers rural and urban children who are alive and decomposes their observed health (nutrition) gap using the detailed Oaxaca and Blinder decomposition[42] approach. The rural-urban gap in child nutrition outcome is obtained from a child health equation of the following type:

$$H_{ij} = X_{ij}'\beta_{ij} + \varepsilon_{ij} \quad (4.9)$$

Where $i$ refers to the individual child, $j$ is child residential type, $H_i$ refers to child health (nutrition) for the urban (rural), $X_i'$ is a vector of determinants of child health, $\beta_i$ is a vector of associated parameter estimates and $\varepsilon_i$ is a normally distributed error term. The standard Oaxaca-Blinder decomposition splits the difference between the health outcomes of the urban and rural children into the observed and unobserved portion as follows:

$$\bar{H}^{urban} - \bar{H}^{rural} = \Delta\bar{x}\left[D\hat{\beta}^{urban} + (I - D)\hat{\beta}^{rural}\right] + \Delta\hat{\beta}[\bar{x}^{urban}(I - D) + \bar{x}^{rural}D] \quad (4.10)$$

Where I is an identity matrix equal to one if $x$ is a scalar and not a vector, D is a matrix of weights, $\bar{H}^{j}$ $(j = urban, rural)$ is the predicted mean nutrition outcome for a given group of children, $\bar{x}^{j}$ is the mean vector of explanatory variables, $\hat{\beta}$ is a vector of parameter estimates and $\Delta$ denote a change. When D = 0, equation (4.10) reduces to:

[42] Jann (2008) developed a Stata decomposed routine for handling the special cases of a more general decomposition.

$$\bar{H}^{urban} - \bar{H}^{rural} = \Delta\bar{x}\hat{\beta}^{rural} + \Delta\hat{\beta}\bar{x}^{urban} \quad (4.11)$$

In this case, the explained gap is weighted by the coefficients of the rural group and the unexplained gap is weighted by the control variables of the urban group. Seemingly, if D = 1 equation (4.10) becomes:

$$\bar{H}^{urban} - \bar{H}^{rural} = \Delta\bar{x}\hat{\beta}^{urban} + \Delta\hat{\beta}\bar{x}^{rural} \quad (4.12)$$

Here, the explained gap is weighted by the coefficients of the urban group, whereas the unexplained gap is weighted by the control variables of the rural group. In either way, we will be able to identify what accounts for the poor child health in rural areas. The difference between these two equations is that in equation (4.11) the interaction effects are imbedded in the unexplained portion, whereas in equation (4.12) it is in the explained part. Decompositions based on this approach will be sensitive to whatever group's health outcome that is assumed to be the norm (Madden, 2004). There are several ways for weighting the observed and unobserved gap. For instance, Reimers (1983) proposed the proportion of the two groups be used to weight the unexplained gap, whereas Cotton (1988) proposed the mean of the coefficient vectors be used to weight the explained gap. Contrary to these approaches, Neumark (1988) suggested, that the coefficients from the pooled regression be used. It is not conclusive at best which of these approaches is the most appropriate. However, according to Jann (2008), these approaches are inappropriate as some of the unexplained parts may be transferred into the explained component. Jann (2008) concluded that the pooled model with a group indicator as an additional variable is the most appropriate. This study therefore follows the Jann (2008) decomposition approach to understand what explains the rural-urban gap in child health.

### 4.4.2 Decomposition with Selectivity-Corrected

Using the anthropometric measure of health to compare health status between or within regions, it is important to correct for possible sample selection bias. Selectivity arises from the fact that this measure of health is observed only for people alive and this might be a selective group. In our case, only the nutritional status of children alive is observed. Studies that have employed this measure to account for the rural-urban gap in child health, especially child nutrition have failed to correct for the possible selectivity bias. To fully comprehend the prevailing rural-urban gap in child nutrition, it is essential to vigorously evaluate the health of

all children born during the period under study. However, it is difficult to ascertain the nutritional status of children who died during this period. This study corrects for selection bias, by taking account of the gap due to selectivity[43] in the child health equation. A two equation model of child health (nutritional status and survival rate) is considered. The survival rate (to control for children not alive) and nutritional status functions for an individual child $i$ in a residential type $j$ are presented as:

$$S_{ij} = Z'_{ij}\gamma_j + \varepsilon_{ij} \tag{4.13}$$

$$H_{ij} = X'_{ij}\beta_j + \mu_{ij} \tag{4.14}$$

Where $S_{ij}$ is a dummy variable equivalent to one if the child is alive and zero if he/she is dead and $H_{ij}$ is a continuous variable that measures the nutritional status of children alive, $Z'_{ij}\ and$ $X'_{ij}$ are vectors of explanatory variables, $\gamma_j\ and\ \beta_j$ are associated parameter vectors and $\varepsilon_{ij}\ and\ \mu_{ij}$ are error terms. The error terms follow a bivariate normal distribution of the form $(0, 0, \sigma_{\varepsilon j}, \delta_{\mu j}, \rho_j)$. Nutritional status is observed for those whom $S_{ij} > 0$, so that the expected nutritional status of a surviving child is determined according to

$$\begin{aligned} E(H_{ij}|S_{ij} > 0) &= X'_{ij}\beta_j + E(\mu_{ij}|\varepsilon_{ij} > -Z'_{ij}\gamma_j) \\ &= X'_{ij}\beta_j + \theta_j\lambda_{ij} \end{aligned} \tag{4.15}$$

Where $\theta_j = \rho_j\delta_{\mu j}$, $\lambda_{ij} = \emptyset(Z'_{ij}\gamma_j)/\Phi(Z'_{ij}\gamma_j)$, $\emptyset(Z'_{ij}\gamma_j)$ is the standard normal density function and $\Phi(Z'_{ij}\gamma_j)$ is the standard normal cumulative density function. The estimating equation of rural-urban nutrition for surviving children (in the presence of selectivity) is expressed as:

$$H_{ij}|\ S_{ij} >\ 0 = X'_{ij}\beta_j + \theta_j\lambda_{ij} + \varepsilon_i \tag{4.16}$$

Equation (4.16) is estimated using the Heckman two-step estimation procedure separately for rural and urban children. Correction of selectivity bias requires the child health decomposition of the form:

$$\bar{H}_u - \bar{H}_r = \bar{X}'_r(\hat{\beta}_u - \hat{\beta}_r) + (\bar{X}'_u - \bar{X}'_r)'\hat{\beta}_u + (\hat{\theta}_u\hat{\lambda}_u - \hat{\theta}_r\hat{\lambda}_u) \tag{4.17}$$

[43] According to Neuman and Oaxaca (1998) there is need to correct for selectivity bias in studies of wage inequality since wages are observed only for the employment. In this light, we correct for selectivity bias in the child nutritional equation using the child survival functions since both can subsequently be used to decompose the rural-urban child health and the fact that nutritional levels are observed only in surviving children.

Where $\bar{H}$ is the predicted mean of height-for-age Z-score of children in a given group, $\bar{X}$ is the mean vector of child health determining variables, $\hat{\beta}$ is a vector of parameter estimates for the $X's$, $\hat{\theta}$ is an estimate of $\rho\delta_u$ and $\hat{\lambda}$ is an estimate of the mean Inverse Mills Ratio (IMR). The first two terms at the right of equation (4.17) are the unexplained and explained portions of the rural-urban gap in child health respectively and the third term is the selectivity component. To estimate this equation, the Oaxaca with Heckman decomposition is used to adjust for sample selection bias.

### 4.4.3 Estimation Issues

The potential problem with decomposing the rural-urban gap in child nutrition is the possibility for selectivity bias (O'Donnell & Wagstaff, 2008). The main impediment for correcting for sample selection bias is the difficulty of finding an identification strategy. This has prevented previous studies from accounting for the possible sample selection bias. This study is not aware of any study that has attempted to address the possible sample selection bias. This study therefore employs the Heckman two-step sample-selection procedure in an attempt to correct for possible sample selection bias. According to Cameron (2005), the use of Heckman two-step automatically corrects for sample selection problems. The major problem with this approach is to identify an exogenous (exclusion restriction) variable, and the fact that the error terms of the selection and outcome equation may be correlated. The exclusion restriction must not directly impact child nutrition but affect the probability of child survival.

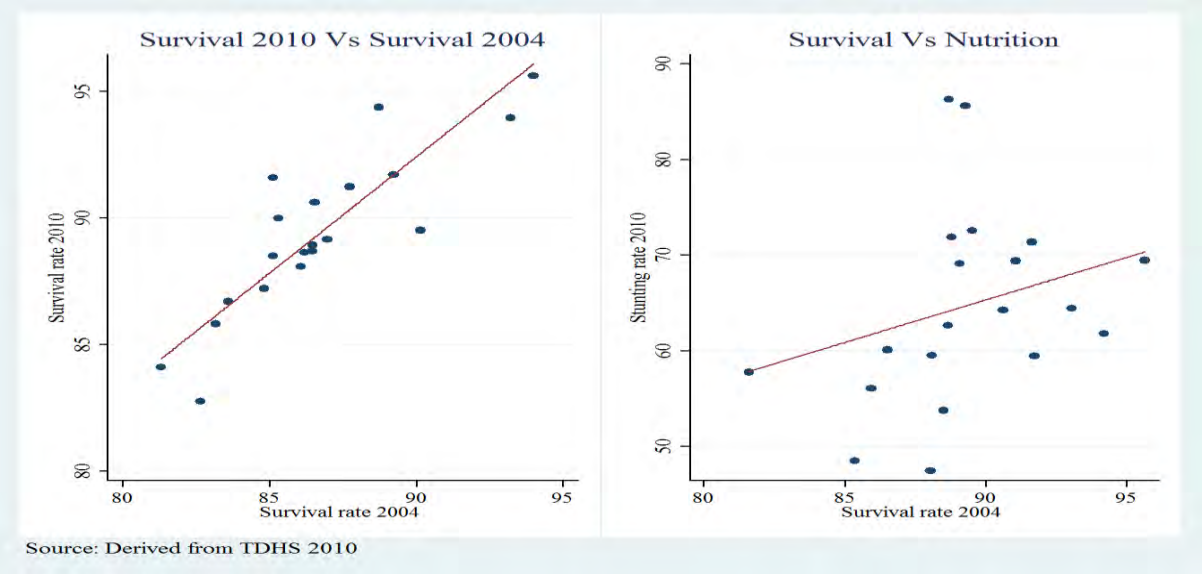
In this chapter, the regional survival rates for 2004 (obtained from 2004 TDHS) are used as a possible variable that exogenously determined child survival in 2010, but not individual nutrition in 2010. Figure 4.1 shows the concentration of child survival rate by region in 2004 and 2010; and child nutrition[44] in 2010 in Tanzania. As shown in this figure, the distribution of child survival rate across the country in 2010 was largely determined by the distribution of child survival rate in 2004. Panel B of the figure shows that the distribution of child nutrition across the country in 2010 is weakly correlated to the distribution of child survival rate in 2004. While the correlation between regional survival rates in 2004 and 2010 is 0.81, the correlation between regional survival rates in 2004 and nutrition in 2010 is only 0.27. In addition, it is evident that child survival rate in 2004 significantly predict child survival rate in 2010 (see

[44] In this case, the child nutritional outcome is one if the child is healthy (not stunted) and zero if the child is stunted. Hence, a region's child nutrition rate is the proportion of healthy children to the total number of children in the region and survival rate is the proportion of surviving children to the total live birth in the region.

Table C4.4 of the appendix). Furthermore, the reference population to which a child's nutritional status is compared take account of only children alive. Given the approach for computing nutritional outcomes, it is less likely that regional survival rates explain regional nutritional outcomes[45].

This suggests that previous child survival rates predict current child survival rates, but not current nutritional status. The study acknowledges that any intervention in favour of regions with low survival rate could alter or reverse the survival trends, thereby reducing the strong association between previous and current regional differences in child survival rate. Based on our knowledge and in the context of Tanzania, there have been no region specific child health care policy within this period, and most child health intervention programmes have been at the national level as highlighted in the introductory chapter. As it is difficult to find a perfect exclusion restriction and since there is no formal statistical test, this study assumes that the theoretical justification above is plausible for the exclusion restriction. Nevertheless, it is necessary to stress that the validity of this exclusion restriction does not undermine the focus of this chapter. The study decomposes the rural-urban child nutrition with and without selection and further use a nonlinear decomposition by Fairlie (2005) to decompose the rural-urban child survival, as a robustness check, and to assess the seriousness of this problem.

Figure 4.1: Correlation between survival and nutrition




[45] Parsons and Vézina (2014) used a similar approach by arguing that the allocation of Vietnamese immigrants in 1975 can effectively instrument for the stock of Vietnamese migrants across the United States of America in 1995.

### 4.5. Data and Data Analysis

As indicated earlier, the analysis in this chapter is based on the Tanzanian Demography and Health Survey conducted in 2010. Since the main focus of this chapter is on the health of children under the age of five, the sample is limited to children aged 0–59 months. The sample is further divided into rural and urban subsamples. There are two commonly used measures of child health. First is the under-five survival or mortality rate. This measure is limited as it says nothing about the health status of children currently alive. The second measure is child nutritional status. This chapter considers rural and urban live children and identifies their prevailing nutritional gap. It helps identify children who are at risk of morbidity and mortality, and provides useful information for policies aimed at improving child health.

There are basically three major approaches for measuring child nutritional status. These approaches include clinical signs, biochemical indicators, and anthropometric measures (see Onis, 2000). The anthropometric approach is the most appropriate measure of child nutritional status and is preferred, as it is able to distinguish between short-term changes from long-term changes in child nutritional status (WHO working group.1986; O'Donnell & Wagstaff, 2008; Onis, 2000). Anthropometric measures use information on children's height, weight, and age to generate three key indicators of child nutritional status, namely height-for-age (stunting), weight-for-height (wasting), and weight-for-age (underweight). In each of these measures child nutritional status is expressed in the form of a Z-score by comparing either the height or the weight of a child to that of a similar child from a reference healthy population (see Zere & McIntyre, 2003a). While anthropometric indicators are sensitive in initial cases of malnutrition, non-invasive, less costly and easy to find, the other two measures are only useful in advanced stages of malnutrition (WHO working group.1986, WHO, 1995).

The weight-for-height measure reflects acute malnutrition, is sensitive to short-term changes, and is essential in evaluating benefits from nutrition intervention programmes. The weight-for-age measure cannot distinguish between short-term and long-term malnutrition. It is therefore difficult to interpret. Wasting and stunting are appropriate measures of child nutrition status, as they can discriminate between temporary and permanent malnutrition (WHO working group, 1986). However, the literature on child nutrition regards stunting as the most appropriate measure of childhood malnutrition, as it is directly associated with socioeconomic status and a reflection of long-term dietary inadequacy (Skoufias, 1998). It is an overall measure of deprivation and is less sensitive to temporary food shortages (Svedberg, 1987). The empirical

analysis in this chapter makes use of the stunting measure of child nutrition. To understand the relationship between these measures, they are all included in the descriptive analysis. Whether or not a child is stunted, wasted, or underweight is based on the WHO recommended range of the Z-score[46]. It should be noted that the measures of intra-household bargaining are as defined in chapter three.

Table 4.2 demonstrates significant differences in the levels of child health, bargaining indicators, as well as individual and household characteristics across rural and urban areas. This allows us to test for the equality in mean of the characteristics between these regions to verify the previously claimed or discussed important differences. The results reveal some interesting differences in observable indicators of intra-household bargaining, as well as individual and household characteristics between the rural and urban population. It should be noted that stunting, wasting, and underweight are all measures of child malnutrition, but in the context of this chapter malnutrition strictly refers to stunting, and the two terminologies are used interchangeably. In terms of child health, about 38 percent of rural children are stunted while only 25 percent of urban children are stunted. The rate of underweight children in rural areas is 22 percent compared to 16 percent in urban areas. The under-five survival rate for rural areas is 89 percent compared to 91 percent for urban areas. As expected, child health outcomes are substantially and significantly better in urban areas than rural areas. It is also observed that differences in the covariates are generally significant and favour the urban population.

With regards to maternal characteristics, only 3 percent of rural women had completed at least secondary education compared to over 16 percent of their urban counterparts. While only about 13 percent of urban women had no formal education, over 30 percent in rural women had no formal education. A similar pattern is observed for the spouse's educational attainment. On average, 9 percent of men in rural areas had completed secondary education relative to over 26 percent of men in urban areas. It is surprising that urban women are on average more malnourished than their rural counterparts. Maternal employment rates (both skilled and unskilled) are significantly higher in urban than in rural areas. A bulk of women, 58 percent of the rural and 50 percent of the urban population, had their first pregnancy over the age of 35 years. Over 97 percent of all child birth in both areas is singleton.

[46] A child is moderately stunted, wasted, or underweight if the Z-score value is between -2.00 to -2.99; and severely stunted, wasted, and underweight if the Z-score value is less than -3.00; otherwise the child is not stunted, wasted, or underweight.

Table 4.2: Comparison of determinants of child health outcomes across urban and rural areas

| Variables | Obs. | All | | Rural | | Urban | |
|---|---|---|---|---|---|---|---|
| **Measures of child health** | | | | | | | |
| Child survival rate (percentage) | 26233 | 88.9 | (0.32) | 88.8 | (0.32) | 90.6* | (0.31) |
| Percentage of stunted children | 2287 | 35.4 | (0.48) | 37.8 | (0.49) | 25.2* | (0.43) |
| Percentage of children underweight | 1504 | 21.0 | (0.41) | 22.2 | (0.42) | 15.9* | (0.37) |
| Percentage of wasted children | 380 | 4.16 | (0.20) | 4.07 | (0.20) | 4.55 | (0.21) |
| **Maternal and child characteristics** | | | | | | | |
| Age at first birth (10 - 19) | 368 | 0.01 | (0.12) | 0.01 | (0.12) | 0.01 | (0.12) |
| Age at first birth (20 - 34) | 11758 | 0.42 | (0.49) | 0.40 | (0.49) | 0.49* | (0.50) |
| Age at first birth (35+) | 17651 | 0.57 | (0.50) | 0.58 | (0.49) | 0.50* | (0.50) |
| No formal education | 8258 | 0.27 | (0.44) | 0.30 | (0.46) | 0.13* | (0.34) |
| Completed primary education | 18301 | 0.68 | (0.47) | 0.67 | (0.47) | 0.71 | (0.45) |
| At least secondary education | 3218 | 0.05 | (0.22) | 0.03 | (0.16) | 0.16* | (0.36) |
| Individual is employed | 25719 | 0.83 | (0.34) | 0.77 | (0.34) | 0.89* | (0.38) |
| Maternal health status (height-for-age) | 29524 | -1.22 | (1.02) | -1.22 | (1.01) | -1.24* | ()1.03 |
| Child is singleton birth | 28762 | 0.97 | (0.17) | 0.97 | (0.17) | 0.96 | (0.19) |
| **Indicators of bargaining** | | | | | | | |
| Partner has no formal education | 5827 | 0.18 | (0.39) | 0.21 | (0.16) | 0.06 | (0.24) |
| Partner has completed primary education | 19115 | 0.73 | (0.44) | 0.74 | (0.41) | 0.68 | (0.47) |
| Partner completed secondary education | 4078 | 0.09 | (0.28) | 0.04 | (0.20) | 0.26 | (0.44) |
| Spouses cooperate on health care decision | 14868 | 0.62 | (0.49) | 0.60 | (0.49) | 0.69* | (0.46) |
| Spouses cooperate in daily purchase decision | 12457 | 0.40 | (0.49) | 0.40 | (0.49) | 0.46* | (0.50) |
| Getting money for health care is problematic | 14217 | 0.49 | (0.50) | 0.53 | (0.50) | 0.35* | (0.48) |
| Wife beaten if she goes out without telling him | 10753 | 0.41 | (0.49) | 0.43 | (0.50) | 0.33* | (0.47) |
| Wife beaten if she neglects children | 11059 | 0.44 | (0.50) | 0.46 | (0.50) | 0.36* | (0.48) |
| Wife beaten if argues with partner | 10473 | 0.41 | (0.49) | 0.43 | (0.50) | 0.33* | (0.47) |
| Wife beaten if she refuses to have sex | 9178 | 0.37 | (0.48) | 0.39 | (0.49) | 0.26* | (0.44) |
| Wife beaten if she burns food | 5043 | 0.20 | (0.40) | 0.22 | (0.41) | 0.14* | (0.35) |
| **Household characteristics** | | | | | | | |
| Household is in the first wealth quintile | 5995 | 0.21 | (0.41) | 0.26 | (0.44) | 0.04* | (0.20) |
| Household is in the second wealth quintile | 6374 | 0.23 | (0.42) | 0.27 | (0.45) | 0.03* | (0.17) |
| Household is in the third wealth quintile | 6301 | 0.22 | (0.42) | 0.26 | (0.44) | 0.07* | (0.25) |
| Household is in the fourth wealth quintile | 6386 | 0.20 | (0.40) | 0.17 | (0.38) | 0.28* | (0.45) |
| Household is in the fifth wealth quintile | 4721 | 0.14 | (0.35) | 0.03 | (0.18) | 0.58* | (0.49) |
| Distance to health facility is problematic | 12118 | 0.46 | (0.50) | 0.51 | (0.50) | 0.23* | (0.42) |
| Access to clean source of drinking water | 14243 | 0.44 | (0.50) | 0.37 | (0.48) | 0.76* | (0.43) |
| Access to at least a pit latrine | 22975 | 0.83 | (0.38) | 0.80 | (0.40) | 0.97* | (0.16) |
| Number of children under age five (mean) | 29777 | 1.64 | (1.48) | 1.76 | (1.56) | 1.15* | (0.99) |
| Household size (mean number) | 29777 | 7.14 | (4.05) | 7.34 | (4.26) | 6.32* | (2.90) |

Note: * indicates that the rural-urban gap is significant at 5%. Values in parentheses are standard deviations.
Obs.= number of observations

In terms of bargaining attributes, there exist low levels of cooperation between spouses in rural household and rural women are more prone to being subjected to domestic violence. The converse holds true for the urban sample. For instance, while over 43 percent of rural women are beaten if they argue with their partners, only 33 percent of urban women are beaten when they argue with their partners. In 60 percent of all rural households, spouses cooperate in health care decision relative 69 percent when the urban sample is considered. The level of cooperation in household daily purchase decision is higher in urban than in rural households. While over half of all rural women had difficulties getting money from their partners to seek care, only 35 percent of urban women faced this challenge.

The household socioeconomic status is on average generally and significantly better in urban than in rural areas. Over 51 percent of rural women reported distance to facilities as problematic compared to just 23 percent in urban areas. Rural households are exposed to poor sanitation (no toilet) and limited access to clean source of water than urban households. Concerning household wealth, only 20 percent of rural households belong to the high income quintiles (fourth and fifth) compared to 86 percent for their urban counterparts. Rural households have significantly higher fertility rates, identified by the average number of children in a household. The rural-urban differences reported here suggest that urban children are likely to have a nutritional advantage. The greater access to economic resources and high level of cooperation among urban households increase the chance of providing adequate care for children.

Table 4.3 shows the average difference in the level of stunting across various bargaining indicators and other covariates. Stunting rates are substantially and significantly higher in violence prone households than violence free households. For example, stunting is 5 percent higher in households where women are beaten if they went out without telling their partners compared to their counterparts. As expected, the rate of stunting is lower if couples cooperate in household decision making process. The rate of stunting is 2 percent significantly lower if couples cooperate in health care use decisions than when they do not cooperate. In addition, stunting rate is 3 percent significantly lower among household with parental cooperation in daily purchase decisions. Interestingly, child stunting rate is 7 percent higher among women who had difficulties getting money to seek care.

Table 4.3: Mean comparison of child stunting across various characteristics

| | | Mean | | Mean Difference |
|---|---|---|---|---|
| Variables | Obs. | Yes | Obs. | No | (Yes - NO) |
| **Maternal and child characteristics** | | | | | |
| Child is delivered in a health facility | 3260 | 30.0 | 3422 | 37.2 | -0.072* (0.115) |
| Individual is employed | 5774 | 26.8 | 989 | 35.0 | -0.082* (0.016) |
| Child is singleton birth | 6605 | 33.2 | 163 | 58.3 | -0.251* (0.037) |
| **Indicators of bargaining** | | | | | |
| Wife beaten justify if she (violence): | | | | | |
| Goes out without telling her partner | 2531 | 36.5 | 4182 | 31.8 | 0.046* (0.012) |
| Neglects their children | 2637 | 36.2 | 4090 | 32.2 | 0.040* (0.012) |
| Argues with her partner | 2523 | 36.1 | 4190 | 32.4 | 0.038* (0.012) |
| Refuses to have sex with her partner | 2143 | 37.1 | 4563 | 32.3 | 0.048* (0.012) |
| Burns food | 1182 | 38.4 | 5556 | 32.8 | 0.056* (0.015) |
| Spouses cooperate in health care decision | 2362 | 32.7 | 3539 | 35.1 | -0.024‡ (0.013) |
| Spouses cooperate in household visit decision | 2239 | 33.4 | 3649 | 33.7 | -0.003 (0.013) |
| Spouses cooperate in household purchases | 1601 | 31.5 | 4294 | 34.4 | -0.029† (0.014) |
| Getting money for medical care is problematic | 3091 | 37.4 | 3669 | 30.7 | 0.066* (0.012) |
| **Household characteristics** | | | | | |
| Distance to facility is problematic | 2813 | 36.8 | 3939 | 31.6 | 0.052* (0.012) |
| Individual belongs to first wealth quintile | 1383 | 41.7 | 5385 | 31.8 | 0.110* (0.014) |
| Individual belongs to second wealth quintile | 1552 | 38.1 | 5216 | 32.5 | 0.056* (0.014) |
| Individual belongs to third wealth quintile | 1449 | 35.0 | 5319 | 33.5 | 0.015 (0.014) |
| Individual belongs to fourth wealth quintile | 1394 | 29.8 | 5374 | 34.8 | -0.050* (0.014) |
| Individual belongs to fifth wealth quintile | 990 | 19.8 | 5778 | 36.2 | -0.164* (0.016) |

Note: Standard errors in parenthesis, level of significance: * p<0.01, † p<0.05, ‡ p<0.1. The mean values are percentages of children who are stunted. Obs. = number of observations, Yes = individual has such characteristics and No = individual does not have such attributes. The Yes and No columns shows the proportion of stunted children.

Regarding individual characteristics, children of employed women are less likely to be stunted relative to children unemployed women. Over 58 percent of multiple birth children are stunted compared to 33 percent for singleton births. In terms of household characteristics, the difference is particularly high for household wealth. While a substantial proportion of children from the poorest household (42 percent) are stunted, only about 20 percent of those from the richest households are stunted. The proportion of stunted children decreases as we move from the lowest to the highest wealth quintiles. An interesting observation is that the greatest gap in child stunting is among those in the highest quintile relative to those in other quintiles.

### 4.5.1 Child Nutrition and Household Wealth

This sub-section helps identify the possible relationships that exist between the various anthropometric measures of child health. Figure 4.2 closely examines the three anthropometric measures of child nutrition in relation to household wealth holdings. The figure reveals that

while stunting and underweight are highly sensitive to household wealth, wasting appears to be less responsive to wealth. Children from the lowest quintile have rates of stunting and underweight that are almost twice those of the richest quintile. Using per capita expenditure decile, Zere and McIntyre (2003a) showed that stunting rate for children from the poorest 10 percent of households in South Africa are eight times those of the richest 10 percent and underweight is about three times higher.

Figure 4.2: Child nutrition by household wealth quintile

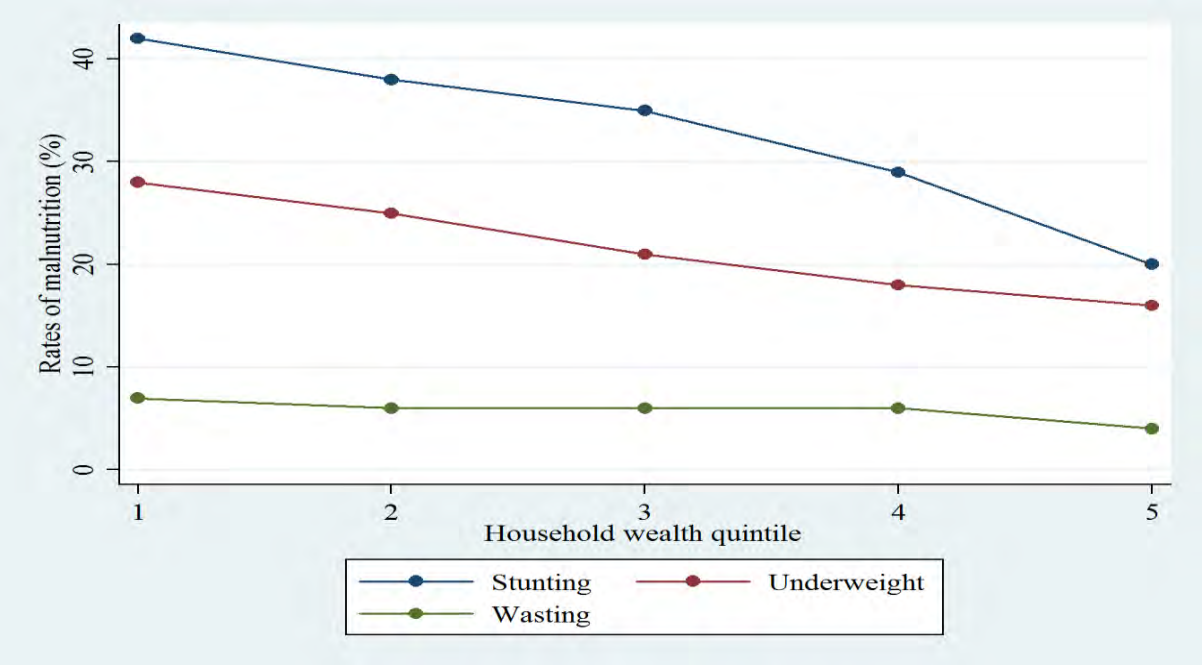
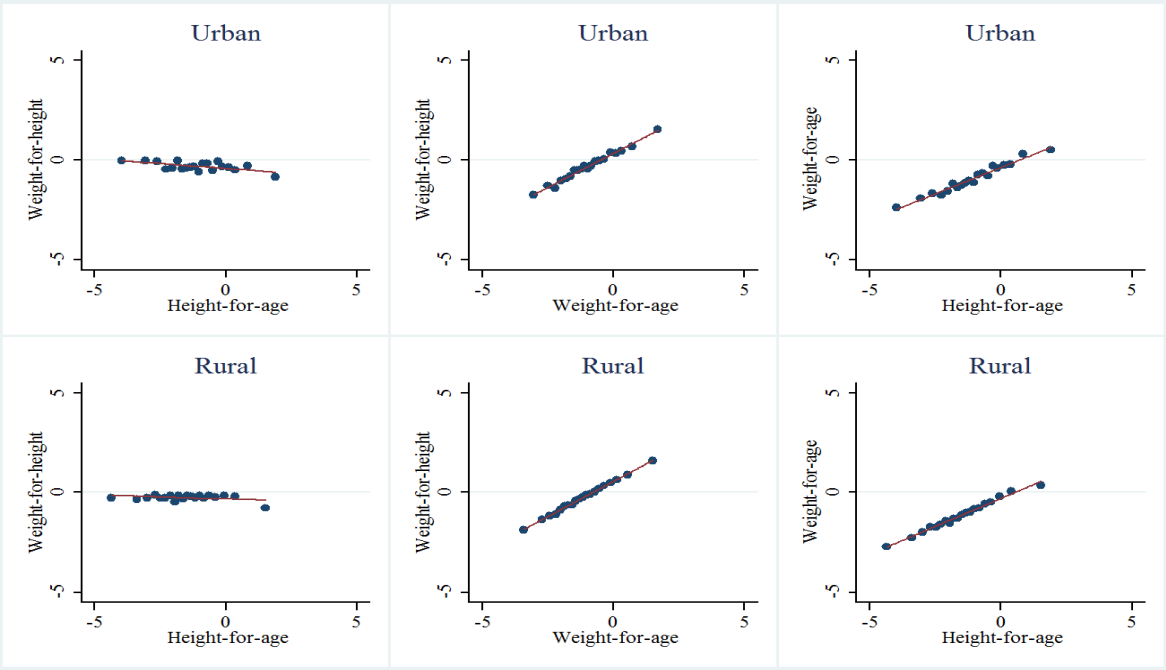



Figure 4.3 provides an understanding of the relationship between the various anthropometric measures of child nutritional status between rural and urban areas. The notion here is to identify whether or not a stunted child is likely to be underweight or wasted. According to O'Donnell and Wagstaff (2008), the absence of wasting in a population does not necessary signify the absence of stunting, since the former is short-term. This study finds no evidence to suggest that a child who is stunted is most likely to be wasted. There exists a positive association between underweight and stunting, and between underweight and wasting. These relationships are consistent across rural and urban dwellers (see Figure 4.3). Considering data for under-five children in 22 African countries, De Onis *et al.* (1993) showed that the frequency of underweight has a strong and positive correlation with wasting and stunting. They found a very low correlation of 0.1 between wasting and stunting. Similar results were obtained by Victora (1992) for Latin America, Eastern Mediterranean, and Asian countries.

Figure 4.3: Correlation of anthropometric indicators




Source: Derived from TDHS 2010

## 4.6. Empirical Results

Table 4.4 presents the marginal effect estimates of female discretion over household wealth, her position in decision-making, and domestic violence on the probability of under-five stunting. It also includes additional controls for the characteristics of the mother, the child, and the household. Three different specifications are estimated, and each provides estimates for the pooled, rural, and urban samples. The results discussed in this section are obtained from the third specification, and are presented in columns 7 to 9 (the last three columns). Estimates in column 7 are for the pooled sample, in column 8 for the rural sample, and in column 9 for the urban sample. It is not surprising that the rural sample is almost four times higher than the urban sample. First, over 75 percent of the population in Tanzania live in rural areas. Second, the final report of the survey and the descriptive statistics presented in Table 3.1 indicate that only 20 percent of the sample was from urban areas. The discussion is limited to the pooled sample and the observed difference with the rural and urban estimates are reported. Generally, the results are more statistically significant for the rural, but the signs on the coefficients for the urban specification tell the same story. The observed difference in the level of significance between the rural and urban estimates may be due to sample differences

Table 4.4: Marginal effects of bargaining including controls for personal and household characteristics

| Variables | (1) Pooled | (2) Rural | (3) Urban | (4) Pooled | (5) Rural | (6) Urban | (7) Pooled | (8) Rural | (9) Urban |
|---|---|---|---|---|---|---|---|---|---|
| **Maternal and child characteristics** | | | | | | | | | |
| Age at first birth (20-35 years) | -0.03*** | -0.04*** | -0.02 | -0.04*** | -0.04*** | -0.04 | -0.04*** | -0.04*** | -0.04 |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.03) |
| Age at first birth (35+ years) | -0.13 | -0.25 | 0.12 | -0.11 | -0.21 | 0.01 | -0.12 | -0.21 | -0.01 |
| | (0.15) | (0.20) | (0.22) | (0.16) | (0.21) | (0.23) | (0.16) | (0.21) | (0.23) |
| Individual years of schooling | -0.01*** | -0.01*** | -0.01*** | -0.01*** | -0.00 | -0.02*** | -0.00 | 0.00 | -0.02*** |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.01) |
| Individual is employed | -0.08*** | -0.07*** | -0.07** | -0.09*** | -0.08*** | -0.06* | -0.07*** | -0.07*** | -0.05* |
| | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.03) |
| Maternal health (height-for-age) | -0.10*** | -0.10*** | -0.08*** | -0.10*** | -0.10*** | -0.07*** | -0.10*** | -0.10*** | -0.07*** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Child is male | 0.04*** | 0.03** | 0.05** | 0.04*** | 0.04*** | 0.04 | 0.04*** | 0.04*** | 0.04* |
| | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.03) |
| Child is delivery in a facility | -0.07*** | -0.06*** | -0.04 | -0.06*** | -0.06*** | -0.03 | -0.04*** | -0.05*** | -0.02 |
| | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.03) |
| Child is singleton birth | -0.25*** | -0.24*** | -0.22** | -0.23*** | -0.23*** | -0.15 | -0.22*** | -0.23*** | -0.15 |
| | (0.04) | (0.04) | (0.09) | (0.04) | (0.04) | (0.11) | (0.04) | (0.04) | (0.11) |
| **Indicators of bargaining** | | | | | | | | | |
| Absolute difference in education | | | | -0.00 | -0.01 | 0.00 | -0.00 | -0.01 | 0.00 |
| | | | | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| Individual less educated than her partner | | | | -0.03 | -0.04 | -0.02 | -0.03 | -0.03 | -0.03 |
| | | | | (0.03) | (0.03) | (0.06) | (0.03) | (0.03) | (0.06) |
| Absolute education interacted with wife less educated | | | | -0.01 | 0.00 | -0.05** | 0.00 | 0.01 | -0.04** |
| | | | | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.02) |
| Absolute difference in age between couples | | | | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 | 0.01 |
| | | | | (0.01) | (0.01) | (0.04) | (0.01) | (0.01) | (0.04) |
| Individual is younger than her partner | | | | 0.02 | 0.05 | -0.11 | 0.01 | 0.04 | -0.09 |
| | | | | (0.05) | (0.06) | (0.15) | (0.05) | (0.06) | (0.15) |
| Absolute difference in age interacted with wife younger | | | | -0.00 | -0.00 | 0.00 | -0.00 | -0.00 | 0.01 |
| | | | | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.01) |
| Domestic violence index | | | | 0.01*** | 0.01** | 0.01* | 0.01* | 0.00 | 0.01* |
| | | | | (0.00) | (0.00) | (0.01) | (0.00) | (0.00) | (0.01) |
| Getting money for care is problematic | | | | 0.05*** | 0.04*** | 0.04 | 0.03** | 0.03* | 0.03 |
| | | | | (0.01) | (0.01) | (0.03) | (0.01) | (0.02) | (0.03) |
| Both partners decide on daily purchases | | | | -0.04** | -0.03* | -0.03 | -0.04** | -0.04** | -0.03 |
| | | | | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.03) |

Continued on next page

Table 4.4: Continued from previous page

| | Pooled | Rural | Urban | Pooled | Rural | Urban | Pooled | Rural | Urban |
|---|---|---|---|---|---|---|---|---|---|
| Partner alone decides on daily purchases | | | | 0.08*** | 0.09** | 0.03 | 0.07** | 0.08** | 0.03 |
| | | | | (0.03) | (0.03) | (0.06) | (0.03) | (0.03) | (0.06) |
| Both partners decide on health care use | | | | -0.09*** | -0.09*** | -0.06 | -0.08*** | -0.09*** | -0.06* |
| | | | | (0.02) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) |
| Partner alone decides on health care use | | | | 0.02 | 0.01 | 0.03 | 0.02 | 0.01 | 0.04 |
| | | | | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) | (0.03) |
| **Household characteristics** | | | | | | | | | |
| Distance to facility is problematic | | | | | | | -0.00 | -0.00 | -0.01 |
| | | | | | | | (0.01) | (0.02) | (0.04) |
| Number of under-five in household | | | | | | | -0.01 | -0.01 | -0.00 |
| | | | | | | | (0.01) | (0.01) | (0.02) |
| Household size | | | | | | | -0.00* | -0.00 | -0.01 |
| | | | | | | | (0.00) | (0.00) | (0.01) |
| Second wealth quintile | | | | | | | -0.02 | -0.03 | 0.03 |
| | | | | | | | (0.02) | (0.02) | (0.10) |
| Third wealth quintile | | | | | | | -0.04** | -0.05** | -0.01 |
| | | | | | | | (0.02) | (0.02) | (0.08) |
| Fourth wealth quintile | | | | | | | -0.08*** | -0.09*** | 0.00 |
| | | | | | | | (0.02) | (0.02) | (0.07) |
| Fifth wealth quintile | | | | | | | -0.18*** | -0.21*** | -0.03 |
| | | | | | | | (0.03) | (0.04) | (0.07) |
| **Observations** | **6,659** | **5,437** | **1,222** | **5,478** | **4,489** | **989** | **5,470** | **4,483** | **987** |

Robust standard errors in parentheses: level of significance: *** p<0.01, ** p<0.05, * p<0.1. The reference categories: Wife alone for decision making variables, unemployed for mother's employment, <20 years for maternal age at first birth. Lowest quintile for household wealth index, multiple birth for birth type, and northern zone of residence

The results show that child-specific characteristics have significant influence on child nutritional outcome (stunting). Male children have higher stunting probability than their female counterparts. The probability of stunting is 4 percentage point higher among male than female children. Children delivered in a health facility have lower stunting probability compared to those delivered at home. Specifically, the use of a health facility during childbirth reduces the probability of child stunting by 4 percentage points. In addition, the type of childbirth significantly influence the probability of child malnutrition (stunting). The probability of child stunting is 23 percentage points lower among singleton birth relative to multiple births. There is an inverse association between maternal educational attainment and child malnutrition. The relationship is significant in the urban and not the rural specification. The significant effects of place of delivery and birth type are observed only in the pooled and rural samples.

In addition, maternal empowerment in terms of education and employment, her health status and age at birth significantly affect child health. The propensity of child stunting reduces with maternal years of schooling in urban areas. Similarly, children of employed women are less likely to be stunted compared to those of unemployed women. The effects are significant across all specification, ranging from 7 percentage points for the pooled sample to 6 percentage for the urban sample. This adds to the fact that a woman's limited discretion over household resources reduces her ability to seek care or provide recommended nutrients to their children (see Ghuman, 2003). Maternal health status is inversely associated with the probability of child stunting. A unit rise in the nutritional status of the mother reduces the probability of child stunting by 10 percent for rural children and 7 percent for the urban children. The probability of child stunting is significantly lower among women who gave birth at age 20 – 34 years, relative to those who gave birth at age less than 20 years. This findings are similar to previous findings by Van de Poel *et al.* (2009) on the probability of child mortality.

The results confirm the impact of bargaining power within couples on child stunting as expected. First, the results show that cooperation in decision making within couples reduce the probability of child stunting. If partners cooperate in health care use decisions, the probability of child stunting reduces by 8 percent. Similarly, if partners cooperate in household daily purchase decisions, the probability of child stunting reduces by 4 percent; but if partner makes purchase decisions alone, the probability of child stunting increases by 7 percent. This relationship is significant only with the pooled and rural samples. On the other hand, the probability of child stunting increases with female's limited discretion over household wealth

and with the incidence of domestic violence. The probability of child stunting is 3 percent higher among women with limited discretion over household wealth than those with access to household wealth. The results suggest that a unit increase in domestic violence significantly increase the probability of child stunting by 1 percentage points. This is only in the pooled sample. Another observation is that differences in the level of education between couples significantly reduce child stunting in urban areas and not in the pooled or rural population.

In terms of household characteristics, household size and household resources endowment are inversely and significantly associated with the probability of child stunting. If the household is made up of more adult than children, then it is possible that household size reduces child stunting, otherwise the converse is true. The probability of child stunting is 4 percent lower in poorer households than in poorest households. Interestingly, the propensity of child stunting decreases consistently and significantly with the level of household wealth. The effects of household wealth are significant only in the rural and the pooled population.

The results suggest that the significant impact of these variables in the pooled sample is driven by the effect in the rural sample. The major findings suggest that cooperation in household decision making, absence of domestic violence, female discretion over resources, and their empowerment through the right to education and employment are essential in reducing child malnutrition (stunting) in Tanzania in general and in rural Tanzania in particular. Relative to household characteristics, the effects of bargaining and maternal specific characteristics are smaller but economically significant, indicating that female empowerment and participation in household decision are likely to partially alter the level of child stunting. In addition, maternal and child specific factors are important in explaining child stunting. These relationships remain significant after controlling for household resource endowment. For a sensitivity check, an OLS is estimated with the same covariates. Not surprisingly, the estimates in Table C4.1 of the appendix are substantially higher than the probit estimates. However, same signs and similar levels significance are observed in both estimations.

### 4.6.1 Decomposition Results

This analysis seeks to answer three fundamental questions. Firstly, what is the child nutritional gap between rural and urban communities? The answer to this question is the total difference between the two areas. Secondly, what would the nutritional gap be if the sample of children alive is not random? This is the total gap from a selectivity corrected child health equation. Thirdly, what would the nutritional gap be if rural households were exactly identical to urban households except for differences in bargaining power within couples? This is the difference due to bargaining effects within households. To answer these fundamental questions, the detailed Oaxaca-Blinder decomposition with and without selection is adopted (see section 4.4). In addition, a generalised non-linear decomposition detailed in Fairlie (2005) is adopted to identify the difference in child survival probability between these areas. It should be noted that the nutritional variable here is continues with high values implying better nutritional outcomes.

Table 4.5 presents the contribution of each covariate to the observed and unobserved rural-urban gap in child nutrition with and without selection bias. The contribution resulting from bargaining power (measured by female decision-making power, her discretion over resources, domestic violence, differences in education, and differences in age between couples) within couples is about 5 percent without selection and 4 percent with selection[47] (6 percent of the total explained gap). Maternal and child specific characteristics account for 10.8 percent of the total gap without selection and 9.7 percent with selection bias (16 percent of the total explained gap). Over 53.4 percent of the gap without selection and 47.9 percent of the gap with selection (78 percent of the total explained gap) is due to differences in socioeconomic status between the rural and urban households. Van de Poel *et al.* (2009) also confirmed that a greater part (67%) of the rural-urban gap in infant mortality in six Sub-Saharan African countries is attributed to differences in household level characteristics. Interestingly, differences in household wealth alone account for 32 percent of the overall gap. The main finding from this analysis is that if the level of bargaining within rural households is equivalent to the level of bargaining within urban households, the overall gap in child nutrition between these areas will reduce by 5 percent without selection and 4 percent with selection.

[47] Without selection implies selection bias is not adjusted and with selection means selection bias is adjusted.

Table 4.5: Detailed decomposition of rural-urban child nutritional status in a selectivity-corrected health equation

| | Selection bias not adjusted | | Selection bias adjusted | |
|---|---|---|---|---|
| Variables | Explained | % | Explained | % |
| Domestic violence index | 0.001 | 0.11 | 0.001 | 0.10 |
| Spouses cooperate in household purchases | 0.002 | 0.47 | 0.002 | 0.42 |
| Spouses cooperate in health care decisions | 0.003 | 0.72 | 0.003 | 0.64 |
| Getting money for care not problematic | 0.011 | 2.49 | 0.011 | 2.23 |
| Absolute difference in education | 0.002 | 0.52 | 0.002 | 0.46 |
| Absolute difference in age | 0.001 | 0.20 | 0.001 | 0.18 |
| **Contribution from bargaining** | **0.02** | **4.51** | **0.02** | **4.03** |
| Individual is employed | 0.009 | 1.97 | 0.009 | 1.77 |
| Individual years of schooling | 0.025 | 5.52 | 0.025 | 4.95 |
| Individual age at first birth | 0.008 | 1.84 | 0.008 | 1.65 |
| Child is singleton birth | 0.008 | 1.82 | 0.008 | 1.63 |
| Child is delivered in facility childbirth) | 0.017 | 3.77 | 0.017 | 3.38 |
| Maternal health (height-for-age) | -0.018 | -4.08 | -0.018 | -3.66 |
| **Contribution from maternal factors** | **0.049** | **10.84** | **0.049** | **9.72** |
| Household size | -0.000 | -0.07 | -0.000 | -0.06 |
| Number of under-five in the household | -0.027 | -6.10 | -0.027 | -5.47 |
| Distance to facility is problematic | -0.007 | -1.59 | -0.007 | -1.43 |
| Household wealth index | 0.144 | 32.31 | 0.144 | 28.97 |
| Has access to pure drinking water | 0.012 | 2.62 | 0.012 | 2.35 |
| Has access to toilet facilities | 0.041 | 9.08 | 0.041 | 8.14 |
| Zone of Residence | 0.076 | 17.13 | 0.076 | 15.36 |
| **Contribution from household factors** | **0.239** | **53.38** | **0.239** | **47.86** |
| **Total explained/Unexplained** | **0.308** | **68.73** | **0.308** | **61.61** |
| **Observations** | **4,570** | | **4,570** | |

Note: A detailed of the results which include both the explained and unexplained component of the gap are presented in Table C4.3 of appendix C.

A contribution from each variable reveals the difference in its distribution between the rural and urban samples, and its degree of association with child nutrition. The interpretation focuses on results obtained from the model with selection bias (sample selection not adjusted), but identified changes after correcting for sample selection bias are reported. In terms of bargaining indicators, half of its contribution is due women limited discretion over household resources to seek care. High incidence of domestic violence in rural areas increase the overall gap by 0.1 percent, while low level of cooperation in health care used and household daily purchase decisions in rural areas increase the gap by 0.54 percent. Differences in educational attainment between couples account for 0.52 percent and differences in age 0.2 percent of the gap. The contribution of each of these indicators reduces slightly after correcting for selectivity.

Concerning maternal and child-specific characteristics, differences in maternal education between rural and urban areas account for 5.5 percent of the gap in child nutrition. Differences in age at first birth and maternal employment contribute 2 percent each to the overall gap. Maternal health actually reduces the rural-urban gap by about 4 percent. The results confirm to the findings observed in the descriptive analysis. Another important finding is that differences in facility use during childbirth between these areas account for over 3.8 percent of the gap, and child birth type account for about 4 percent of the gap. For household characteristics, differences in household wealth contribute 32 percent, zone of residence 17 percent, access to toilet facilities 9 percent, and access to clean water sources 3 percent. Other household factors such as distance to a health facility, household size, and number of under-five children in the household contribute negatively to the total explained gap. The relative contributions and the observed explained and unexplained gaps are presented in Figure 4.4.

Figure 4.4: Percentage contribution of grouped covariates

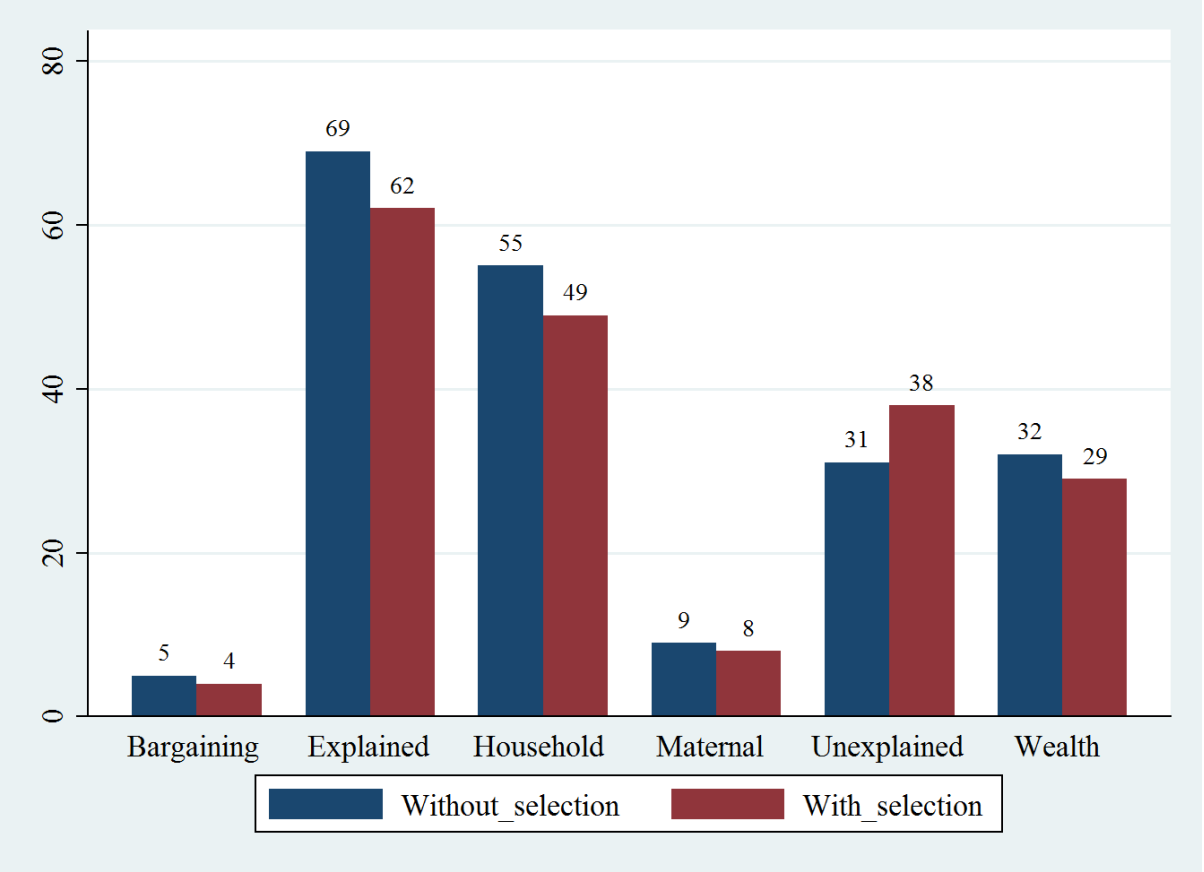


Table 4.6 illustrates an extended decomposition of the rural-urban gap in child nutrition. The gap is divided into the explained (*due to differences in observable characteristics*) and unexplained (*due to differences in coefficients and unobservable*). First, it is assumed that there is no sample selection bias (sample is random) or there is no possibility to correct for possible sample selection bias as has been the case in the literature. Second, it is assumed that sample selection bias can be adjusted. This helps identify the likely changes in the total gap, the explained, and the unexplained gap when selection bias is adjusted. In addition, the nonlinear decomposition is used to determine the rural-urban difference in child survival rate. The results are generally more plausible for urban than for rural children. Without adjusting for sample selection, the average nutritional status is -1.14 for urban children and -1.59 for rural children. After correcting for possible selection bias, the average child nutritional status in urban areas reduced to -1.39 and in rural areas reduced -1.89. The results from the non-linear decomposition indicate that child survival rate in urban areas is 92 percent, relative to 90 percent in rural areas.

Table 4.6: Extended rural-urban child health decomposition (sample selection corrected)

| | Selection bias not adjusted | Selection bias adjusted | Nonlinear (child survival) |
|---|---|---|---|
| Predicted mean for urban population | -1.1427*** | -1.3901*** | 0.9206 |
| | (0.0738) | (0.1134) | |
| Predicted mean for rural population | -1.5887*** | -1.8876*** | 0.8958 |
| | (0.0314) | (0.0490) | |
| Total gap (Urban - Rural) | 0.4461*** | 0.4975*** | 0.0248 |
| | (0.0802) | (0.1235) | |
| Total explained gap | 0.3065*** | 0.3065*** | 0.0197 |
| | (0.0693) | (0.0693) | |
| Percentage of explained gap | 68.7% | 61.6% | 79.12% |
| Total unexplained gap | 0.1396* | 0.1910 | 0.0052 |
| | (0.0767) | (0.1246) | |
| Percentage of unexplained gap | 31.3% | 38.4% | 20.88% |
| Total gap in predicted means | 0.4460*** | 0.4975*** | 0.0249 |
| | (0.0802) | (0.1235) | |
| Percentage of total gap | 100% | 100% | 100% |
| **Number of observations** | **4,570** | **4,570** | **17,642** |

Note: Robust standard errors in parentheses: level of significance: *** p<0.01, ** p<0.05, * p<0.1. Model (1) include sample selection bias; Model (2) sample selection bias is corrected and Model (3) is non-linear decomposition for child survival rate.

The overall rural-urban gap in child nutrition is 0.45. This gap increased to 0.50 after correcting for possible sample selection bias (see row 3). Consequently, failure to correct for possible sample selection bias results in an underestimation of the rural-urban gap in child nutrition. The results reveal that about 69 percent of the gap can be explained by differences in the distribution of observable covariates across these regions. The total explained gap reduces to

62 percent once selection bias is corrected (see row 5). Without selection, the difference in coefficients (unobservable) explains only about 31 percent of the gap and about 38 percent with selection (see row 7). In the non-linear decomposition, differences in covariates between rural and urban households account for over 79 percent of the gap in child survival rate.

This section has identified evidence of sample selection bias and how it affects the total gap, the gap due to observable, and unobservable covariates in child nutrition. It is also observed that the increase in the overall gap after correcting for selectivity is explained by the unobservable characteristics. The results suggest that differences in household factors remain the main drivers of the rural-urban gap in child nutritional status, but can be exacerbated by differences in bargaining power within couples in these region. Finally, failure to correct for possible sample selection bias results in underestimation of the rural-urban gap in child health.

### 4.7. Conclusion

This chapter has investigated the contribution of intra-household bargaining to the rural-urban gap in child nutrition in Tanzania, a country with a significant disparity in rural-urban child health and parental bargaining outcomes. The argument in this chapter is that parents care about the health of their children, but their actions may affect child health inputs which in turn affect child health. This implies that increasing parental cooperation or female participation in household decision making, and a declined rate of domestic violence in rural communities reduce the rural-urban gap in child nutrition, in addition to the prevailing disparity due to differences in household wealth. This offers an attractive policy option particularly when compared to the difficult alternative of household wealth redistribution. The study further suggests that the overall gap is likely to be underestimated if possible sample selection bias is not adequately addressed.

First, the chapter examined the effect of bargaining on child nutrition in Tanzania. The effect of bargaining on child nutrition was estimated using a standard probit and the ordinary least square to check for the sensitivity of the results to different specifications. A variety of parental bargaining attributes are used to examine the relationship between intra-household bargaining and the probability of child stunting. The results suggest that parental cooperation in decision making and low incidence of domestic violence significantly increase child nutritional outcome (reduce child stunting). Maternal discretion over household resources is significantly important

in reducing child malnutrition. The effects are significant mostly in rural but not in urban communities. Controlling for household characteristics slightly affect the magnitude of the coefficients of parental bargaining, but not the sign or significance. Taken together, the results suggest that child specific attributes, such as gender of child, child's birth type, and being delivered in a facility are important in explaining the probability of child stunting. Mother-specific observable components, such as educational attainment, age at first birth, maternal employment, and maternal health directly improve child nutrition. At household levels, household wealth is directly associated with the probability of child nutrition.

There are two main conclusions about the rural-urban gap in child nutritional outcome. First, all of the results suggest that differences in intra-household bargaining between rural and urban households appear to have altered the rural-urban gap in child nutrition. The generalised detailed Blinder-Oaxaca decomposition and the Heckman two-step decomposition suggest that differences in bargaining within couples increase the gap by approximately 5 percent. The results confirm that over 69 percent of the gap is explained by differences in the distribution of factors that determine child health, whereas differences in the effects of these determinants (coefficient effects) account for only 31 percent of the gap. The study illustrates the significance of properly correcting for sample selection bias in identifying rural-urban differences in child health, since failure to do so clearly results in understating of the gap. After correcting for selection bias, the child health gap increased from 0.45 to 0.50. A bulk of the total explained gap is due to differences in household wealth.

In sum, the chapter has shown that child nutrition in Tanzania depends on parental actions and household living conditions that may limit their ability to care for their children. In addition to the behavioural differences between rural and urban areas, rural households live under conditions that are detrimental to the health of their children. Poor child health and the rural-urban gap derived mainly from household and community factors can be exacerbated by the inability of parents to cooperate in their actions. Similarly, maternal specific characteristics account for a significant portion of the gap in child nutrition. From this perspective, this thesis argues that policies need not be limited to correcting deficiencies at community and household endowment, but how to empower women. Empowering rural women reduces the gap directly and indirectly through their participation in household decision making process.

# Chapter 5

# Conclusion

## 5.1 Summary of Findings

The utilisation of maternal health care services in Tanzania has declined substantially over the last decade (2000-2010). The rapid decline does not synchronise with the increased government interventions and is likely to hinder progress towards achieving national and regional health goals. Additional concerns have been raised regarding promotion of access to child health care services with the aim of improving child health outcomes. While the country celebrates the huge decline in infant and under-five mortality, the nutritional status of the surviving rural children relative to urban children is poor despite efforts to reduce this gap. Empirical evidence has identified individual, household, and community characteristics as the possible setbacks for the use of health services. Accordingly, most researchers view the rural-urban gap in child health as a main consequence of differences in socioeconomic status between these areas. The results obtained in this thesis confirm to this claim. Little is empirically known about the health care utilization effects of social networks. There is also very little empirical evidence on how the bargaining process between couples can enhance the use of health services as well as reduce the rural-urban gap in child health. This thesis separately investigated these issues in three linked chapters using data from the 2010 TDHS. In the process, the thesis contributed to a currently small body of empirical evidence on social networks, intra-household bargaining, health care use, and child health in Tanzania.

Chapter Two presented an empirical analysis of the impact of information externalities through social networks on antenatal care utilization in Tanzania. The evidence suggested that networks impact positively and significantly on the probability of early antenatal check-up and antenatal completion. The impact of networks is substantially lower for timing of antenatal visits than for antenatal completion probabilities. Using a fixed effect model to control for the various channels of omitted variable bias escalated the impact of network on antenatal care use. The impact deteriorated once individual and household observable characteristics were included. The chapter subsequently used two measures of social interaction to identify whether or not the impact of the social networks is sensitive to the measure of the quantity of network. Age-marital status and age-fertility cohort are used to measure the quantity of once network.

Generally, networks affect health care utilization behaviour, confirming to the fact that one's attitude is affected by the behaviour of others around the individual. Networks matters and can affect one's attitude through information transmission and norms. If high utilizing age-marital cohorts reside in areas with high concentration of the same age-marital cohort, access to health is found to increase. This underlines the influence of information. On the other hand, if low utilizing age-marital cohorts reside in areas with high concentration of the group, access to health care is found to decrease. This highlights the influence of norms. Though it is difficult to ascertain the true effect of networks, this study provides new approaches for quantifying the size of one's network. It presents novel evidence that shows that irrespective of the way in which the size of one's network is quantified, belonging to a high quality network increases access to health care.

It is acknowledged that even within the same cohorts and geography, socialization is likely to be influenced by the social status of women. The educated are likely to interact mostly with the educated and the rich are most likely to interact with the rich. From this perspective, the magnitude of the effects of social network on antenatal care utilisation is dependent not only on the quantity and quality of one's potential contact, but also on whether the individual is able to access her network effectively. The results showed that network effects were higher among employed and educated women as well as those who relocated within the intervening period. Additionally, network had stronger effects among affluent relative to poor households. The indirect effect of networks in both early antenatal check-up and antenatal completion are highest in urban areas.

The third chapter investigated the role of bargaining power within couples on health care provider choice during childbirth in Tanzania. The effect of bargaining power between couples on the decision to deliver in a health care facility is estimated using a logit model and on health provider choice using a multinomial nested logit model. In the first stage, individuals decide whether or not to deliver in a health facility, and in the second stage they choose between private and public facilities. These decisions are likely to be subjected to negotiations within couples as their preferences over care use varies. A variety of bargaining indicators were used to assess the various channels through which cooperation between partners can influence the use of health services.

Overall, the results of the effect of bargaining suggested that negotiation within couples appears to have altered partially the health care seeking behaviour of women at childbirth. The logit estimates suggested that couples' cooperation in household decision making would have the probability of delivery in a health facility increase (after controlling for socioeconomic status). Limited discretion over household resources by women and the presence of female domestic violence in the household are found to significantly reduce the probability of care use. In terms of female empowerment, employed women significantly increases the probability of facility use at childbirth. Likewise, the probability of health care use increases significantly with maternal years of schooling and with differences in education between couples.

Distance to the facility is included to control for the supply side influence as well as antenatal care completion to control for health knowledge. While completing the number of antenatal care visits significantly increases the probability of health care use, the probability significantly declines with distance to facility. Household demographic and socioeconomic characteristics are included to control for household wellbeing. The probability of care use increases significantly with household wealth and among households in urban areas. The probability of health care use reduces with experience and with the number of children under five years per woman. These factors also explain the probability of using a public or a private facility. In general, the bargaining effects are relatively smaller than the effects resulting from individual and household characteristics.

The fourth chapter examined the effects of intra-household bargaining processes on child nutrition using the probit and the OLS techniques. The chapter further explored differences in the probabilities of child malnourishment between rural and urban areas arising from differences in household bargaining process. This chapter made use of the identified indicators of bargaining power within couples in Chapter 3. The estimates in both models suggested that intra-household cooperation in decision making, low incidence of domestic violence, and female discretion over household resources are likely to reduce the probability of child stunting by 5 percent. The effects were less substantial and less significant in urban areas than was the case for rural areas. Maternal specific factors such as educational attainment, health status, and employment were found to significantly reduce the probability of child stunting. As expected, the findings confirmed that child-specific characteristics, such as being female, delivered in a facility, and being singleton birth, reduce the probability of child stunting. Similarly it was observed that the probability of child stunting decreases with the level of household wealth.

The results suggested that differences in intra-household bargaining between rural and urban areas appear to contribute to the rural-urban gap in child nutrition. The gap was estimated using the generalised detailed Blinder-Oaxaca decomposition and the Heckman two-step decomposition approach. This helped to identify the true gap and contribution of bargaining by controlling for possible sample selection bias. The results confirmed that the overall gap in child nutrition increased from 0.45 to 0.50 and the gap due to differences in bargaining declined from 4.5 percent to 4 percent after controlling for selection bias. A larger percentage of the explained gap is due to differences in individual characteristics (10.8 percent) and household factors (53.4 percent). The contribution due to differences in bargaining and female specific characteristics are smaller but economically significant, indicating the importance of female empowerment and participation in household decision making.

A larger percent of the gap is explained by differences in the distribution of factors that determine child health, whereas differences in the effects of these determinants (coefficient effects) account for only 31 percent of the gap. Correcting for selectivity, the total explained gap declined to 62 percent and the total unexplained to 38 percent. The study illustrates the significance of properly correcting for sample selection bias in identifying rural-urban differences in child nutrition, since failure to do so clearly results in understating of the gap.

**5.2 Possible Policy Implications**

The findings broadly point to two potential policy implications. First, the social network effect suggests that information externalities and norms are likely to significantly influence the probability of antenatal care use. Access to information about the availability and the importance of consuming health services as well as perceptions about modern health care provision depend critically on the social structure and the social networks to which these women belong. As most governments emphasis on subsidisation and free provision of these services, it is important to note that there is need to create awareness about the ongoing health care policies as well as service availability and importance. The poor and disadvantaged communities have limited access to the media and other formal sources of information. They thus rely on informal sources. Devising ways of sensitising such individuals is a potential way of increasing awareness and assuring full utilisation of freely provided health services.

Second, confirmation of the health care use and child nutritional effects of bargaining within couples calls for policies that empower women. The important effect of female discretion over

resources suggest that encouraging their participation in the labour market, especially rural women, is likely to enhance the use of modern health services and improve child health outcomes. Other policies that will foster women's participation in household decision, free them from possible domestic violence practices, promote access to education and employment creation maybe particularly important for health care use and child well-being.

### 5.3 Limitations of the Study

This study has some limitations that are important to be highlighted. One is the way the social network variable was measured. As noted in Chapter 2, and as pointed out in previous literature, most datasets have no information on one's actual contacts. As such, it was difficult to ascertain the actual quantity or quality of one's network. However, an approach that identifies one's potential quantity and quality of contacts was adopted from previous studies. In addition, a sensitivity analysis was performed by considering two approaches for measuring the quantity and quality of one's potential contacts. The study equally acknowledges that homophily is an important determinant of the formation and differentiation of social groups, and is therefore likely to bias the network variable. According to McPherson et al. (2001) people's networks are homogenous with regards to their sociodemographic, behavioural and interpersonal characteristics. With this argument, several studies have demonstrated empirically that has a significant influence on social group formation (Popielarz and McPherson, 1995 and Marsden, 1988). While this likely selection problem cannot be completely addressed into this study, we have attempted to show the extent to which network effects varies if homophily exist, by estimating the network coefficient for subgroups of the population which share particular characteristics (see Table 2.10 and 2.11).

The study acknowledges that the effectiveness of social networks is contingent on differences in the characteristics of care users, in the characteristics of their contacts or their relationship with their contacts, and the nature of the health care system. This study does not ascertain the various channels through which the effectiveness of networks is contingent on. It simply illustrates the actuality of the social network effects for the respective social clusters. Justification as to why the magnitude of network effects varies significantly across groups remain difficult, unless there is more detailed information on the functioning of the health care system, relationship between health care users and their contacts, and the patient-physician

relationship. A further understanding of the dynamics and complexities of social networks in the Tanzanian health care system hinge critically on a robust data set on social networks.

The analysis contained in this thesis assume away the barriers to assessing health care. This is especially the case with direct out-of-pocket payments. Also, it does not take into account the quality of services provided by different providers. This setback is due to the fact that the dataset does not contain information on these variables. As argued in previous literature, getting the direct costs of services in each option is difficult, making the use of prices impossible (Booysens & Visser, 2005; Brown & Theoharides, 2009; Sahn *et al.,* 2003). In the context of Tanzania, maternal health services are free in public facilities and the choice between the private and public care is most likely not to depend heavily on direct but on indirect cost of care. Indirect costs include the cost of waiting time and travel cost to the facility. As is the case in most studies, distance to the facility was used as a proxy for indirect cost of service.

Another potential problem was obtaining an exclusion restriction to correct for the possible sample selection bias in the decomposition analysis. The main challenge for correcting for sample selection bias has been the difficulty of getting an identification strategy. For this reason, some previous studies have highlighted this problem, but no study has attempted to address it. This study therefore employs the Heckman two-step sample-selection procedure to correct for possible sample selection bias (Cameron, 2005). Getting an exogenous variable is the main hurdle for this approach, especially in the context of child nutrition and child survival. Regional child survival rates in 2004 were used as a possible variable that exogenously determined survival rate in 2010 but not nutrition. As evidence thesis demonstrates that the correlation between regional child survival rates in 2004 and 2010 is as high as 0.81 whereas the correlation between survival in 2004 and nutrition in 2010 is only 0.27. This suggests that previous survival rates predict current survival rates, but not necessary current nutritional status. The study therefore trust that the exclusion restriction was subsequently strong. As it is difficult to find a perfect exclusion restriction and since there is no formal statistical test, we assume that the theoretical justification above is plausible for our exclusion restriction.

### 5.4 Future Research and Data Collection

It is important to note that the limitations highlighted in this chapter do not undermine the conclusions so derived, but solutions to such setbacks could only improve on the analysis. The results and limitations identified in this study point to the need for further research on the

effectiveness of social networks and health care demand in Tanzania. They also point to the need for more robust measures of bargaining power within couples, especially in the context of institutional bargaining that may lead to unequal social norms (unequal gender norms). The network effects from one's actual contact could be more imperative than the network effects from one's potential contact. It is necessary to ascertain the various channels through which the effectiveness of networks is contingent on. In addition, there is need to justify why the magnitude of network effects varies significantly across groups. For a deeper understanding of why take-up of maternal health care in Tanzania is low despite the existing government policies required some focus group discussions.

A more comprehensive dataset that contain information on one's actual contacts, the characteristics of the contacts, the relationship with the contacts, and the functioning of the health care system are needed for the above suggested areas of research. Similarly, longitudinal data is required to assess the dynamics and complexities of social networks in the Tanzanian health care system. The TDHS and other surveys in Tanzania should consider improving on social network questions that would allow researchers to draw reliable estimates of networks from one's actual contacts.

Furthermore, while knowledge of bargaining power within couples and health care provider choice is important, a suitable avenue of research would be to examine how the effect of bargaining are altered, if price, and quality of services for each provider is available. It is necessary to disentangle bargaining power from household level to institutional context. This will inform policies that seek to break gender institutions or traditional customs that give men some freely unequal social rights. For this to be feasible, subsequent surveys in Tanzania should include questions that will provide rigorous information on individual, household, and institutional bargaining power within couples. Finally, data collection that seek to assess health and health care issues should include questions that provide information on quality and price of services of various providers.

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# Appendix A: Appendix for Chapters 2

Table A2.1: Mean statistics for sample by antenatal care visit

| Number of children | Observations | All | At least four visits | Less than four visits | Early care check-up |
|---|---|---|---|---|---|
| 1 | 1241 | 0.05 | 0.21 | 0.17 | 0.22 |
| 2 | 2566 | 0.10 | 0.20 | 0.18 | 0.23 |
| 3 | 3327 | 0.13 | 0.17 | 0.16 | 0.17 |
| 4 | 3964 | 0.14 | 0.12 | 0.14 | 0.14 |
| 5 | 3820 | 0.13 | 0.09 | 0.10 | 0.09 |
| 6 | 3510 | 0.12 | 0.07 | 0.08 | 0.06 |
| 7+ | 11349 | 0.34 | 0.13 | 0.16 | 0.08 |

Note: the Table illustrates how the level of antenatal care use decline with fertility rate

Table A2.2: Marginal effects estimates of network as additional fixed effects are included

| | Probability of antenatal care use | | | Probability of early antenatal care use | | |
|---|---|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.10*** | -0.19*** | -0.22*** | -0.13*** | -0.13*** | -0.16*** |
| | (0.02) | (0.03) | (0.04) | (0.01) | (0.01) | (0.01) |
| Network effects | 0.39*** | 0.66*** | 0.75*** | 1.06*** | 1.09*** | 1.22*** |
| | (0.07) | (0.09) | (0.10) | (0.08) | (0.08) | (0.11) |
| Individual relocated in the intervening period | 0.13*** | 0.13*** | 0.12*** | -0.01 | -0.01 | -0.01 |
| | (0.04) | (0.04) | (0.04) | (0.02) | (0.02) | (0.03) |
| Distance to health facility is problematic | -0.05** | -0.04* | -0.02 | -0.03** | -0.03** | -0.02 |
| | (0.03) | (0.03) | (0.03) | (0.01) | (0.01) | (0.02) |
| Number of children ever born | -0.00 | -0.03*** | -0.02** | 0.00* | -0.02*** | -0.02** |
| | (0.00) | (0.01) | (0.01) | (0.00) | (0.01) | (0.01) |
| **Observations** | **5,310** | **5,310** | **5,181** | **5,249** | **5,249** | **4,038** |
| Age-fertility cohort fixed effects | No | Yes | Yes | No | Yes | Yes |
| Cluster fixed effects | No | No | Yes | No | No | Yes |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.
The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$
Age- fertility cohort is a measure of the quantity of one's contacts

Table A2.3: Marginal effects estimates of network as additional fixed effects are included

| | Probability of antenatal care use | | | Probability of early antenatal care use | | |
|---|---|---|---|---|---|---|
| Variables | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.06*** | -0.31*** | -0.31*** | -0.16*** | -0.14*** | -0.17*** |
| | (0.02) | (0.04) | (0.03) | (0.01) | (0.01) | (0.02) |
| Network effects | 0.19*** | 0.95*** | 0.97*** | 0.94*** | 1.24*** | 1.43*** |
| | (0.04) | (0.09) | (0.09) | (0.07) | (0.11) | (0.12) |
| Individual relocated in the intervening period | 0.13*** | 0.12*** | 0.11* | -0.01 | -0.00 | -0.01 |
| | (0.04) | (0.04) | (0.04) | (0.03) | (0.02) | (0.03) |
| Distance to health facility is problematic | -0.06** | -0.05** | -0.02 | -0.03*** | -0.03** | -0.03 |
| | (0.03) | (0.02) | (0.02) | (0.01) | (0.01) | (0.02) |
| Number of children ever born | -0.01* | -0.03*** | -0.01** | 0.00 | -0.02*** | -0.02*** |
| | (0.00) | (0.01) | (0.01) | (0.00) | (0.00) | (0.00) |
| **Observations** | **5,310** | **5,308** | **5,179** | **5,231** | **5,231** | **4,026** |
| Age-marital status cohort fixed effects | No | Yes | Yes | No | Yes | Yes |
| Cluster fixed effects | No | No | Yes | No | No | Yes |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.
The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$
Age- marital status cohort is a measure of the quantity of one's contacts

Table A2.4: Marginal effects of networks including individual and household characteristics

| Variables | Using age-fertility cohort | | | Using age-marital status cohort | | |
|---|---|---|---|---|---|---|
| | Antenatal completion | Antenatal completion | Antenatal care early | Antenatal completion | Antenatal completion | Antenatal care early |
| | (1) | (2) | (3) | (4) | (5) | (6) |
| Contact availability | -0.14*** | -0.20*** | -0.16*** | -0.31*** | -0.26*** | -0.17*** |
| | (0.03) | (0.03) | (0.01) | (0.03) | (0.03) | (0.02) |
| Network effects | 0.56*** | 0.69*** | 1.21*** | 0.96*** | 0.81*** | 1.42*** |
| | (0.09) | (0.10) | (0.11) | (0.09) | (0.09) | (0.12) |
| Early antenatal check-up | | 0.38*** | | | 0.36*** | |
| | | (0.03) | | | (0.03) | |
| **Individual characteristics** | | | | | | |
| Individual relocated in the intervening period | 0.11** | 0.11*** | -0.01 | 0.10** | 0.10** | 0.02 |
| | (0.04) | (0.04) | (0.04) | (0.04) | (0.04) | (0.03) |
| Individual age at birth (20 – 34 years) | 0.09** | 0.09** | -0.01 | 0.08** | 0.08** | 0.01 |
| | (0.04) | (0.04) | (0.03) | (0.04) | (0.04) | (0.04) |
| Individual age at birth (35 – 49 years) | 0.50* | 0.24** | 0.13 | 1.77*** | 1.55*** | 0.56*** |
| | (0.29) | (0.10) | (0.09) | (0.27) | (0.26) | (0.11) |
| Individual years of schooling | 0.01** | 0.01*** | 0.00 | 0.01*** | 0.01** | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Knowledge of pregnancy complication | 0.05*** | 0.04** | 0.03** | 0.05*** | 0.04** | 0.03* |
| | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) | (0.01) |
| Distance to health facility is problematic | -0.01 | -0.00 | -0.02 | -0.02 | -0.01 | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.02) | (0.02) | (0.02) |
| Number of children ever born | -0.00 | 0.00 | -0.01 | 0.00 | 0.00 | -0.01** |
| | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) | (0.00) |
| Number of under-five per woman | -0.07*** | -0.07*** | -0.04*** | -0.09*** | -0.08*** | -0.03*** |
| | (0.02) | (0.01) | (0.01) | (0.01) | (0.01) | (0.01) |
| **Household characteristics** | | | | | | |
| Getting money for care is problematic | -0.06** | -0.05* | -0.02 | -0.05* | -0.05 | -0.03 |
| | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) | (0.03) |
| Male headed household | 0.05* | 0.04** | -0.02 | 0.05* | 0.05** | -0.02 |
| | (0.03) | (0.02) | (0.02) | (0.03) | (0.02) | (0.02) |
| Household asset index | 0.05*** | 0.05*** | 0.01 | 0.05** | 0.04** | 0.03** |
| | (0.02) | (0.02) | (0.01) | (0.02) | (0.02) | (0.01) |
| Household size | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 | -0.00 |
| | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) | (0.00) |
| Individual lives in the central | -0.02 | 0.07** | -1.35*** | -0.09** | -0.04 | -1.25*** |
| | (0.04) | (0.03) | (0.13) | (0.04) | (0.04) | (0.11) |
| Individual lives in the southern highlands | -0.20*** | -0.15*** | 0.03 | -0.21*** | -0.15*** | 0.10*** |
| | (0.04) | (0.03) | (0.02) | (0.04) | (0.04) | (0.02) |
| Individual lives in the lake | 0.13*** | 0.09*** | 0.06*** | 0.07* | 0.07* | -0.13*** |
| | (0.04) | (0.02) | (0.02) | (0.04) | (0.04) | (0.03) |
| Individual lives in the eastern | 0.21*** | 0.07** | 0.19*** | 0.06* | -0.03 | 0.20*** |
| | (0.04) | (0.03) | (0.03) | (0.04) | (0.04) | (0.02) |
| Individual lives in Zanzibar | 0.07* | 0.08*** | 0.00 | 0.02 | 0.03 | 0.00 |
| | (0.04) | (0.03) | (0.03) | (0.04) | (0.04) | (0.02) |
| Individual lives in the southern | -0.28*** | -0.27*** | -0.11 | -0.38*** | -0.37*** | -0.01 |
| | (0.04) | (0.09) | (0.11) | (0.04) | (0.04) | (0.02) |
| Individual lives in the western | -0.05 | -0.14*** | 0.02 | -0.13*** | -0.18*** | 0.01 |
| | (0.05) | (0.04) | (0.03) | (0.05) | (0.05) | (0.03) |
| **Observations** | 5,016 | 5,017 | 3,986 | 5,016 | 5,015 | 3,973 |

Notes: Significance *** 1%, ** 5%, * 10%, Robust standard errors in parentheses.
The contact availability variable is $V_{jk}$ and the network variable is defined as $Netw_{jk} = V_{jk} * \overline{use_k}$
All regressions include cluster fixed effects for age-marital status cohort fixed effect
Column 1, 2, 4, 5 are for antenatal care use regression, column 3 and 6 are estimates for timing of antenatal visit

## Appendix B: Appendix for Chapters 3

Table B3.1: Correlation between indicators of domestic violence

| | Went out | Neglects children | Argues with | Refuse sex |
|---|---|---|---|---|
| Goes out without telling her partner | 1 | | | |
| Neglects their children | 0.685 | 1 | | |
| Argues with her partner | 0.638 | 0.666 | 1 | |
| Refuses to have sex with her partner | 0.575 | 0.581 | 0.665 | 1 |
| Burns food | 0.464 | 0.485 | 0.503 | 0.547 |

Note: The more correlated the data is the better for the extraction of components otherwise it will be harder to apply this method

Table B3.2: Detail of the principal component weighting factors (Eigenvectors)

| Variables | Comp1 | Comp2 | Comp3 | Comp4 | Comp5 | Unexplained |
|---|---|---|---|---|---|---|
| Wife beaten justify if she (violence) | | | | | | |
| Goes out without telling her partner | 0.454 | -0.393 | 0.380 | 0.635 | 0.316 | 0.314 |
| Neglects their children | 0.462 | -0.334 | 0.329 | -0.417 | -0.627 | 0.289 |
| Argues with her partner | 0.470 | -0.16 | -0.344 | -0.525 | 0.600 | 0.264 |
| Refuses to have sex with her partner | 0.453 | 0.170 | -0.694 | 0.380 | -0.374 | 0.316 |
| Burns food | 0.394 | 0.829 | 0.384 | -0.053 | 0.086 | 0.484 |

Note: The Eigenvectors or loadings of the PCA show the percentage of variation unexplained. The lower the percentage of the unexplained the better.

Table B3.2: Principal component/correlation

| Component | Eigenvalue | Difference | Proportion | Cumulative |
|---|---|---|---|---|
| Comp1 | 3.334 | 2.729 | 0.667 | 0.667 |
| Comp2 | 0.605 | 0.169 | 0.121 | 0.788 |
| Comp3 | 0.436 | 0.109 | 0.087 | 0.875 |
| Comp4 | 0.327 | 0.03 | 0.066 | 0.941 |
| Comp5 | 0.297 | . | 0.06 | 1 |

Note: Components with Eigenvalues of more than one should be retained.

Figure B3.1: Predicted probability of each provider choice

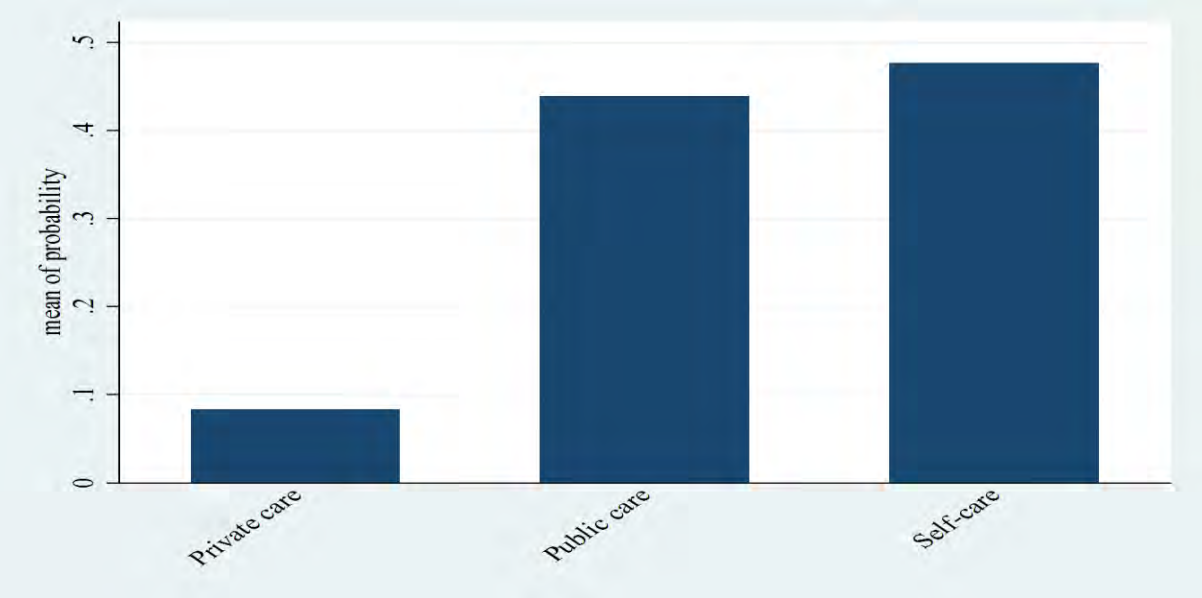

Table B3.3: Mean change in probability of facility use associated with raising the following factors

| | Home care | Public care | Private care |
|---|---|---|---|
| Spouses cooperate in health care decisions | | | |
| Home care | -0.011 | 0.006 | 0.005 |
| Public care | -0.010 | 0.004 | 0.006 |
| Private care | -0.002 | 0.001 | 0.001 |
| Spouses cooperate in household purchase decisions | | | |
| Home care | 0.003 | -0.004 | 0.000 |
| Public care | 0.003 | -0.004 | 0.001 |
| Private care | 0.001 | -0.001 | 0.000 |
| Spouses cooperate in household visit decision | | | |
| Home care | -0.013 | 0.005 | 0.008 |
| Public care | -0.011 | 0.001 | 0.010 |
| Private care | -0.002 | 0.000 | 0.002 |
| Knowledge about pregnancy complications | | | |
| Home care | -0.054 | 0.047 | 0.008 |
| Public care | -0.050 | 0.044 | 0.007 |
| Private care | -0.010 | 0.008 | 0.001 |
| Getting money for medical care is problematic | | | |
| Home care | 0.021 | -0.018 | -0.003 |
| Public care | 0.018 | -0.016 | -0.003 |
| Private care | 0.003 | -0.003 | -0.000 |
| Index of domestic violence | | | |
| Home care | 0.005 | -0.004 | -0.004 |
| Public care | 0.000 | -0.000 | -0.005 |
| Private care | 0.000 | -0.001 | -0.001 |
| Individual woman is employed | | | |
| Home care | -0.075 | 0.063 | 0.011 |
| Public care | -0.069 | 0.058 | 0.010 |
| Private care | -0.013 | 0.011 | 0.002 |
| Age of the individual (years) | | | |
| Home care | -0.003 | 0.002 | 0.001 |
| Public care | -0.003 | 0.002 | 0.001 |
| Private care | -0.000 | 0.000 | 0.000 |
| Individual years of schooling | | | |
| Home care | -0.011 | 0.009 | 0.002 |
| Public care | -0.010 | 0.000 | 0.002 |
| Private care | -0.002 | 0.002 | 0.008 |
| Has health insurance | | | |
| Home care | -0.043 | 0.015 | 0.028 |
| Public care | -0.035 | -0.002 | 0.036 |
| Private care | -0.007 | -0.001 | 0.008 |
| Distance to facility is problematic | | | |
| Home care | 0.030 | -0.034 | 0.004 |
| Public care | 0.024 | -0.032 | 0.008 |
| Private care | 0.004 | -0.006 | 0.002 |
| Index of household wealth | | | |
| Home care | -0.041 | 0.039 | 0.002 |
| Public care | -0.033 | 0.000 | 0.001 |
| Private care | -0.006 | 0.006 | 0.034 |
| Completed antenatal visits | | | |
| Home care | -0.035 | 0.025 | 0.010 |
| Public care | -0.032 | 0.022 | 0.010 |
| Private care | -0.006 | 0.004 | 0.002 |
| Reside in an urban area | | | |
| Home care | -0.085 | 0.062 | 0.023 |
| Public care | -0.069 | 0.043 | 0.025 |
| Private care | -0.013 | 0.008 | 0.006 |
| Number of children ever born | | | |
| Home care | 0.019 | -0.016 | -0.003 |
| Public care | 0.018 | -0.014 | -0.003 |
| Private care | 0.003 | -0.003 | -0.001 |
| Number of under five children by individual | | | |
| Home care | 0.040 | -0.034 | -0.006 |
| Public | 0.036 | -0.031 | -0.005 |
| Private | 0.007 | -0.035 | -0.001 |

## Appendix C: Appendix for Chapters 4

Table C4.1: Regression estimates of bargaining including controls for personal and household characteristics

| Variables | (1) Pooled | (2) Rural | (3) Urban | (4) Pooled | (5) Rural | (6) Urban | (7) Pooled | (8) Rural | (9) Urban |
|---|---|---|---|---|---|---|---|---|---|
| **Maternal and child characteristics** | | | | | | | | | |
| Age at first birth (20-35 years) | 0.11*** | 0.14*** | 0.03 | 0.11*** | 0.14*** | 0.05 | 0.11*** | 0.14*** | 0.04 |
| | (0.03) | (0.04) | (0.08) | (0.04) | (0.04) | (0.09) | (0.04) | (0.04) | (0.09) |
| Age at first birth (35+ years) | 0.21 | 0.50 | -0.57 | 0.16 | 0.42 | -0.40 | 0.20 | 0.43 | -0.35 |
| | (0.41) | (0.49) | (0.76) | (0.43) | (0.53) | (0.77) | (0.43) | (0.53) | (0.77) |
| Individual years of schooling | 0.03*** | 0.02*** | 0.05*** | 0.03*** | 0.01* | 0.07*** | 0.01 | -0.01 | 0.06*** |
| | (0.00) | (0.01) | (0.01) | (0.01) | (0.01) | (0.02) | (0.01) | (0.01) | (0.02) |
| Individual is employed | 0.30*** | 0.25*** | 0.29*** | 0.29*** | 0.24*** | 0.29*** | 0.23*** | 0.21*** | 0.26*** |
| | (0.05) | (0.05) | (0.09) | (0.05) | (0.06) | (0.10) | (0.05) | (0.06) | (0.10) |
| Maternal health (height-for-age) | 0.32*** | 0.33*** | 0.27*** | 0.33*** | 0.34*** | 0.27*** | 0.31*** | 0.32*** | 0.26*** |
| | (0.02) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) |
| Child is male | -0.13*** | -0.12*** | -0.12 | -0.14*** | -0.15*** | -0.05 | -0.14*** | -0.15*** | -0.05 |
| | (0.03) | (0.03) | (0.08) | (0.04) | (0.04) | (0.08) | (0.03) | (0.04) | (0.08) |
| Child is delivery in a facility | 0.26*** | 0.21*** | 0.16* | 0.23*** | 0.21*** | 0.07 | 0.16*** | 0.18*** | 0.06 |
| | (0.03) | (0.04) | (0.10) | (0.04) | (0.04) | (0.11) | (0.04) | (0.04) | (0.11) |
| Child is singleton birth | 0.78*** | 0.73*** | 0.96*** | 0.69*** | 0.67*** | 0.47 | 0.69*** | 0.70*** | 0.51 |
| | (0.10) | (0.11) | (0.30) | (0.12) | (0.13) | (0.38) | (0.12) | (0.12) | (0.38) |
| **Indicators of bargaining** | | | | | | | | | |
| Absolute difference in education | | | | -0.01 | -0.00 | -0.04 | -0.00 | 0.01 | -0.03 |
| | | | | (0.02) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) |
| Individual less educated than her partner | | | | 0.05 | 0.06 | 0.08 | 0.05 | 0.04 | 0.12 |
| | | | | (0.08) | (0.09) | (0.19) | (0.08) | (0.09) | (0.19) |
| Absolute education interacted with wife less educated | | | | 0.03 | 0.00 | 0.08* | 0.00 | -0.01 | 0.06 |
| | | | | (0.02) | (0.02) | (0.04) | (0.02) | (0.02) | (0.04) |
| Absolute difference in age between couples | | | | -0.05 | -0.06 | 0.05 | -0.05 | -0.05 | 0.04 |
| | | | | (0.04) | (0.04) | (0.15) | (0.04) | (0.04) | (0.15) |
| Individual is younger than her partner | | | | -0.07 | -0.16 | 0.61 | -0.07 | -0.13 | 0.55 |
| | | | | (0.15) | (0.16) | (0.51) | (0.15) | (0.16) | (0.51) |
| Absolute difference. in age interacted with wife younger | | | | 0.05 | 0.06 | -0.05 | 0.05 | 0.05 | -0.04 |
| | | | | (0.04) | (0.04) | (0.15) | (0.04) | (0.04) | (0.15) |
| Domestic violence index | | | | -0.03*** | -0.02** | -0.05* | -0.02* | -0.01 | -0.03 |
| | | | | (0.01) | (0.01) | (0.03) | (0.01) | (0.01) | (0.03) |

Continued on next page

Table C4.1: Continued from previous page

| | Pooled | Rural | Urban | Pooled | Rural | Urban | Pooled | Rural | Urban |
|---|---|---|---|---|---|---|---|---|---|
| Getting money for care is problematic | | | | -0.14*** | -0.10*** | -0.17* | -0.07* | -0.06 | -0.12 |
| | | | | (0.04) | (0.04) | (0.10) | (0.04) | (0.04) | (0.11) |
| Both partners decide on daily purchases | | | | 0.04 | 0.07 | -0.14 | 0.05 | 0.10* | -0.18* |
| | | | | (0.05) | (0.05) | (0.10) | (0.05) | (0.05) | (0.10) |
| Partner alone decides on daily purchases | | | | -0.24*** | -0.20** | -0.24 | -0.20** | -0.16 | -0.30 |
| | | | | (0.09) | (0.10) | (0.19) | (0.09) | (0.10) | (0.19) |
| Both partners decide on health care use | | | | 0.21*** | 0.17*** | 0.30** | 0.19*** | 0.15** | 0.30** |
| | | | | (0.06) | (0.07) | (0.12) | (0.06) | (0.07) | (0.12) |
| Partner alone decides on health care use | | | | -0.04 | -0.05 | -0.01 | -0.04 | -0.05 | 0.04 |
| | | | | (0.04) | (0.05) | (0.11) | (0.04) | (0.05) | (0.11) |
| **Household characteristics** | | | | | | | | | |
| Distance to facility is problematic | | | | | | | 0.04 | 0.04 | 0.04 |
| | | | | | | | (0.04) | (0.04) | (0.12) |
| Number of under-five in household | | | | | | | -0.00 | 0.00 | -0.01 |
| | | | | | | | (0.02) | (0.02) | (0.05) |
| Household size | | | | | | | 0.02*** | 0.01* | 0.03* |
| | | | | | | | (0.01) | (0.01) | (0.02) |
| Second wealth quintile | | | | | | | 0.05 | 0.09 | -0.71** |
| | | | | | | | (0.05) | (0.06) | (0.35) |
| Third wealth quintile | | | | | | | 0.12** | 0.17*** | -0.47* |
| | | | | | | | (0.06) | (0.06) | (0.28) |
| Fourth wealth quintile | | | | | | | 0.33*** | 0.38*** | -0.16 |
| | | | | | | | (0.06) | (0.06) | (0.24) |
| Fifth wealth quintile | | | | | | | 0.62*** | 0.73*** | -0.05 |
| | | | | | | | (0.07) | (0.10) | (0.24) |
| Constant | -2.14*** | -2.06*** | -2.23*** | -1.96*** | -1.82*** | -2.44*** | -2.15*** | -2.06*** | -2.44*** |
| | (0.11) | (0.12) | (0.34) | (0.21) | (0.23) | (0.69) | (0.22) | (0.24) | (0.74) |
| **Observations** | **6,659** | **5,437** | **1,222** | **5,478** | **4,489** | **989** | **5,470** | **4,483** | **987** |
| **R-squared** | **0.09** | **0.08** | **0.08** | **0.10** | **0.09** | **0.11** | **0.11** | **0.10** | **0.12** |

Robust standard errors in parentheses, level of significance: *** p<0.01, ** p<0.05, * p<0.1. The reference categories: Wife alone for decision making variables, unemployed for mother's employment, <20 years for maternal age at first birth. Lowest quintile for household wealth index, multiple birth for birth type, and northern zone of residence

Table C4.2: Test for selection

| | F-statistics | Standard error | P-values |
|---|---|---|---|
| Selection | 0.825*** | (0.077) | 0.001 |

Table C4.3: Detailed decomposition of rural-urban child nutritional status in a selectivity-corrected health equation

| | Selection bias not adjusted | | | | Selection bias adjusted | | | |
|---|---|---|---|---|---|---|---|---|
| Variables | Explained | % | Unexplained | % | Explained | % | Unexplained | % |
| Domestic violence index | 0.001 | 0.11 | -0.136 | -30.5 | 0.001 | 0.10 | -0.211 | -42.4 |
| Spouses cooperate in household purchases | 0.002 | 0.47 | 0.033 | 7.3 | 0.002 | 0.42 | -0.163 | -32.8 |
| Spouses cooperate in health care decisions | 0.003 | 0.72 | 0.139 | 31.3 | 0.003 | 0.64 | 0.187 | 37.6 |
| Getting money for care not problematic | 0.011 | 2.49 | 0.015 | 3.4 | 0.011 | 2.23 | 0.009 | 1.8 |
| Absolute difference in education | 0.002 | 0.52 | 0.020 | 4.6 | 0.002 | 0.46 | 0.020 | 3.9 |
| Absolute difference in age | 0.001 | 0.20 | -0.105 | -23.4 | 0.001 | 0.18 | -0.086 | -17.4 |
| **Contribution from bargaining** | **0.02** | **4.51** | **-0.034** | **-7.5** | **0.02** | **4.03** | **-0.244** | **-49.2** |
| Individual is employed | 0.009 | 1.97 | -0.083 | -18.6 | 0.009 | 1.77 | 0.001 | 0.2 |
| Individual years of schooling | 0.025 | 5.52 | 0.315 | 70.5 | 0.025 | 4.95 | 0.370 | 74.5 |
| Individual age at first birth | 0.008 | 1.84 | -0.053 | -11.8 | 0.008 | 1.65 | -0.020 | -4.0 |
| Child is singleton birth | 0.008 | 1.82 | 1.147 | 257.1 | 0.008 | 1.63 | 1.325 | 266.3 |
| Child is delivered in a facility | 0.017 | 3.77 | 0.009 | 2.1 | 0.017 | 3.38 | 0.035 | 7.1 |
| Maternal health (height-for-age) | -0.018 | -4.08 | 0.078 | 17.5 | -0.018 | -3.66 | 0.084 | 16.9 |
| **Contribution from maternal factors** | **0.049** | **10.84** | **1.413** | **316.7** | **0.049** | **9.72** | **1.795** | **361** |
| Household size | -0.000 | -0.07 | -0.167 | -37.5 | -0.000 | -0.06 | -0.071 | -14.4 |
| Number of under-five in the household | -0.027 | -6.10 | 0.002 | 0.4 | -0.027 | -5.47 | 0.018 | 3.6 |
| Distance to facility is problematic | -0.007 | -1.59 | -0.024 | -5.4 | -0.007 | -1.43 | -0.040 | -8.1 |
| Household wealth index | 0.144 | 32.31 | -0.006 | -1.2 | 0.144 | 28.97 | 0.181 | 36.3 |
| Has access to pure drinking water | 0.012 | 2.62 | 0.218 | 48.8 | 0.012 | 2.35 | 0.184 | 36.9 |
| Has access to toilet facilities | 0.041 | 9.08 | 0.247 | 55.4 | 0.041 | 8.14 | -0.022 | -4.4 |
| Zone of Residence | 0.076 | 17.13 | 0.057 | 12.9 | 0.076 | 15.36 | 0.058 | 11.7 |
| **Contribution from household factors** | **0.239** | **53.38** | **0.327** | **73.4** | **0.239** | **47.86** | **0.308** | **61.7** |
| Constant | | | -1.567 | -351.4 | | | -1.667 | -335.1 |
| **Total explained/Unexplained** | **0.308** | **68.73** | **0.139** | **31.3** | **0.308** | **61.61** | **0.192** | **38.4** |
| **Observations** | **4,570** | | **4,570** | | **4,570** | | **4,570** | |

Table C4.4: Marginal effects of child survival rate in 2004 on child survival probability in 2010

| Variables | (1) Pooled | (2) Rural | (3) Urban |
|---|---|---|---|
| Child survival rate 2004 | 0.01*** | 0.01*** | 0.01*** |
| | (0.00) | (0.00) | (0.00) |
| Observations | 29,458 | 23,956 | 5,502 |

Standard errors in parentheses, level of significance: *** p<0.01, ** p<0.05, * p<0.1