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SOCIOECONOMIC INEQUALITIES IN THE USE OF SKILLED BIRTH DELIVERY DURING CHILDBIRTH IN GHANA: A DECOMPOSITION MODEL

Research Protocol submitted to the Human Research Ethics Committee as a partial fulfilment for the degree of Masters' in Public Health (MPH) In Health Economics

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SECTION 0

Declaration

I, ……***Aseye Eyram Afi Kpodotsi***……, hereby declare that the work on which this dissertation/thesis is based is my original work (except where acknowledgements indicate otherwise) and that neither the whole work nor any part of it has been, is being, or is to be submitted for another degree in this or any other university.

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Date: 19th February, 2018

Dedication

I dedicate this thesis to God, my beloved parents, brother for giving me the opportunity and friends for the immense support and encouragement throughout my studies.

Abstract

Equitable access to, and use of skilled birth attendance during delivery is vital for the achievement of the Sustainable Development Goals (SDGs) in reducing global maternal deaths to 70 deaths per 100, 000. Although several initiatives have been implemented to reduce maternal mortality in Ghana, inequities in the use of skilled birth attendance during delivery still exist among women of different socioeconomic groups. This study assessed the socioeconomic inequalities and the underlying factors related to the inequalities in the use of skilled birth attendants during delivery in Ghana.

This study analysed data from the 2014 Ghana Demographic and Health Survey (GDHS) using a decomposable health concentration index. Concentration index (CI) and concentration curves were employed to measure the magnitude of socioeconomic inequality in the use of skilled birth attendants during child delivery. The concentration index was decomposed to identify the underlying factors causing the inequalities.

Out of a total of the 1,305 women who gave birth in the year prior to the interview, 28% of the deliveries had no skilled birth attendants of which 60% lives in rural compared to 40% in urban. A concentration index of 0.147 showed a pro-rich utilization of skilled birth attendance during delivery. The decomposition analysis revealed that, wealth, education and location of residence were the major contributors to socioeconomic inequalities in the use of skilled birth attendants during child delivery among Ghanaian women.

This study suggests that factors such as wealth, area of residence and education are worthy of increased attention in programmatic efforts, and policy interventions, because they are amenable to the reduction of observed inequality.

Acknowledgements

Foremost, I would like to express my sincere appreciation to my supervisors Dr. Olufunke Alaba, Dr. Joanne Hunter Adam and the entire Health Economics Unit for their dedication, motivation, patience, and guidance at the various stages of writing this thesis.

To my parents, brother and friends who in one way or the other shared their inspiration, prayers, encouragement, and financial support during my studies.

Above all I would like to thank God for giving me the wisdom and determination to undertake this studies.

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PART A: RESEARCH PROTOCOL

BACKGROUND

Globally about 800 women die from preventable complications during pregnancy and childbirth daily. This suggests that a woman dies every 90 seconds and millions more left with life threating disabilities (UNFPA, 2016). These high maternal deaths reflect inequities in access to health services, stressing the wide gap that exists between the rich and poor (WHO, 2016). Of all these deaths, developing countries account for almost all (99%) with sub-Sahara Africa accounting for more than half (62%) followed by 37% in Southern Asia (Iaccino, 2014). These gaps exist between countries and within countries; between socioeconomic status in society and between area of residence, rural or urban (WHO, 2016).

According to Heilbrunn Department of Population and Family Health (2016), over 70% of maternal deaths worldwide are as a result of five major direct obstetric complications: haemorrhage (24%), Sepsis-related to poor hygiene and infection control during childbirth (15%), unsafe abortion (13%), hypertension disorder (12%), obstructed labour (8%) and indirect causes accounting for almost 20%.

Maternal health services like antenatal care, delivery at a health facility and immediate postpartum care with skilled birth attendants have been advocated, for timely management and treatment of complications to reduce maternal deaths. However, in Sub-Saharan Africa, women continue to face limited access to skilled birth attendants. The term "*skilled birth attendant*" defined by the World Health Organization (WHO), refers to *"an accredited health professional – such as a midwife, doctor, or nurse - who has been educated and trained to proficiency in the skills needed to manage normal (uncomplicated) pregnancies, childbirth and the immediate postnatal period, and in the identification, management and referrals of complications in women and new-borns*"

(WHO, 2004). While almost 100% of births are assisted by skilled birth attendants in developed countries, more than half of all births in sub-Saharan Africa occur without the help of a skilled birth attendant (UNICEF, 2015). WHO, (2008) reports the low use of skilled birth attendants during delivery in sub- Saharan Africa as a result of women having limited access to skilled delivery services due to socioeconomic inequalities in health care utilization among population groups. Therefore, raising concerns into health inequities regarding health care service utilization. (WHO, 2008).

Over the years, health equity and its association with socioeconomic status (SES) have attracted attention from researchers and policy makers. Despite numerous efforts in this regard, socioeconomic factors keep accounting for the differences in access and use of health care services (Gwatkin, 2000). Evidence from studies have shown that, socioeconomic stratification determines the use of health care services not only in developing countries but also developed nations as well (Fiscella et al., 2000). In order to reduce inequalities in health care access, Gallo, Espinosa De Los Monteros and Shivpuri, (2009) suggest a broad understanding of the underlying causes of the socioeconomic inequality in health. This has led researchers to come up with different models to help understand the causes of socioeconomic inequalities in health (Andersen & Newman, 1973; Jacobs et al., 2012; Levesque et al., 2013). Factors such as income, educational level, perceived need, distance to health facilities, beliefs among others have been discovered to impede the use of health care services, most especially in developing countries (Say & Raine, 2007).

Ghana like many other sub-Saharan African countries, high maternal mortality and low skilled birth attendants at birth remains a problem of public health importance. The 2008 Ghana Demographic and Health Survey (GDHS) reported a national average of 59% of the population delivered with the assistance of a skilled birth attendant (i.e. doctor, nurse/midwife, community

health officer/nurse) (GSS, GHS & ICF Macro, 2009). As at 2015, the maternal mortality ratio in Ghana was estimated at 319 deaths per 100,000 live births which is still above the global average of 216 deaths per 100,000 live births (UNICEF, 2016).

STUDY RATIONALE

Although, attendance of antenatal care visits improved significantly over the past two decades with national averages from 82% in 1998 to 95.8% in 2008 only 59% of birth reported, used skilled attendants during delivery, out of which 94.5% were from the richest quintile compared to the 24.2% in the poorest quintile (2008 Ghana DHS). Also, the women with high educational levels (i.e. secondary level and above) are more likely (94.3%) to deliver with skilled attendants than those with no education (ORC Macro, 2007). This suggests that there exist some form of inequalities with the use of skilled attendants during delivery. The question, therefore, is why are pregnant women attending antenatal visits are not using skilled birth attendants during deliveries? Hence, this study will like to examine the extent to which socioeconomic inequalities exist in the use of skilled birth attendants during delivery and the underlying causes contributing to these inequalities in Ghana.

There have been a number of studies conducted in Ghana around maternal health care utilizations. However, these studies are conducted either about specific regions or districts where maternal mortality seems to be on the rise with few concentrating on Ghana as a whole. Others that have been conducted are based on specific factors associated in the use of maternal health care services like health insurance, geospatial analysis among others (Browne et al., 2016; Galaa et al., 2016; Wang et al.,2017). Very few studies in Ghana (Say & Raine, 2007; Aseweh Abor et al., 2011; Asamoah et al., 2014) have addressed inequity relating to the use of skilled attendants at birth and those that exist are based on years between 1988 and 2008. Moreover, due to structural

transformations that may have occurred between 2008 and 2014, it will be only prudent that the most current data which is the 2014 Ghana Demographic and Health Survey, be use to provide a more current analysis of the socioeconomic inequalities in the use of skilled attendants at birth.

LITERATURE REVIEW

Introduction

This section seeks to provide some literature on the extent to which socioeconomic inequalities exist in the use of skilled birth attendants during delivery and the underlying causes associated with these inequalities as well as the conceptual framework to be used in this study.

Socioeconomic inequalities in the use of skilled birth attendants during delivery

The 2011 Centre for Disease Control and Prevention's (CDC) report on health disparities and inequalities explains that health inequalities is often used in economic literature and sometimes used interchangeably with health disparities as the measure of health among population groups. It is associated with individual or group specific characteristics such as income, education, race or ethnicity, etc. Health inequalities are important indicators for community health improvement. They provide important information for policymakers for the implementation of interventions to reduce preventable morbidities and mortalities (CDC, 2011).

A number of studies have been conducted globally on the socioeconomic inequalities in the use of skilled birth attendants during delivery using a decomposition analysis to understand the extent to which theses inequalities affect the use of skilled birth attendants (Celik & Hotchkiss, 2000; Benova et al., 2014; Liu et al., 2014).

Using Concentration index to identify socioeconomic inequalities in the use of skilled birth attendants, studies conducted in Nigeria (Adeyanju et al., 2017), Namibia (Zere et al., 2011) and Bangladesh (Shabnam et al., 2011) have revealed that the wealthy and the most educated in society

are the ones who use skilled birth attendants during delivery. This implies that income, education and place of residence are the major causes of inequality in the use of skilled birth attendants. Moreover, these studies have agreed that health insurance cover and female headed household also help in reducing inequalities therefore increase the use of skilled birth attendants during delivery.

Marthias, (2013) in his study conducted in Indonesia, shows that, inequality in skilled birth attendant utilization during delivery varies across regions. Using the concentration indices, it was reported that skilled birth attendants (SBAs) utilization was unequally distributed among the richer groups. It was also observed that antenatal visits, maternal education and wealth distribution were the basis for the inequality.

In Ghana, only a few studies have been conducted looking into inequalities in maternal health care utilization (De Onis et al., 2007; Say & Raine, 2007b; Aseweh Abor et al., 2011; Zere et al., 2012; Afulani & Moyer, 2016; Asamoah et al., 2014). Aseweh Abor et al., (2011) examines the socioeconomic determinants of maternal health services using Probit and ordered probit models. The findings of the study revealed that, older women compared to younger women, women with multiple birth (twin birth or more), mothers with secondary or higher education, ethnicity, women from wealthy households, and religious affiliation had a significant positive influence in maternal health services. Likewise, Zere et al., (2011) in their study measured the presence and absence of inequities in maternal and child health outcomes using population-weighted, regression-based measures: Slope Index of Inequality (SII) and Relative Index of Inequality (RII). Their study revealed a pro-rich socioeconomic inequalities where the rich were the main users of skilled attendance at birth. In addition, Asamoah et al., (2014) studies the magnitude and trends of inequalities in antenatal and delivery care under skilled care among different socio-demographic groups from 1988 – 2008. It is discovered that, rural-urban gap and education- related inequalities

in the use of prenatal and skilled birth attendants seems to be closing over time. However, income-related inequality regarding skilled birth delivery was low, stabled from 1988 to 1998, peaked between 1998 and 2003 and then plateaued after 2003. This study applied the regression-based Total Attributable Fraction (TAF).

Say and Raine, (2007b) in their study, examined inequalities in the use of a skilled health worker at delivery based on women's socioeconomic status and place of residence (urban/rural) in ten countries. It was observed that, maternal care use varies greatly within and between countries and those more likely to use maternal health services are women from wealthy households and urban areas.

Underlying factors associated with the use of Skilled Birth Attendants at delivery

Major factors affecting the use of skilled birth attendants during delivery are identified in literature as follows:

Woman's Autonomy

Woman's autonomy is defined as the ability of a woman to make decisions that affect their own lives (Khan & Ram, 2009). Therefore, women's autonomy and reproductive health behaviours is a major concern as it reduces maternal mortality and improve child health. Factors such as age especially young women between the ages of 20 and 39 years, women living in urban residence, higher education attainment , employment status, female household heads are associated with high women autonomy (Nigatu et al., 2014; Osamor & Grady, 2016). With regard to maternal health service utilization ,a number of studies have shown that women with high autonomy have high tendency of using maternal health services like skilled birth attendants during delivery (Mahapatro, 2012; Hou & Ma, 2013; Situ, 2013; Fekadu & Regassa, 2014). These suggest that better maternal health services utilization are strongly related to women who are able to decide on their own as to

when and where they need health care. This was also consistent with a study conducted by Ameyaw et al., (2016) in Ghana.

Maternal Age

Age of the mother has been shown to influence maternal health service utilization (Celik & Hotchkiss, 2000; Stephenson et al., 2006; Mpembeni et al., 2007; Onasoga et al., 2014). Findings from these studies revealed that women between the ages of 20 and 35 years were more likely to use skilled birth attendants than women below 20 years and above than 35 years. However this was not true for a study conducted by Benova et al., (2014) in Egypt. The findings from Egypt showed that women above the age of 40 years were more likely to seek skilled delivery care from a professional that their younger counterparts. This was consistent with a study conducted in Northern Nigeria where women below 35 years were more likely to use non-skilled birth attendants (Doctor & Dahiru, 2014).

Maternal education

Studies conducted in Uganda by Rutaremwa et al., (2015) , Peru by Elo, (1992), Thailand by Raghupathy, (1996) and The Gambia by Barrett & Browne, (1996) have shown that maternal literacy affects the use of skilled delivery . The findings further show that, women who have had some form of formal education prefer to deliver in the presence of a skilled birth attendants to women with no education at all. This implies that women who are educated have better awareness and knowledge on the importance of skilled delivery services (Chakraborty et al., 2003).

Health Insurance Coverage

Studies have proven that health insurance coverage has contributed immensely to the use of maternal health services. A study carried out by Wang, Temsah and Mallick, (2014) using the

DHS program in eight (8) low- and middle-income countries (LMIC) of which Ghana was part revealed a significant positive association between health insurance coverage and the use of maternal health care. It was also observed that educational attainment and household wealth status contributed to high enrolment in health insurance, thus increasing maternal health care utilization which was consistent with other studies that have been conducted elsewhere (Khan & Singh, 2016; Ameyaw, Kofinti & Appiah, 2017; Rashad, Sharaf & Mansour, 2017).

Yet, studies conducted in only in Cambodia and Gabon by Wang et al., (2014) , and in Burkina Faso by Gnawali et al., (2009) have showed that health insurance enrolment is positively associated with the poor women, thereby increasing the use of maternal health care like skilled birth attendants. The analysis revealed a clear evidence that health insurance contributes immensely to the use of maternal health services.

Socioeconomic status

Furthermore, findings of other studies have revealed that economic well-being status of the household of which women belonged played plays a crucial role in explaining the variations in the use of maternal health services. A study conducted on the use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania by Mpembeni et al., (2007) revealed that using skilled attendance during delivery were associated with high to moderate socioeconomic status. Furthermore, they found that high socioeconomic status influence decision-making since the woman is able to make wise decisions about her own health. Their findings were similar to other studies (Osubor, Fatusi & Chiwuzie, 2006; van Eijk et al., 2006; Gabrysch & Campbell, 2009)

Accessibility

Literature has also identified distance to health facility has a major factor affecting the use of skilled birth attendants during delivery. In an article published by Thaddeus and Maine, (1994) shows that distance to a health facility particularly in rural settings affects the decision to seek health and arrive at the health facility on time. A study published by Ettarh and Kimani, (2014) on the how distance to a health facility affect the use of skilled birth attendants during delivery in Kenya. It was reported that households which within 5km to a health facility used skilled birth attendants at delivery and the opposite being true. Another study conducted in Zambia revealed that households who lived less than 1km and 5km from a health facility were more likely to access skilled birth attendants during delivery where more than 16% of home deliveries could be avoided (Gabrysch et al., 2009).

Studies on socioeconomic inequalities in the use of skilled birth attendants during delivery in Ghana are still limited. Most of studies have focussed on GDHS data from 1988 to 2008 using a regression-base Total Attributable Fraction, probit or ordered-probit models in their analysis. Making use of data almost ten years old can limit comparability due to some structural transformation that may have taken place in the last ten years Some of these structural transformation include, bridging equity gaps in access to health care (in terms of health worker availability, geographical accessibility and financial accessibility) and quality maternal, neonatal, child and adolescent health services. To bridge equity gaps in access to health care, the Community-based Health Planning Services (CHPS) programme was implemented to increase the availability of health workers across the country, mostly in the remote and deprived areas. In addition, geographical accessibility was being improved through the establishment of new health facilities like the Tamale Teaching Hospital. Already existing health facilities like Korle Bu, Ridge

and Komfo Anokye Teaching Hospitals are being upgraded in order to support effective and efficient service delivery in the country (Ghana Health Service, 2010). Furthermore, was assessing the equity in the enrolment in the National Health Insurance Scheme (NHIS). Over the years, NHIS enrolment has expanded and become more equitable. The Health sector through the auspices of the Ghana Health Service (GHS) has tried to increase coverage to promote universal health coverage. In 2014, coverage had increased to 10.5 million representing 40% of the population since its inception in 2004 (Wang, Otoo & Dsane-Selby, 2017). Also, its benefit package has been reviewed where more than 95% of diagnosed conditions are covered under the NHIS and has no cost-sharing requirements (Wang, Otoo & Dsane-Selby, 2017). For improving access to quality maternal, neonatal, child and adolescent health services, a number of programmes were implemented. These included Prevention Mother To Child Transmission (PMTCT) scale-up Plan, MDG Accelerated Framework (MAF, Under-five mortality policy, 2010 Child Health Promotion Week, Training of trainers (TOT) workshop on lactating management, training and deployment of midwives to increase skilled birth attendants coverage in the country were all implement (Ghana Health Service, 2010). Therefore in view of all these transformation that have been implemented since 2008, there is the need to use a more recent data to examine if socioeconomic inequalities still persist and if so to what extent do they exist.

In Ghana, Bosomprah et al., (2014) did a decomposition analysis of change in skilled birth attendants 2003 and 2008 GDHS. They used the conventional Blinder-Oaxaca decomposition based on two linear regression models. Again only few studies have looked at socioeconomic inequalities in the use skilled birth attendants during delivery in developing countries and in Africa to be precise using a decomposition model (Zere et al., 2011; Liu, Gao & Yan, 2014; Prusty, Gouda & Pradhan, 2015; Makate & Makate, 2017). The motivation of this study originated from this

context and aims to add to empirical literature on socioeconomic inequalities in the use of skilled birth attendants globally, in sub-Saharan Africa and in Ghana. In addition, this study will use the most recent data, the 2014 Ghana Demographic and Health Survey data by giving a more recent analysis of socioeconomic inequalities in skilled birth attendants during delivery in Ghana. This study will also decompose the underlying factors contributing to the socioeconomic inequalities using the concentration index by Wagstaff et al., (2011).

RESEARCH AIM

This study aims to quantify and explain the socioeconomic inequalities that exist in the use of skilled birth delivery service in Ghana using a decomposing model.

Specific Objectives

1. To assess the socioeconomic inequalities related to skilled birth attendants utilization during delivery in Ghana.
2. To decompose the underlying determinants contributing to the observed inequalities in skilled birth attendants' utilization during delivery in Ghana.

CONCEPTUAL FRAMEWORK ON EQUITY OF ACCESS TO HEALTHCARE

The concept of access has been explained by different researchers, however, Levesque, Harris and Russell, (2013) defined access as the opportunity to identify healthcare needs, to seek, to reach, to obtain or use healthcare services and actually having the need for services fulfilled. It is in this regard that researchers over the years have developed a number of frameworks to help in understanding the factors that influence one's decision to access healthcare (Andersen & Newman, 1973; Penchansky & Thomas, 1981; Solar & Irwin, 2010). Although most of these framework focus on individual factors like demographics, cultural and personal health beliefs and health

insurance status, Brown et al., (2004) confirmed that not only do individual factors affect inequalities in healthcare access but also societal factors.

Andersen and Newman's (1973), framework known as the behavioural framework is the most commonly used framework used to understand the individual factors that impede access to healthcare. This framework has gone through various phases since it was first developed in 1960. The model considers an individual's use of health service to influence by three types of factors: predisposing factors like demographic, cultural and personal health beliefs; enabling factors such as income, health insurance cover, other personal and societal resources; and perceived need like health status.

Another framework for understanding the access to healthcare is the barrier-focus model developed by Penchansky and Thomas. Penchansky and Thomas, (1981). The framework explains the concept of access as the fit between characteristics of providers and health services, and characteristics and expectations of clients. This framework further argues that an individual's decision to access health are based on five dimensions: availability of the existing services that is needed by the individual; accessibility to health services in terms of distance to health facility, travel time, availability of transport, and cost; affordability such as the cost of existing health services, individuals income and the individual's ability to pay and existing of health insurance; acceptability, referring to cultural and personal health beliefs that enable a person to accept the health services provided; and accommodation that is the relationship between the quality of services provided and the individual's needs like the appointment systems, walk-in facilities, hours of operations, waiting time. One key feature of this model is its understanding of health inequalities based on the factors that inhibits a person's access to healthcare.

A more revised framework developed by Levesque, Harris and Russell, (2013) based on Penchansky's framework also conceptualises access to healthcare based of 5 dimensions of access namely: approachability which indicates a person facing health needs can actually identify the existence of some form of services can be reached; acceptability which refers to the cultural, social and personal beliefs that influences a person to accept the services offered; availability and accommodation refers to resources and health services being readily available and can be reached both physically and in a timely manner; affordability which refers to a person's ability to pay for the use of needed services; and appropriateness is the best fit between health services provided and the individual's need. However, what distinguishes Levesque et al., (2013) framework from Penchansky's is the five corresponding abilities of a person, that interacts with the five dimensions of accessibility access to healthcare from Penchansky's framework. They include the ability to perceive; ability to seek; ability to reach; ability to pay; and the ability to engage.

Again, is the conceptual framework for action on social determinants of health developed by the Commission on Social Determinants of Health (CSDH) set up by the World Health Organisation (WHO) (Solar & Irwin, 2010). This framework creates a space for sharing ideas on how to confront social determinants of health to improve health equity. This framework shows how social, economic and political mechanisms give rise to a set of varied socioeconomic positions, whereby populations are stratified according to income, education, occupation, gender, race/ethnicity among other factors.

Considering all these frameworks, this study will be built on Levesque, Harris and Russell, (2013) framework (see figure 1) which recognizes that an individual decision to access and use of skilled birth attendants during delivery is deeply rooted on a set of underlying causes at individual, household and community level. The framework has been applied to various studies (Jacobs et

al., 2012; Bailie et al., 2015) to tackle the issue of inequity in access to healthcare and not specifically to skilled birth attendants during delivery.

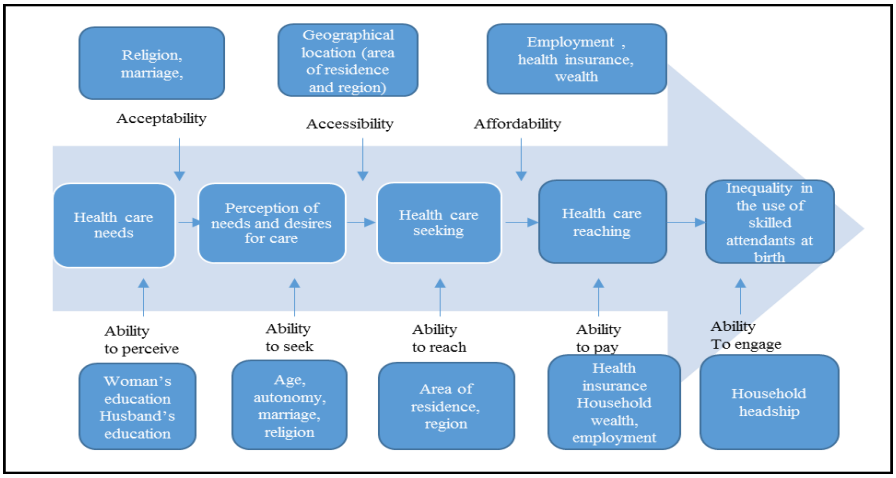

Figure 1. Adapted conceptual framework on equity of access to skilled birth delivery by pregnant women (Levesque et al., 2013).

Based on the framework above (figure1), the five dimensions of healthcare access: acceptability, availability, accommodation, affordability, and approachability together with its corresponding abilities result in underlying factors that cause social stratification which determines an individual's decision to access and use healthcare. Therefore, the study will use the demand side of Levesque et al., (2013) framework which are the five corresponding abilities they added to Penchansky and Thomas, (1981). This will help determine the underlying causes contributing to socioeconomic inequalities in the use of skilled birth attendants. These underlying causes will be grouped into individual, household and community factors.

METHODS

Introduction

This section provides information about the data source and a brief description of the dataset. It further provides into detail how socioeconomic (SE) inequality in the use of skilled birth attendants

during delivery will be measured. Lastly, this section will explain how the decomposition analysis will be conducted.

Data Source

The 2014 Ghana Demographic and Health Survey (GDHS) is a nationally represented household survey which provides up-to-date information on basic demographic and health indicators such as fertility levels, marriage, sexual activity, fertility preferences, awareness and use of family planning methods, breastfeeding practices, nutrition, childhood mortality, maternal and child health, awareness and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs), and other health issues such as smoking, tuberculosis, and blood pressure. In order to provide detailed information on the areas mentioned above, the 2014 GDHS used three questionnaires: a Household Questionnaire, a Men's Questionnaire, and a Women's Questionnaire. A two-stage sampling method was used for the 2014 GDHS. The first stage involved selecting clusters where 427 clusters were selected. In the second stage sampling, a systematic sampling method was used to select 30 households from each cluster for a total of 12,831 households. Of which 11,835 households were successfully interviewed. Among the successfully interviewed household, 9,656 women aged 15 – 49 years were eligible for individual interview. However, only 9,396 women were interviewed successfully at a response rate of 97 percent.

The Households Questionnaire collects information at the household level such as age and sex. The Women's Questionnaire collects information from all eligible women aged 15 – 49 on topics including background characteristics (age, education, media exposure, etc.), birth history and child mortality, knowledge and use of family planning methods, fertility preferences, antenatal, delivery, and postnatal care, breastfeeding and infant feeding practices, vaccinations and childhood illnesses

and marriage and sexual activity, women's work and husbands' background characteristics, knowledge, awareness, and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs), and knowledge, attitudes, and behaviour related to other health issues (e.g., smoking, tuberculosis, and blood pressure). The Men's Questionnaire also collects much of the same information found in the Woman's Questionnaire but shorter because it did not contain a detailed reproductive history or questions on maternal and child health.

For this study, only selected information collected using the Women's Questionnaire will be used. Data would be directly downloaded from the DHS website after proper permission has been obtained (http://www.dhsprogram.com/data/dataset_admin/login.cfm) (DHS, 2014).

MEASUREMENT OF SOCIOECONOMIC (SE) INEQUALITY IN THE USE OF SKILLED BIRTH ATTENDANT DURING DELIVERY

There are variety of methods of how socioeconomic inequality in health can be measured. They include the use of the range, population attributable risk (PAR), the slope and relative indexes of inequality and the concentration index (CI).

The Range

This is the most common and simplest method used. This involves using the absolute or relative measures and comparing the experiences of the lowest and highest socioeconomic groups. In using the absolute measure known as the absolute difference (AD), the difference in health outcomes between the highest and lowest socioeconomic groups are taken. By convention, the highest socioeconomic group is used as the base group. Equality is said to exist when the AD is equal to zero and inequality when AD is greater than zero (Munoz-Arroyo & Sutton, 2007).

$$AD = R_l - R_h$$

Where; R_l is the rate of health outcome in the lowest socioeconomic group, R_h is the rate of health outcome in the highest socioeconomic group (base group). The relative measure also known as the disparity rate ratio (DRR) accounts for the socioeconomic gap between groups. This is presented in a ratio form where the rate of the lowest socioeconomic group is divided by the rate of the highest group. A DRR of one indicates perfect inequality whereas a value greater than one indicates an inequality in health amongst the least advantaged. It can also be interpreted as the relative disparity between the lowest and highest socioeconomic groups. The DRR is calculated as;

$$\mathrm{DRR} = \frac{R_l}{R_h}$$

Where R_l, is the rate of health outcome in the lowest socioeconomic group, R_h is the rate of health outcome in the highest socioeconomic group. In both approaches, a 95% confidence interval (CI) that does not include zero shows the existence of a significant inequality in health. This range is commonly used in studies where socioeconomic groups do not reflect a hierarchical structure such as occupation and ethnic groups. This method is commonly used since it is easy to calculate and its interpretations are straightforward (Ontario Agency for Health Protection and Promotion, 2013).

Population Attributable Risk (PAR)

This is widely used in epidemiology studies to measure disease frequency in a population if the disease was eliminated. This method is done by subtraction the incidence of the disease in the unexposed from that of the exposed. The PAR requires choosing one of the groups as the comparator. A higher PAR values indicates an inequality in health. The PAR is expressed as a percentage after the PAR is divided by the disease frequency in the entire population and multiplied by 100 as shown below.

$$\text{PAR \%} = \frac{P_e(RR-1)}{1 + P_e(RR-1)} \times 100$$

Where P_e = frequency of disease among the exposed in the entire population, RR = relative risk for the exposed, compared to 1 for the unexposed. The PAR is mostly used when rapid decisions are needed, or measures of inequality are needed to generate further investigations.

The Slope and Relative Indexes of Inequality

The slope index of inequality (SII) requires that the mean health status of the socioeconomic groups are ranked according to their socioeconomic status. The SII is the linear regression coefficient that shows the relation between the level of health or the frequency of a health problem and the ranking of the socioeconomic groups in ascending order. This is done by creating a variable from a series of values assigned to the different socioeconomic group with reference to the range (Munoz-Arroyo & Sutton, 2007).

In case of a grouped data, the regression equation is transformed to prevent heteroscedasticity of the error term. The Weighted Least Squares (WLS) estimate of the SII can be obtained using the formula below;

$$Y \times \sqrt{a} = 0 + \sqrt{a} + b \times \sqrt{a}$$

Where; Y is the health outcome variable, $\sqrt{a}$ is the square root of the population proportion in each socioeconomic group and b is the relative rank variable. The SII in interpreted as the absolute difference between the highest and lowest socioeconomic groups in a population. The relative index of inequality (RII) on the other hand works exactly like the SII. The RII is used to measure the relative difference by dividing the SII by the mean level of health. The only difference between the SII and the RII is that whereas the SII is easily affected by the mean level of health the RII is not affected at all. One major advantage of the SII and the RII is that they both take into account

the different socioeconomic groups and not just the highest and lowest groups as the range and the PAR (Ontario Agency for Health Protection and Promotion, 2013).

Concentration Index (CI)

The Concentration Index (CI) which is a general form of the Gini Index which measures inequality in health or healthcare utilization based on income disparity (Kakwani, Wagstaff and van Doorslaer, 1997; van Doorslaer, Koolman, and Jones, 2004). The CI compares the aggregate share of health in the population against the aggregate share of the population ranked according to their socioeconomic status from the lowest to highest.

The CI is defined in reference to the concentration curve which may fall above or below the perfect line of equality. It is defined as twice the area between the line of equality (45 degrees line) and the concentration curves C(p) and C(p*) representing concentration among the poor and rich respectively as shown in figure 2 below.

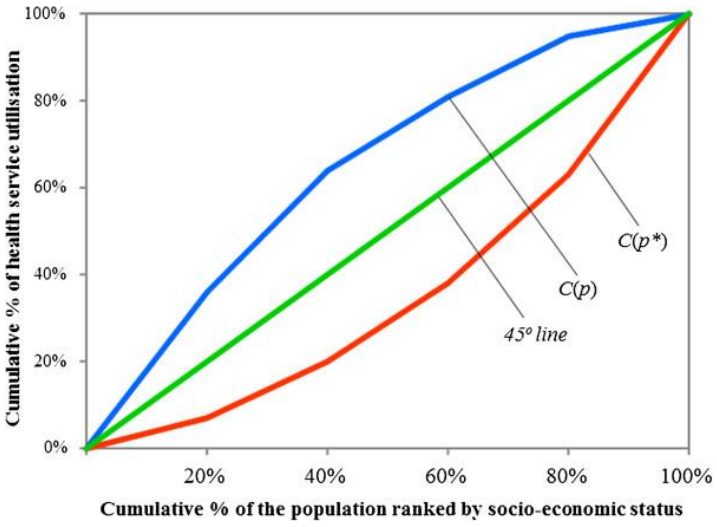

Figure 2: Concentration curve for health service utilization illustrated

The value of CI measures the severity of socio-economic inequality. The value of the CI may vary between −1 to +1. A negative value implies that the health outcome is concentrated among those

with lower socioeconomic status (poor) and the concentration curve will be above the line of equality. While a positive value shows concentration among the higher socioeconomic status (rich) showing a concentration curve below the line of equality. A CI value of zero implies no inequality. The larger the absolute value of CI, the greater the disparity (The World Bank, 2000). The CI can be estimated using the formula;

$$CI = (p_1L_2 - p_2L_1) + (p_2L_3 - p_3L_2) + \cdots + (p_{T-1}L_T - p_TL_{T-1})$$

Where p is the cumulative percent of the population in socioeconomic group T and L_T is the corresponding concentration curve ordinates. For computation, a more convenient formula for the CI is given as twice the covariance of the health variable and a person's relative rank in terms of socioeconomic status, divided by the outcome mean as presented below.

$$C = \frac{2}{\mu}\mathrm{cov}(h_i, r_i)$$

Where C is the concentration index; h_i is the health variable index; r_i is the fractional rank of the individual i in the distribution of socioeconomic position; μ is the mean of the health variable and cov denotes the covariance. One major advantage of using the CI is that it considers the distribution of population income and the strength of the effect and also give a good visualisation of the inequalities. However, its limitation is that it is difficult to calculate measures of precision as well as control for confounders. It also lack a straightforward interpretation (Ontario Agency for Health Protection and Promotion, 2013).

This study will use the concentration index and curve to measure the inequality that exist in the use of skilled birth attendants during delivery. This is because this study will like to make comparisons between population groups based on their socio-economic status with visual displays of inequalities.

DECOMPOSING THE CONCENTRATION INDEX

Understanding and explaining the extent to which an underlying factor contributes to socioeconomic inequality has become of great interest to researchers and policymakers. The concentration index is now commonly used to examine socioeconomic inequality in health (Heckley, Gerdtham & Kjellsson, 2016). According to Wagstaff, van Doorslaer, EddyO'Donnell and Lindelow, (2003) one important use of the concentration index is its ability to be decomposed into a linear combination of concentration indices of its potential causes. Decomposition estimations have mostly been used when the health outcome is a continuous variable[1] using the Ordinary Least Square (OLS) regression model[2]

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon. \qquad \text{Equation (1)}$$

Where y is the concentration index (C), ε is the error term. However, since most health outcomes are binary[3] in nature, a number of studies have used different methods – probit analysis[4] (van Doorslaer, Koolman & Jones, 2004) and the logit analysis (Hosseinpoor et al., 2006) to help decompose a health variable with two outcomes.

In this study where skilled birth attendant is a binary outcome (i.e. using SBA during delivery or not), to decompose the concentration index, the following steps are vital: (i) regress the outcome variable against its determinants using an appropriate model. This helps in finding the coefficients of the predictor variables (β_k). (ii) Calculate the means of the health utilization outcome and each of its determinants (μ and x_k). (iii) Calculate the concentration indices of the health utilization outcome variable and the determinants (C and C_k) using the equation

[1] A variable that can take any numerical value and can be measured
[2] Ordinary Least Squares (OLS) is a method for estimating unknown parameters in a linear regression model, with the aim of minimizing the sum of squares of the differences between the observed responses (values of the variable being predicted) in the given dataset and those predicted by the linear function of a set of explanatory variables
[3] A variable that can take on only two possible outcomes
[4] Probit model is a type of regression used to analyse a binomial (consisting two terms) response variable.

$$C = \frac{2}{\mu}\ \mathrm{cov}_w\ (y_i, R_i) \qquad \text{Equation (2)}$$

where y_i and R_i are the health utilization of the i_{th} individual and fraction of the fractional rank of the i_{th} individual (for weighted data) in terms of the index of the household status; μ is the (weighted) mean of the health of the sample and cov_w is the weighted covariance, as well as the generalised concentration index of the error term

$$(GC_\varepsilon)\ C = \sum_k \left(\frac{\beta_k x_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu} = C_y + \frac{GC_\varepsilon}{\mu} \qquad \text{Equation (3)}$$

Where μ is the mean of the outcome variable y. that is the mean of the deliveries by SBA x_k is the mean of x_k, C_k is the concentration index of determinant x_k (defined analogously to C) and $\frac{GC_\varepsilon}{\mu}$ is the generalised error term of ε. This captures wealth related inequality in using SBA during delivery. The $\left(\frac{\beta_k x_k}{\mu}\right)$ expresses the impact of each determinant on the probability of delivery using a SBA In the equation above, C is a binary variable. The first is the deterministic component and the second is the error term or "unexplained" component in the equation.

After the decomposition analysis, a determinant may contribute to inequality in the dependant model, if the effect of the determinant on the dependant variable and the mean of the determinants are large. This shows that inequality is distributed more by the determinant. The opposite is true (Wagstaff et al., 2011).

The variables below will be used in the decomposition analysis based on the conceptual framework for determinants of use of skilled birth attendants during delivery discussed above.

Dependent variable: delivery be skilled birth attendant. This will be a binary outcome and will take the value 1 if the delivery was attended by a skilled birth attendant and 0 if not. Information on

birth attendance by a skilled health professional was collected based on the question "*Who assisted in the delivery of (NAME OF CHILD)*"?

Table 1: Decomposition analysis and variables

Domain	Individual level Variables	Variable type
Ability to seek	Woman's age at birth	(Categorical) <20 20-34 35-49
	Woman's autonomy (decides on own health)	(Categorical) Mainly wife Mainly Husband Wife and Husband jointly Someone else
	Woman's marital status	(Binary) Single (Never married, divorced, separate, widowed) Married (Married, living with partner)
Ability to perceive	Woman's education	(Binary) No education Primary Secondary Tertiary
	Husband's education	(Binary) No education

		Primary Secondary Tertiary
Ability to pay	Woman's employment status	(Binary) Employed Unemployed
	Health Insurance Coverage (woman)	(Binary) Health Insurance No Health insurance
Domain	Household level	Variable type
Ability to pay	Household wealth index	(Categorical) Lowest Second Middle Fourth Highest
Ability to engage	Household headship	(Binary) Man Woman
Domain	Community Level	Variable type
Ability to reach	Area of residence	(Binary) Urban Rural

	Region	(Categorical) Ashanti Brong Ahafo Central Eastern Greater Accra Northern Upper East Upper West Volta Western

STATA software version 14 will be used for data manipulation and management before uploading into the ADePT software. The analysis of inequality in the use of skilled birth attendants during delivery will be done using the ADePT software. The ADePT software was developed by World Bank. The ADePT software will be used for the decomposition analysis. The basic decomposition tables ADePT produces are based on a standard OLS regression depending on whether the utilization measure is a count or binary variable. , In a case where the healthcare utilization outcome is binary like the use of skilled birth attendants during delivery, the ADePT will produce a decomposition analysis based on the probit model, by using a linear approximation of the decomposition with partial effect evaluated at the sample means (Wagstaff et al., 2011).

ETHICAL CONSIDERATION

The study will use secondary household survey data and so no ethical issues are expected. However, for this study, ethical approval will be sought from the Faculty of Health Sciences, University of Cape Town Human Research Ethics Committee. In order to have access to the DHS

datasets, permission will be sought from the DHS program expert by registering on the website and submitting an online research project form for dataset access approval.

DISSEMINATION

This findings of this study will be disseminated mainly through publications. That is a journal manuscript and a policy brief which are in fulfilment of the Masters in Public Health (MPH) – Health Economics dissertation requirement.

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PART B: LITERATURE REVIEW

This chapter aims to provide a review of literatures in three areas: theoretical, methodological and empirical. The chapter begins with a global and Ghanaian overview of access to and use of skilled birth attendants during delivery, then explains some factors that impede access to and use of skilled birth attendants during delivery. This is followed by theoretical approaches, methodological review then empirical review of published researches relating to inequalities in the use of skilled birth attendants in developing countries. This literature search was guided by the research questions: 1) to what extent do socioeconomic inequalities exist in the use of skilled birth attendants during delivery in Ghana. 2) What underlying conditions contribute to these inequalities in the use of skilled birth attendants during delivery in Ghana?

Global overview of Skilled Birth Attendants (SBA) and disparities in coverage

The quest to reduce maternal deaths especially in developing countries is increasingly being addressed by two key strategies: training and deploying skilled birth attendants (SBAs) and improving access to emergency obstetric care (EmOC) facilities (Liljestrand, 2000). This has shown to improve maternal and child health outcomes for those who use them.

Globally, there have been major reductions in infant mortality over the years, however, maternal mortality does not seem to be reducing as expected. It has been reported that, every year, more than 500,000 women die as a result of pregnancy and childbirth-related complications. Therefore, every 90 seconds that passes, a woman dies (UNFPA, 2016). The majority of these deaths could be prevented by the presence of a skilled birth attendant. In 2016, it was reported that only one in five births (21%) were delivered by skilled birth attendants worldwide (UNICEF, 2016). This suggests that nearly 31 million births are unattended by skilled birth attendants. However, large inequalities still exist across and within countries particularly in developing countries (UNICEF,

2017). It has been reported that, west and central Africa have the lowest (45%) births attended by a skilled birth attendants in the world while other regions have almost attained universal coverage. Despite progress being observed worldwide, the rich-poor gap still remain particularly in Asia and sub-Saharan Africa. However, in the Central and Eastern Europe and the Commonwealth Independent States (CEE/CIS) 99 percent skilled attended birth coverage has been achieved. Reports have also shown that, 85 per cent of sub-Saharan African women in the richest 20 per cent are three times more likely to use skilled birth attendants during delivery than women in the poorest quintile (30 per cent) (UNICEF, 2017).

In as much as uptake of skilled birth attendants during delivery is concerned, increasing coverage of skilled birth attendants have been advocated. Figures from the 2006 World Health Report estimated that a total of 4.3million skilled birth attendants were unavailable. To reach the 72 per cent targeted coverage, an additional 334,000 midwives were needed to be trained and deployed most especially in sub-Saharan Africa (WHO, 2006). Various initiatives and countries like Rwanda, Bangladesh, Tunisian, and the Dominican Republic have been proposed to scaling up their skilled birth attendants through training, education, retention and deployment worldwide (Every Woman Every Child, 2015).

Skilled Birth Attendants in Ghana

Labour and delivery are the most critical period in a woman's life. This is because the majority of maternal deaths arise from complications during child delivery. Most of these complications could be managed or avoided if there exist a skilled attendants at every delivery.

In Ghana, delivery by a skilled attendant is a key strategy and a benchmark for monitoring progress towards the Sustainable Development Goals (SDGs). In 2016 it was discovered that the national

percentage of births that were attended by skilled health professional was 56% which is still lower that the national target of 80% (GHS, 2017) while antenatal coverage shows good coverage of over 80% (GHS, 2017). Despite this progress, it is believed that large equity gaps still exist. Therefore, this study seeks to unveil these inequities that exist in the use of skilled attendant during delivery.

Underlying factors associated with the use of Skilled Birth Attendants at delivery

Some common factors affecting the use of skilled birth attendants during delivery in developing countries identified from published literature are discussed below:

Woman's Autonomy

Woman's autonomy is defined as the ability of a woman to make decisions that affect their own lives (Khan & Ram, 2009). Therefore, women's autonomy and reproductive health behaviours are major concern as they reduce maternal mortality and improve child health. Factors such as age especially young women between the ages of 20 and 39 years, women living in urban residence, higher education attainment, employment status, female household heads are associated with high autonomy of women (Nigatu et al., 2014; Osamor & Grady, 2016). With regard to maternal health service utilization, a number of studies have shown that women with high autonomy have high tendency of using maternal health services like skilled birth attendants during delivery (Mahapatro, 2012; Hou & Ma, 2013; Situ, 2013; Fekadu & Regassa, 2014). This suggest that better maternal health services utilization are strongly related to women who are able to decide on their own as to when and where they need health care. This is consistent with a study conducted by Ameyaw *et al.*, (2016) in Ghana.

Maternal Age

Age of the mother has been shown to influence maternal health service utilization (Celik & Hotchkiss, 2000; Stephenson et al., 2006; Mpembeni et al., 2007; Onasoga et al., 2014). Findings from these studies reveals that younger women between the ages of 20 and 35 years were more likely to use skilled birth attendants than women younger than 20 years and older than 35 years. However, this was not true for a study conducted by Benova et al., (2014) in Egypt. This is because the findings in Egypt shows that women above the age of 40 years are more likely to seek skilled delivery care from a professional than their younger counterparts. This is consistent with a study conducted in northern Nigeria by Doctor & Dahiru, (2014) where women below 35 years were more likely to use non-skilled birth attendants .

Maternal Education

Based on extensive research conducted worldwide, it has been identified that education plays a critical role to social and economic development and as such a major predictor health outcome. Among the various social determinants of health that explain health disparities by geographical and demographic factors, literature has always pointed to predominantly to education (Zimmerman, Woolf & Haley, 2015) . In reference to maternal health services utilization, studies conducted in developing countries like Uganda, Peru, Thailand and The Gambia have shown strong positive association between maternal education (i.e. mothers with more years of schooling) and the use of skilled birth attendants during delivery (Elo, 1992; Barrett & Browne, 1996; Raghupathy, 1996; Rutaremwa et al., 2015). This study showed that, better educated women preferred to deliver in the presence of a skilled birth attendants than women with no education at all. It means that women who were educated had better awareness and knowledge on the importance of skilled delivery services (Chakraborty et al., 2003).

Health Insurance Coverage

Health insurance coverage is an important determinant of access to health care especially to the worse off in society. Studies have proven that health insurance coverage has contributed immensely to the use of maternal health services especially in Ghana. A study carried out by Wang, Temsah and Mallick, (2014) using the DHS programme in eight (8) low- and middle-income countries (LMIC) of which Ghana was part revealed a significant positive association between health insurance coverage and the use of maternal health care. It was also observed that educational attainment and household wealth status contributed to high enrolment in health insurance, thus increasing maternal health care utilization (Khan & Singh, 2016; Ameyaw, Kofinti & Appiah, 2017; Rashad, Sharaf & Mansour, 2017).Similar results were found in studies conducted in Cambodia, Burkina Faso and Gabon showing that health insurance enrolment is positively associated with the poor women, thereby increasing the use of maternal health care like skilled birth attendants (Gnawali et al., 2009; Wang, Temsah & Mallick, 2014, 2017; Browne et al., 2016; Rashad, Sharaf & Mansour, 2017).

Socioeconomic status

Studies have revealed that economic well-being status of the household of which women belonged played a crucial role in explaining the variations in the use of maternal health services. A study conducted on the use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania (Mpembeni et al., 2007) revealed that using skilled attendant during delivery were associated with high to moderate socioeconomic status. Besides, they found that high socioeconomic status influence decision-making since the woman is able to make personal decisions about her own health (Osubor, Fatusi & Chiwuzie, 2006; van Eijk et al., 2006; Gabrysch & Campbell, 2009).

Geographical Accessibility

Literature has also identified distance to health facility has a major factor affecting the use of skilled birth attendants during delivery. In a study by Thaddeus and Maine, (1994) shows that distance to a health facility particularly in rural settings affects the decision to seek healthcare and arrive at the health facility on time. Ettarh and Kimani, (2014) conducted a study on how distance to a health facility affected the use of skilled birth attendants during delivery in Kenya. It was observed that households which lived within 5km to a health facility used skilled birth attendants at delivery compared to households living more than 5 km away. Another study conducted in Zambia revealed that households which lived less than 5km from a health facility were more likely to access skilled birth attendants during delivery than those which are 5 km away (Gabrysch et al., 2009).

THEORETICAL REVIEW

This section introduces and describes theories and concepts that are relevant to access to health care. This section explains the concept of access to health care, health care utilization, health inequalities and inequities, socioeconomic factors that affect health care utilization and finally some theoretical frameworks that help demonstrate an understanding of access to health care. Published literature for this section were retrieved from the following online databases PubMed, google scholar, web of science and EBSCOhost through academic search premier, African-wide information, Econlit, and CINAHL.

Health inequalities and inequities

Health inequities according the World Health Organization (WHO) are preventable inequalities of health that exist between groups of people in a country or between countries. These inequities are as a result of social and economic conditions between and within societies and their effects on

people's lives (WHO, 2014). These can be grouped as socioeconomic, demographic or geographical factors. These factors according to Evans and Brown, (2003) can be summarised using the acronym PROGRESS: place of residence (urban/rural), race, occupation, gender, religion, education, socioeconomic status, and social capital /resources that influence a person's health status. And this is evident in all countries; low-, middle-, and high-income countries indicating that, the lower a person's socioeconomic status, the higher the risk of poor health.

A technical reports from the European Centre for Disease Prevention and Control (ECDC) showed that, health inequities contributes to huge financial crisis thereby lowering economic growth rates. For example the European Parliament estimated that almost 1.4% loss in gross domestic products (GDP) were as a result of health inequities. These losses were mostly as a result of losses in productivity, tax payment, high welfare payments and health care costs (European Centre for Disease Prevention and Control, 2013).

A systematic literature review conducted by Suhrcke et al., (2011) in Europe revealed the presence of health inequalities for various infectious diseases. This is causing changes in disease transmission pattern, treatment, preventive and disease control programs in times of economic crisis.

In addition, as a result of health inequities, there exist huge variations in life expectancy across countries. A number of reports have shown that in low- /middle-income countries and high-income countries the average life expectancy is about 62 and 81 years respectively. For example, whereas a child born in Sierra Leone is expected to live for 50 years, a child born in a high-income country like Japan is expected to live for 84 years (Buck & Maguire, 2015; WHO, 2016a).

Owing to inequalities and inequities in health, certain diseases and health outcomes like maternal deaths, infant mortality, tuberculosis and non-communicable diseases have been associated with the poor. This has been so since majority of these diseases occur in developing countries. Studies have shown that around 95% of tuberculosis, 87% of premature deaths and 99% of all maternal deaths occur in developing countries (WHO, 2010, 2016b; WHO et al., 2015).

Health equity refers to the differences in the quality of health and healthcare across different population groups. These inequities may be in the form of differences in health outcomes, access to health, or presence of diseases between populations of different ethnicity, sexual orientation, race or socioeconomic status (Culyer, 2001). Health equity can be divided into two: horizontal equity which refers to the equal treatment of individuals or groups of equal circumstances while vertical equity is the treatment of unequal individual or groups based on their level of need (Oliver & Mossialos, 2004). Vertical equity entails giving 'higher' treatment to those with higher level of need (Culyer, 2001). The existence of inequity is tested whether two or more groups (for instance rich and poor) receive the same amount of health care. The absence of equity leads to inequality between the two groups (Macinko & Starfield, 2002).

Theoretical framework for access and use of health care

Concerns about improvement of access to health care from researchers, health policy makers and other health stakeholders have been on the increase. Therefore, to develop policies and strategies that reduce inequity in health care access, a broad understanding of the multiple factors that impede health care is needed. In view of this, several study findings have revealed a relationship between the differences in health care utilization and patient's social characteristics. Besides, these studies describing healthcare utilization patterns in different health care settings, different theoretical models have been developed with regard to access and utilization of health care services,

identifying the determinants of healthcare utilization patterns. Some of the common models used to understand the differences in health care access and use are discussed in this section.

The Behavioural Model of Health Service Utilization – Ronald Andersen 1963

This model is the most common model developed to help understand individual's use and access to health care. In this model, Andersen argues that utilization of healthcare is dependent on three dynamics – the predisposing factors, enabling factors and the need factors (Andersen, 1995a).

The predisposing factors in this model are described as biological factors, social structures and health beliefs such as age, gender, occupation, educational level, race and ethnicity may guide a person's chance of seeking healthcare, coping with health problems and opinion of need and use for health services (Lo & Fulda, 2008). The idea of health belief influencing an individual's view on the need and use of health service has been widely discussed. Researchers especially those of social psychologists have raised concerns about health beliefs not being employed enough in the behavioural model of health service. Therefore, suggesting that these health beliefs are not important in influencing a person's decision and understanding to use of health services (Andersen, 1995a) . Angel and Thoits (1987), presented a theoretical framework on the impact of beliefs on the processes in recognizing and seeking health when needed. They argued that, beliefs or culture may impede an individual's response to a health problem and eventually may also influence their behaviour option in seeking health care.

Enabling factors on the other hand, are the logistics or resources that permit or allow an individual to seek and access health service. Andersen (1995a) categorizes the enabling factors into family and community characteristics. The family characteristics he describes as income, insurance coverage, access in the form of transport availability and distance to health services. The community characteristics are resource availability (health facilities, equipment, health workers

etc.), waiting time and the region of country (Lo & Fulda, 2008). A number of studies have shown that families or individuals who are insured have a higher chance of seeking and accessing health care (Cheng & Chiang, 1997; Xu et al., 2003). Physical accessibility was reported to have a significant association with health care utilization. It was argued that households who lived more than 5 km from a health facility were less likely to access health care while those who lived less than 5km were likely to access health care services more (Nemet & Bailey, 2000; Kim & Lee, 2016).

The third dynamic according to Andersen, in determining the use of health services is the need factors. He described this factor as the push factors for health service use whether individual, social or clinical (Andersen, 1995b). The author explained that there are two types of need: the perceived and actual need. The perceived need he explained as how people perceived their own health and functional state and their experience be it pain, sorrow in a health problem pushed people to seeking professional help (Mojtabai, Olfson & Mechanic, 2002). The actual need represents a professional judgement about one's health and the necessity for healthcare (Andersen, 1995b). These three factors determine and influence an individual's decision about health services use and their satisfaction with the services provided.

Several disapprovals have been raised against Andersen's Behavioural Model. These include: not giving enough credence to culture and social interactions as possible factors that could impede a person's decision to seek and access health care. Moreover, the overemphasis of the need factors at the expense of health beliefs and social structures and adopting health seeking utilization as a binary factor (Harris, McLean & Sheffield, 2009; Portes & Eaton, 2009). In view of all this, the author argued that, culture and health beliefs are all forms of social structure therefore are

incorporated in the enabling factors permitting a person to seek and use healthcare (Andersen, 1995a).

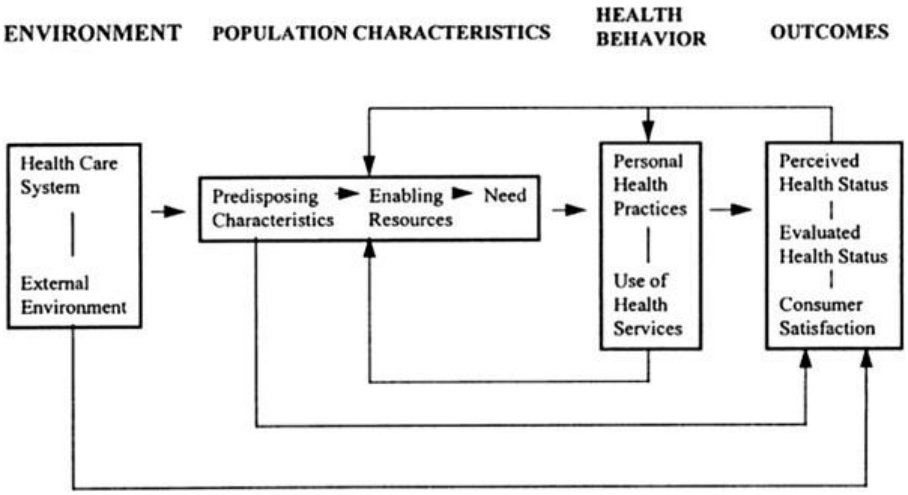

Figure 1: Behavioural Model and Access to health service use (Andersen & Newman, 1973)

The Barrier focus Model – Roy Penchansky and J. William Thomas 1981

This model which was developed in the early 1980s, identifies that income, health insurance cover and having a usual source of care can influence an individual's choice to use and access health care. Penchansky defined access as the measure of fit between the user and the services. He indicated that the better the fit, the better the access. He stated that access can be measure by five different dimensions: availability, accessibility, accommodation, affordability and acceptability in service design, implementation and evaluation. Penchansky and Thomas, (1981) proposed that, these dimensions are independent yet interconnected and each is important to assess the achievement of access.

Availability – This involves the relationship of the user's needs and the existence of services. That is when there exist enough health providers like physicians, dentists and facilities like clinics,

hospitals, health centres and health services like emergency care, mental health care, and obstetric care to cater for the needs of user.

Accessibility – This refers to the relationship between the location of supply of health services and the location of individuals who need these services. This takes into account the availability of transportation resources, travel time, and distance to these health services.

Accommodation – This dimension relates with the organizational structure in which the health services are provided. Therefore, it states the relationship between the manner in which health services are supplied and organized to accept users and the user's ability to put up with these factors. These include: appointment systems, hours of operation, walk-in facilities, telephone services and waiting time

Affordability – This is the relationship of prices of services and user's ability to pay for the needed services without financial hardship. This takes into account not the direct cost associated with accessing health services nonetheless the indirect cost like cost of transport to and from facilities.

Acceptability – This refers to the users' willingness to seek health care due to personal, socio-cultural factors like language, sex, ethnicity or religious affiliation.

A more revised framework developed by Levesque, Harris and Russell, (2013) based on Penchansky's framework conceptualises access to healthcare based of 5 dimensions. These include accessibility, acceptability, availability, and affordability. However, what distinguishes Levesque et al., (2013) framework from Penchansky's is the five corresponding abilities of a person, that interacts with the five dimensions of access to healthcare from Penchansky's framework include: the ability to perceive; ability to seek; ability to reach; ability to pay; and the ability to engage.

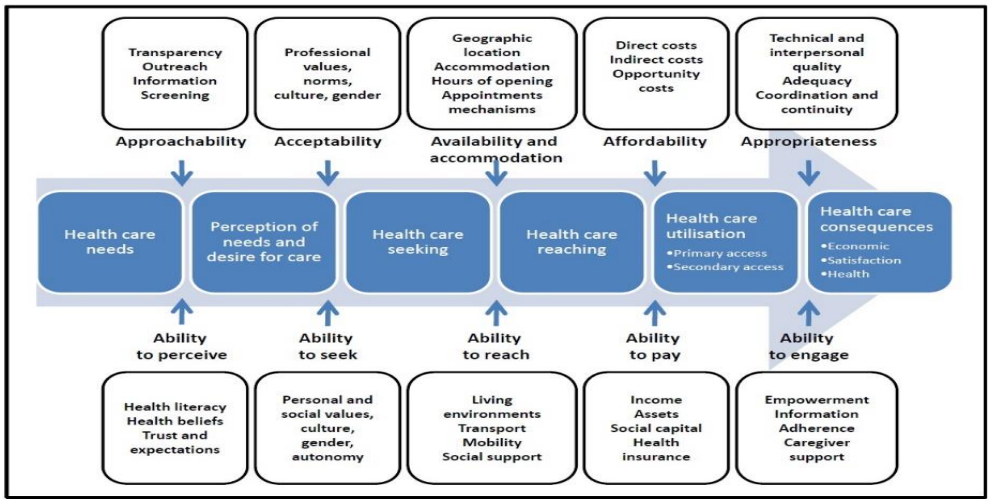

Figure 2: Framework for access to health care use (Levesque et al., 2013)

Conceptual framework used in this study

Considering all these frameworks, this study builds on Levesque et al., (2013) framework. It recognizes that an individual decision to access and use of health care (e.g. skilled birth attendants during delivery) is deeply rooted on a set of underlying causes at individual, household and community level. One major advantage of Levesque et al., (2013) is how the authors integrate both supply and demand side dimensions which allow operationalisation of access long the pathway of utilization from the perspective of need through to the outcomes of service use (Richard et al., 2016).The framework has been applied to various studies (Jacobs et al., 2012; Bailie et al., 2015) to tackle the issue of inequity in access to healthcare and not specifically to skilled birth attendants during delivery.

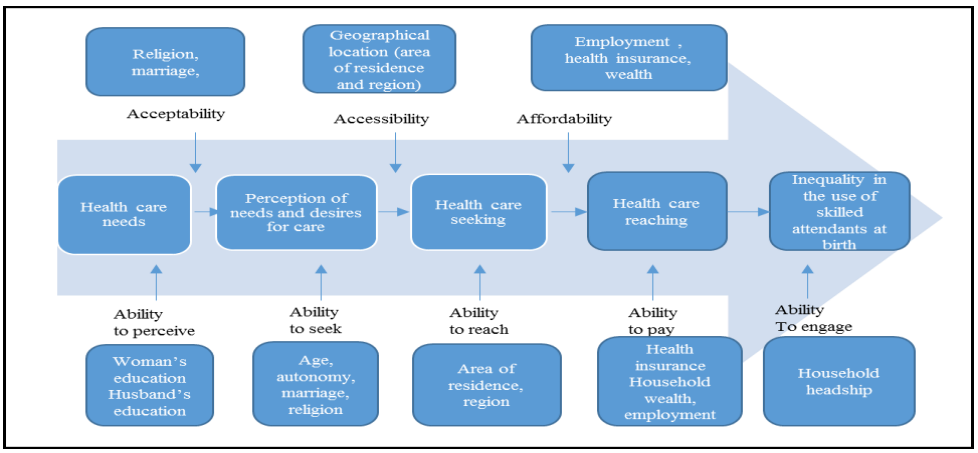

Figure 3. Adapted conceptual framework on equity of access to skilled birth delivery by pregnant women (Levesque et al., 2013)

Based on figure 3 above, the five dimensions of healthcare access and its corresponding abilities result in the underlying factors which determines an individual's decision to access and use healthcare. Therefore, the study will use the demand side of Levesque et al., (2013) framework which are the five corresponding abilities they added to Penchansky and Thomas (1981). This will help determine the underlying causes contributing to socioeconomic inequalities in the use of skilled birth attendants.

The framework used in this study is a revision of Levesque, Harris & Russell, (2013) model from Roy Penchansky and William Thomas' published article on '*The concept of access: Definition and Relationship to Consumer Satisfaction'.* It argues that, access to health care utilization are affected by five dimensions (availability/accommodation, acceptability, approachability, affordability and appropriateness) and their corresponding abilities (ability to perceive, ability to reach, ability to engage, ability to pay and ability to seek). Therefore, owing to the study focus, the study also relied on Andersen's (1995b) framework of health service utilization in order to identify the underlying conditions that impede or facilitate the use skilled birth attendants during delivery in Ghana.

Socioeconomic factors and health inequalities

Research has shown increasing empirical interest on the impact of socioeconomic factors on the health status or outcome of an individual. It has been indicated that these socioeconomic factors are important source of health inequalities among population groups in society. It has been observed that less socially and economically integrated people in society are less healthy, psychologically and physically and more likely to die (Steptoe, 2013). Socioeconomic factors are those social and economic experiences and realities that help mould one's personality, attitude, and lifestyle in a society (Chase, 2017). The common socioeconomic factors that have been revealed to determine one's health include education, income and occupation status. It has been revealed that these factors are dependent on one another. For example, one's educational level indicates one's employment and employment dictates one's income level. Others that have also been discovered to affect health are gender, marital status, culture /ethnicity, place of residence and household wealth, and religion. These factors are further discussed individually based on empirical research conducted.

Education

Ross & Wu, (1995) argues that the educational status of an individual plays a crucial role in determining one's health or health seeking behaviour. They stated that education impact health in different ways. That is, through education one is able to learn about health, one is equipped with critical thinking and making choices that enable a person to develop healthy lifestyles. There is a well-known association between education and health showing that individuals with high educational attainment have better health and well-being and healthy behaviours.

A cross-sectional study by Ross & Wu, (1995) using a national probability sample of U.S household in 1990, demonstrates that education has a positive influence on health. The finding

revealed that, well-educated compared to the poorly educated were less likely to be unemployed, more likely to work full-time, to have fulfilling and rewarding jobs, high incomes and low economic hardships. These benefits of being well educated significantly improved health in all aspects of an individual's life. It was also reported that the well-educated had a great sense control over their lives and their health, and greater social support. Likewise, it was discovered from the study that, well-educated individuals were more likely to adopt healthy lifestyles such as regular exercising, regular check-ups, smoke less, and moderate drinking habits which in the long run contributed to good health status (Ross & Wu, 1995).

Income

Income is defined as "money that an individual receives in exchange for providing a good or service within a time frame"(Case, Fair & Oster, 2012). This could be through wages, salaries, profits and rents. Income could also come in the form of unemployment or workers compensation, social security, pensions, grants, alimony, royalties, trust, interests or dividend, or other governmental, public, or family financial assistance. It is a commonly used measure of a person's socioeconomic status relative to another in society. Research has also proven that income influences a person's health status. Thus, income inequality impacts highly on health status of an individual of which numerous studies have shown a significant negative association. Health outcomes such as mortality, hypertension, smoking sedentary life, body mass index (BMI) have been correlated to income inequalities. This is consistent with a study conducted in the Kagera region of North Western Tanzania using data from a longitudinal Living Standards Measurement Survey. The study (Fichera & Savage, 2015) reported a positive and a statistically significant association between income and health outcome and behaviours. It was discovered that those with

high income were less likely to self-report illness symptoms like cough, fever, diarrhoea, increase uptake in vaccinations and an increase in BMI and weight-for-height.

Employment Status

Employment is said to reflect one's educational attainment as well as income levels that differ with jobs and ranks of occupation. Employment status measures ones social position by describing job characteristics, decision-making ability, control and psychological demands on the job. Therefore, employment status has a large impact on one's health. Using various statistical approaches, researchers have proven that employment can provide a lot of benefits important to keeping good health.

A study in 2012 by the Bureau of Labour Statistics in the U.S, reported that a stable and well-paying job can contribute to better health. The research indicated that through employment, workers enjoyed health insurance benefits hence making good decisions about their health through preventative care services and make rapid decisions to seek healthcare in times of illness (Bureau of Labor Statistics, 2012).

METHODOLOGICAL REVIEW

Based on literature, a number of methods including concentration index, slope or relative index of inequality, among others have been used in the analysis of health inequalities associated with health care utilization. The main objective of this section is review the different methods that have been used for measuring or analysing socioeconomic inequalities in health care utilization. The literature included in this section were obtained from, academic search premier, econ lit, medline, african-wide information, CINAHL, health source: nursing/academic edition using the EBSCOhost database platform and google scholar. No literature was excluded on the bases of

country of origin, and publication data except if not in English. The literature from the electronic databases search were supplemented with website literature.

Measuring socioeconomic inequality in health care.

There are wide variations of methods that have been applied in the measurement of socioeconomic inequalities in health. Measuring socioeconomic inequalities in health require that the population in question is divided into socioeconomic groups. These measure can be individual-based like household income quintiles or area-based like the neighbourhood income quintile. Evidence from Spinakis et al., (2011) shows that, used measurement approaches arise basically from statistics or economics disciplines. These may be "straightforward" and "simple" or "complex" in their analysis. Some statistical approaches used in the measurements of socioeconomic inequalities in health include regression analyses like the logistic, logit, probit regression methods, the Slope Index of Inequality (SII), the Relative Index of Inequality (RII), Total Attributable Risk (TAR) among others. Furthermore, it has been observed that most of these statistical techniques preferably the logistics regression analysis are used in epidemiological studies to measure association between the health inequality and socioeconomic factors (Spinakis et al., 2011).

On the other hand, there exist economic techniques used in the measurement of socioeconomic inequalities in health. They are the Gini coefficient and the concentration index. The advantages that these economic models have over the statistical model is that they provide a pictorial view of the inequality level through the combination of the Lorenz and the concentration curve (Spinakis et al., 2011). Therefore, this study will adopt the economic technique for its analysis.

The Slope Index of Inequality (SII)

This is one of the complex measures of inequality in health which depicts the slope of health care use across socioeconomics groups with natural ordering. The Slope index of inequality represents the absolute difference in predicted values between the highest and lowest socioeconomic groups (WHO, 2013). In calculating the slope index of inequality, a weighted sample of the entire population is ranked from the lowest socioeconomic group (at rank 0) to the highest socioeconomic group (at rank 1). The ranked weighted sample accounts for the proportional distribution of population within each socioeconomic group. The weighted sample in each group is then considered in terms of its range in the cumulative population distribution, and the midpoint of this range. The health utilization outcome is then regressed against the midpoint value for each socioeconomic group and the predicted values of the health outcome are calculated for the two extreme values (rank 1 and rank 0). The difference between the predicted values at rank 1 and rank 0 show the slope index of inequality. This is also represented graphically. The slope index of inequality is represented by a regression line showing the relationship between socioeconomic groups' health use and their relative rank in the socioeconomic distribution (Wagstaff, Paci & van Doorslaer, 1991). A flat regression line indicates that the slope index of inequality is 0. After the socioeconomic groups are ranked from the least to the highest, positive values show that the health outcome is more dominant in the highest socioeconomic group, while negative values show that the health outcome is dominant in the lowest socioeconomic group (WHO, 2013). One major advantage in the use of the slope index of inequality lies in easy and straightforward interpretation of its values. Furthermore, is its sensitivity to the distribution of the population across socioeconomic groups and it reflects the experiences of the entire population (Wagstaff, Paci & van Doorslaer, 1991).

The Disparity Rate Ratio (DRR)

This is a relative measure of inequalities that accounts for the socioeconomic gap between groups. This is presented in a ratio form where the rate of the lowest socioeconomic group is divided by the rate of the highest group. A DRR of one (1) indicates perfect inequality whereas a value greater than one (1) indicates an inequality in health among the least advantaged. It can also be interpreted as the relative disparity between the lowest and highest socioeconomic groups. A 95% confidence interval (CI)[5] that does not include zero shows the existence of a significant inequality in health. This range is commonly used in studies where socioeconomic groups do not reflect a hierarchical structure such as occupation and ethnic groups. This method is commonly used since it is easy to calculate and its interpretations are straightforward (Ontario Agency for Health Protection and Promotion, 2013).

Population Attributable Risk (PAR)

This is widely used in epidemiology studies to measure disease frequency in a population. This method is done by subtracting the incidence of the disease in the unexposed population from that of the exposed population. The PAR requires choosing one of the groups as the comparator. A higher PAR values indicates an inequality in health. The PAR is expressed as a percentage after the PAR is divided by the disease frequency in the entire population and multiplied by 100 as shown below.

$$PAR\ \% = \frac{P_e(RR-1)}{1 + P_e\,(RR-1)} \times 100$$

[5] Confidence Interval is a range of values so defined that there is a specified probability that the value of a parameter lies within it.

Where P_e = frequency of disease among the exposed in the entire population, RR = relative risk for the exposed, compared to 1 for the unexposed. The PAR is mostly used when rapid decisions are needed, or measures of inequality are needed to generate further investigations.

The Concentration Index and concentration curve

Another most common index used in the analysis of health inequalities is the concentration index. As the name suggests, the concentration index shows how a health outcome is concentrated across socioeconomic groups. Just like the slope index of inequality, the population is ranked from the least socioeconomic group to the highest socioeconomic group (WHO, 2013). The concentration index is bounded by values from -1 to +1. Negative values of the concentration index indicates the concentration of the health outcome among the least socioeconomic group whereas positive values of the concentration index represent the concentration of the health outcome among the highest socioeconomic group. While in theory the concentration is bound by ±1, in practice absolute values of the concentration index will hardly exceed 0.5. A value of 0.2 and 0.3 is considered as high level of inequality(WHO, 2013).

The concentration index can also be presented visually using concentration curves. The curve plot the cumulative share of the population ranked from the lowest to the highest socioeconomic group against the cumulative share of health. The concentration curve is interpreted in relation to a 45 degrees line known as the line of perfect equality. Inequality is revealed to be concentrated among the lowest socioeconomic group when the concentration curve lies above the line of perfect equality. And inequality is concentrated among the higher socioeconomic group when the curve lies below the line of perfect equality. Therefore, the concentration index is calculated as twice the area between the line of perfect equality and the concentration curve (Wagstaff, Paci & van Doorslaer, 1991; WHO, 2013). The concentration index just like the slope of index of inequality,

reflects the experiences of the entire populations as well as its sensitive nature to the distribution of population across socioeconomic groups (Wagstaff, Paci & van Doorslaer, 1991). This study therefore uses concentration curve and index to measure the extent of inequality in health care utilization (i.e. skilled attendants during birth).

In view of the approaches used in measuring socioeconomic inequality in health care delivery, this study adopts the concentration index and curves for its analysis.

Decomposition Analysis

Understanding and explaining the extent to which an underlying factor contributes to socioeconomic inequality has become of great interest to researchers and policymakers. The concentration index is now commonly used to examine socioeconomic inequality in health (Heckley, Gerdtham & Kjellsson, 2016). According to Wagstaff, van Doorslaer, O'Donnell and Lindelow, (2003) one important use of the concentration index is its ability to be decomposed into a linear combination of concentration indices of its potential causes.

Decomposition estimations have mostly been used when the health outcome is a continuous variable[6] using the Ordinary Least Square (OLS) regression model[7]

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon. \quad (1)$$

Where *y* is the concentration index *(C)*, α is the y-intercept, β and χ are the predictor variables in health care demand and ε is the error term. However, since most health outcomes are binary[8] in nature, a number of studies have used different methods – probit analysis[9] (van Doorslaer,

[6] A variable that can take any numerical value and can be measured
[7] Ordinary Least Squares (OLS) is a method for estimating unknown parameters in a linear regression model, with the aim of minimizing the sum of squares of the differences between the observed responses (values of the variable being predicted) in the given dataset and those predicted by the linear function of a set of explanatory variables
[8] A variable that can take on only two possible outcomes
[9] Probit model is a type of regression used to analyse a binomial (consisting two terms) response variable.

Koolman & Jones, 2004) and the logit analysis (Hosseinpoor et al., 2006) to help decompose a health variable with two outcomes.

In this study where skilled birth attendant is a binary outcome (i.e. using SBA during delivery or not), to decompose the concentration index, the following steps are vital: (i) regress the outcome variable against its determinants using an appropriate model. This helps in finding the coefficients of the predictor variables (β_k). (ii) Calculate the means of the health utilization outcome and each of its determinants (μ and x_k). (iii) Calculate the concentration indices of the health utilization outcome variable and the determinants (C and C_k) using the equation

$$C = \frac{2}{\mu}\, cov_w\,(y_i, R_i) \qquad (2)$$

where y_i and R_i are the health utilization of the i_{th} individual and fraction of the fractional rank of the i_{th} individual (for weighted data) in terms of the index of the household status; μ is the (weighted) mean of the health of the sample and cov_w is the weighted covariance, as well as the generalised concentration index of the error term

$$(GC_\varepsilon)\; C = \sum_k \left(\frac{\beta_k x_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu} = C_y + \frac{GC_\varepsilon}{\mu} \qquad (3)$$

Where μ is the mean of the outcome variable *y*. that is the mean of the deliveries by SBA x_k is the mean of x_k, C_k is the concentration index of determinant x_k (defined analogously to *C*) and $\frac{GC_\varepsilon}{\mu}$ is the generalised error term of ε. This captures wealth related inequality in using SBA during delivery. The $\left(\frac{\beta_k x_k}{\mu}\right)$ expresses the impact of each determinant on the probability of delivery using a SBA In the equation above, C is a binary variable. The first is the deterministic component and the second is the error term or "unexplained" component in the equation.

After the decomposition analysis, a determinant may contribute to inequality in the dependant model, if the effect of the determinant on the dependant variable and the mean of the determinants are large. This shows that inequality is distributed more by the determinant. The opposite is true (Wagstaff et al., 2011).

EMPIRICAL REVIEW

This section reviews published literature on inequalities and inequity in utilization of skilled attendants during delivery, assessing the underlying factors that determine the use of skilled attendants during delivery, examining methods used in these studies to show findings of the existence of inequalities in skilled attendants during delivery. Based on this, the aim of the section is to identify gaps and generate some ideas about new research opportunities in this field.

Method of literature search

Studies from high-, middle- and low income countries were included in this review. Keywords used in the search for literature for the study are inequalities/inequities, socioeconomic inequalities/socioeconomic factors/socioeconomic determinants, skilled attendants/skilled birth attendants/skilled delivery/maternal health care utilization, delivery, and obstetric. Some online databases used for the literature search were on Google scholar, PubMed, Web of Science, Academic search Premier, African-wide information, Econ lit, Medline, CINAHL, Health source: nursing/academic edition using the EBSCHOHOST. Also, search through some of the identified studies' references was performed.

The inclusion criteria for the studies were that:

- The studies had to be in English
- The studies had to be published within the last 10 years (2007 – 2017)

- The studies had to be specifically focused on inequalities, inequities or socioeconomic inequalities/determinants/factors in the use of skilled attendants during delivery or maternal health services utilization of which skilled attendants during delivery as a component was analysed.

In total, of fourteen (14) articles were relevant and reviewed for this study. Out of which nine (9) are from developing countries, four (4) from sub-Saharan Africa and one (1) systematic review of developing countries.

Table 1: Summary of studies that examined socioeconomic inequalities in the use of skilled birth attendants in developing countries

Author of study	Country and year of analysis	Type of study	Characteristics of participants	How inequality is measured	Socioeconomic indicators	Findings
Li et al., (2015)	China (2007 - 2010)	Cross-sectional study	Women who had given birth in the preceding three years	Concentration Index and decomposition analysis	Household wealth index	The highest proportion of women giving birth in a county-level health facility or above was seen in the richest group. Significant inequalities in hospital delivery were indicated in all but one county (Qian yang) (95% confidence interval -0.001 to -0.003). The decomposition showed that household wealth index (35.50%) contributed the most to socioeconomic

						inequalities followed by maternal education (28.76%).
Limwattananon, Tangcharoensathien & Prakongsai, (2010)	Thailand (2005-2006)	Multiple Indicator Cluster Survey	Women of reproductive age 15 -49 years	Concentration index	Household wealth	Delivery care by a skilled health worker showed a statistically significant concentration among the rich. Women who lived in urban areas were up to 4% more likely than those in rural areas to receive delivery care from a skilled health worker and delivery in a health facility. Women who were educated beyond secondary school were 10 – 28% more likely than those without

						formal education to receive delivery by a skilled health worker or in a health facility.
Kamal, Hassan & Kabir, (2015)	Bangladesh (2007)	Demographic and Health Survey, 2007	Women aged 15 – 49 years	Univariate and multivariate binary logistic regression model	Maternal age, birth rank, religion, household wealth index, region, number of ANC visits.	Maternal age and birth rank were significantly negatively associated with seeking assistance from a medically trained personnel. Woman's education was significantly positively associated with seeking skilled assistance at birth. Muslim women compared to non-Muslim women were less likely to seek skilled assistance. Wealth index was significantly positively

						associated with seeking skilled assistance. Seeking skilled assistance during labour were lowest in Barisal and Sylhet divisions, followed by Rajshahi, Dhaka, Chittagong, and Khulna divisions.
Houweling et al., (2007)	45 developing countries	Demographic and health survey	Women of reproductive aged 15 – 49 years	Rate ratio (RR) and Rate difference (RD)		Among the richest quintile, professional delivery care levels of 80% or higher irrespective of the average level in the country except Bangladesh, Nepal, Pakistan, Chad and Yemen.

						Use of professional delivery is lower among the poor.
Dingle, Powell-Jackson & Goodman, (2013)	Cambodia (2000, 2005,2010)	Demographic and health survey	Women aged 15 – 49 years	Concentration index	Household wealth index	Utilisation for skilled attendants delivery was highest among the women in quintile 4 (second richest) and quintile 5(richest).
Pulok et al., (2016)	Bangladesh (2004-2011)	Demographic and health survey (2004, 2007 and 2011)	Women aged between 15 and 49 years who had at least one live birth in the three years preceding the survey	Concentration index and Logistic regression model	Woman's education, husband's education, woman's employment and household wealth	The results from the concentration index and curve showed that utilization of skilled attendants during delivery is concentrated among the richest though the inequity gap reduced slightly between 2004 and 2011. The regression results showed that women

						from wealthier households were more likely to use skilled delivery care services (SBAs). Husband's and women's education were significantly associated with greater use of delivery care services. However, the association between woman's employment and delivery care was not very strong.
Bhatta & Aryal, (2015)	Nepal (2010)	Cross-sectional household survey	Male household heads and whose wives had given birth to at least one child. Men age ranged from 20 – 55 years	Concentration curve and concentration index	Household wealth index	The concentration curves showed inequity in the use of SBA being disproportionately utilized more by rich people and less by poor people. Concentration

						index of 0.05 was calculated.
Saxena et al., (2013)	India (2008)	District level household and Facility survey	7,534 ever married women aged 15-49 years who delivered since January 2004	Logistic regression analysis	Wealth Index, caste group and education	Caste group, education and wealth are significantly associated with access institutional delivery. There is a significant relationship between being poor and access to less utilization of institutional delivery. The odds of not using institutional delivery was higher among the poor (OR = 2.03; 95% CI=1.79-2.31), Scheduled Tribe STs (OR=3.22; 95% CI=2.73-3.78), Scheduled Caste SCs (OR=1.39; 95%

						CI=1.16-1.67), SEBC (OR=1.49; 95% CI=1.29-1.72), non-literate (OR=2.74; 95% CI=2.45-3.07), or educated for less than 5 years (OR=2.24; 95% CI=1.89-2.66).
Salam & Siddiqui, (2006)	India (1992 - 2006)	National Family Health Survey		Concentration index and curves, logistic regression and multinomial logistic regression	Socioeconomic status (wealth index)	Pro-rich utilization of SBAs across all selected states in India. At state level economic inequalities in the use of SBAs remained higher in Uttar Pradesh. Furthermore, inequalities were highest among rural mothers
Tesfaye, Mathewos & Kebede, (2017)	Ethiopia (2000, 2005, 2011, 2016))	Demographic and Health Survey	Women between the age 15 – 49 years	Rate Ratio and Rate difference	Economic status and education level	The findings showed that coverage in SBA utilization increased

		(DHS) (2000, 2005, 2011, 2016)				from 5.62% in 2000 to 28% in 2016. However, gap of inequality on receiving SBA during delivery also increased from 24.2 in 2000 to 53.8 in 2016 among wealth quintiles and from 44.9 in 2000 to 76.0 in 2016 among educational level. Using the 2016 DHS, the proportion of birth attended by SBAs among women in the richest quintile was about 5.11 times higher than women in the poorest quintile. Proportion of birth attended by SBAs was 5.42 higher among

						women who completed secondary and above education than women with no formal education.
Silal et al., (2012)	South Africa	Mixed method study design	Women over 18 years	Regression analyses (multiple linear regression)	Socioeconomic status and geographic area	Access to obstetric services were impeded by affordability (amount of money spent on the day of delivery as a measure of annual household consumption expenditure), acceptability (health worker too busy to listen to patients' problems) and availability (patient travel time to facility) barriers.

						The model showed significant association between travel time to facility and education, site and age. Those who had secondary and tertiary educational level travelled less time to facility than those who had only primary education. Urban dwellers were more likely to take less travel time to get to the facility that rural dwellers. Year on year increases in age were more like to travel less. Affordability was significantly associated with socioeconomic status. This showed

						that wealthier household spend significantly less money as a percentage of their household consumption expenditure than their poorer counter parts. For acceptability, wealthier households and urban dwellers were less likely to feel that the health worker was too busy compared to households in the poorest quintiles and rural settlers.
Zere et al., (2011)	Namibia (2006 – 2007)	Demographic and health Survey	Women aged between 15 and 49 years	Concentration index and decomposition analysis	Wealth index	Findings revealed that about 80.3% of births were attended by SBAs.

						SBA in the richest quintile is about 70% more than the poorest quintile and almost twice among the educated women than women with no education. Furthermore, women in urban areas access the services of SBAs 30% more than those in rural areas. The concentration index and curves shows a statistically significant wealth-related inequalities in the use of SBA during deliveries to the advantage of

						economically better off households. The decomposition analysis revealed that most of the inequality in delivery by a SBA that is to the advantage of a wealthier segment of the population is explained by inequalities in income, education and urban residence.
Makate & Makate, (2017)	Zimbabwe (1994 – 2011)	Demographic and health survey	Women aged between 15 – 49 years	Concentration index and decomposition analysis	Wealth index	Findings revealed a pro-rich inequality in the use of professional delivery assistance. Women from wealthier families (richer and richest) had a high utilization rate.

						Women from urban areas had better access to professional delivery assistance compared to women in rural areas. The result from the decomposition analysis revealed that household wealth and education explains the large share of observed inequalities in maternal health care utilization (professional delivery assistance)
Prusty, Gouda & Pradhan, (2015)	India (Odisha) 2007-2008	District level household and facility survey	7792 ever married women aged 15 -49 years	Concentration curve and decomposition analysis	Region and socioeconomic status (wealth index and educational level)	Based on regional variations, among the three regions, KBK region had the lowest utilization rate (32%) of deliveries were

						conducted by SBAs compared to 52% in the western and 61% in the coastal region According to socioeconomic variations, poor women were found to have low maternal health care utilization than the rich. Almost 92% of women in the richest group had skilled delivery with an SBA compared to 30% in the poorest group. It was also revealed that the education of women and their husbands were linearly related to the maternal health care utilization.

						It was evident that among women with 10 or more years of schooling, 88% had safe delivery with SBAs compared to 28% among illiterate women. The concentration curve showed high inequality in the utilization SBAs during delivery and utilization is more concentrated among affluent women.
Obiyan & Kumar, (2015)	Nigeria (1990-2008)	Nigerian Demographic and Health Survey (1990 and 2008)	Women aged 15 – 49 year who had at least one birth in the past 3 years prior to the survey dates	Concentration index (CI)	Household index and woman's level of education	In general, the findings revealed a pro-rich utilization of the medical assistance during delivery over time. The value of CI was 0.455 in 1990 and

						0.523 in 2008. The extent of socioeconomic inequality was also higher across women's level of education. The value of CI was 0.495 in 1990 and 0.523 in 2008.
Adeyanju, Tubeuf & Ensor, (2017)	Nigeria (1990 and 2008)	Nigerian Demographic and Health Survey	Women aged 15 – 49 year who had at least one birth in the past 3 years prior to the survey dates	Concentration Index and decomposition analysis	Place of residence, region, religion, education, wealth index	Pro-rich inequalities were found among women who received skilled birth attendants during delivery. The value of CI was 0.31 in 1990 and 0.43 in 2008 showing an increase in inequality. The decomposition analysis revealed being poor, having no education and living in northern

						and rural Nigeria as main contributors to inequality in the use of skilled birth attendants during delivery.
Asamoah Oppong Benedict & Agardh Anette, (2017)	Ghana (2003 and 2014)	Women between age 15 -24 years old with at least one previous birth experience in the past 5 years prior to the survey	Demographic and Health Survey	Total Attributable risk (TAR)	Wealth index, place of residence and women's educational level	Findings revealed a rise in urbanity-related, education-related and wealth-related (most especially) inequality in SBA use during delivery between 2008 and 2014. Poor women were 3.4 times more at odds not to use SBA during delivery indicating a pro-rich utilization of SBAs during delivery.

Review of studies that assessed socioeconomic inequalities in the use of SBA during delivery in developing countries.

The 2011 Centre for Disease Control and Prevention's (CDC) report on health disparities and inequalities explains that health inequalities is often used in economic literature and sometimes used interchangeably with health disparities as the measure of health among population groups. It is associated with individual or group specific characteristics such as income, education, race or ethnicity etc. It has been stated that studies on health inequalities are important indicators for community health improvement and provide important information for policymakers and intervention implementation to reduce preventable morbidities and mortalities (CDC, 2011).

As shown in Table 1, all the studies revealed inequities/inequalities in the use of skilled birth delivery. The studies showed that women from the wealthy affluent households are more likely to use skilled birth attendants during birth compared to their less prosperous counterparts revealing a pro-rich utilization. There was no literature on the inequalities/inequities in the use of maternal health services (skilled delivery care) in developed countries. It was noted that most studies on the inequalities /inequities in the use of maternal health care utilization (i.e. skilled delivery care) were mostly from developing countries (Limwattananon, Tangcharoensathien & Prakongsai, 2010; Saxena et al., 2013; Bhatta & Aryal, 2015; Prusty, Gouda & Pradhan, 2015; Pulok et al., 2016; Tesfaye, Mathewos & Kebede, 2017). This confirmed the evidence from literature that almost all (99%) maternal deaths occur in developing countries (South East Asia and sub-Saharan Africa), hence research in these countries.

All these studies showed a pro-rich utilization of skilled birth attendants during delivery. Of all the studies that were reviewed five (5) were conducted using a decomposition analysis. The decomposition analysis of these five (5) studies found income, area of residence and education

(maternal and husband's) to be the major contributors to inequalities (Baral et al., 2010; Spinakis et al., 2011; Li et al., 2015; Prusty, Gouda & Pradhan, 2015). Furthermore, out of the 14 articles reviewed, seven (7) were analysed using the concentration index and curves and a decomposition analysis while the remaining six (6) used mixed methods such as Rate Ratios, Rate Differences and logistic regression analysis (Houweling et al., 2007; Silal et al., 2012; Saxena et al., 2013; Kamal, Hassan & Kabir, 2015; Tesfaye, Mathewos & Kebede, 2017).

Besides, it was evident that all except one study used secondary analysis of various types of household surveys. Among the studies was a systematic review conducted by Houweling et al., (2007) in 45 developing countries. The socioeconomic indicator used was household wealth index the women belonged as the study's aim was to describe the huge poor-rich inequalities in maternity care of which professional delivery assistance is included. Using the most recent demographic and health survey at the time for all the countries that were included in the review, it was evident that inequalities existed in maternity care but most especially in professional delivery care in most countries. It also revealed that, although, the poor-rich inequalities are large within both urban and rural residences, most births unattended by a skilled birth attendants occurred among the rural poor. Furthermore, it was discovered that although household wealth influenced the use of skilled birth delivery, public sector inequalities were a major contributing factor to household wealth inequalities.

Globally, a lot of studies have been conducted assessing the determinant on the use of maternal health care services with skilled birth attendants as a component most especially in developing countries. However, only a handful of studies have really examined the socioeconomic inequalities in the use of maternal health services using a decomposition analysis to understand the extent to which theses inequalities affect the use of skilled birth attendants. Studies on socioeconomic

inequalities in the use of skilled birth attendants during delivery are still limited. Most of studies have focussed on GDHS data from 1988 to 2008 using a regression-base Total Attributable Fraction, probit or ordered-probit models in their analysis. Making use of data almost ten years old can limit comparability due to some structural transformation that may have taken place in the last ten years. Some of these structural transformation include, bridging equity gaps in access to health care (in terms of health worker availability, geographical accessibility and financial accessibility) and quality maternal, neonatal, child and adolescent health services. To bridge equity gaps in access to health care, the Community-based Health Planning Services (CHPS) programme was implemented to increase the availability of health workers across the country, mostly in the remote and deprived areas in Ghana. In addition, geographical accessibility was being improved through the establishment of new health facilities like the Tamale Teaching Hospital and upgrade of already existing health facilities like Korle Bu Teaching Hospital, Ridge Hospital and Komfo Anokye Teaching Hospital in order to support effective and efficient service delivery in the country (Ghana Health Service, 2010). Furthermore, it was assessing the equity in the enrolment in the National Health Insurance Scheme (NHIS). Over the years, NHIs enrolment has expanded and become more equitable. The Health sector through the auspices of the Ghana Health Service (GHS) tried to increase the coverage to promote universal health coverage. In 2014, the coverage had increased to 10.5 million representing 40% of the population since its inception in 2004 (Wang, Otoo & Dsane-Selby, 2017). Also, its benefit package has been reviewed whereby more than 95% of diagnosed conditions are covered under the NHIS and has no cost-sharing component (Wang, Otoo & Dsane-Selby, 2017). For improving access to quality maternal, neonatal, child and adolescent health services, a number of programmes were implemented. These included Prevention Mother To Child Transmission (PMTCT) scale-up Plan, MDG Accelerated Framework (MAF, Under-five

mortality policy, 2010 Child Health Promotion Week, Training of trainers (TOT) workshop on lactating management, training and deployment of midwives to increase skilled birth attendants coverage in the country were all implemented (Ghana Health Service, 2010). In view of all these transformations that have been implemented since 2008, there is the need to use a more recent data to examine if socioeconomic inequalities still persist and if so to what extent do they exist.

In Ghana, Bosomprah et al., (2014) did a decomposition analysis of change in skilled birth attendants using the 2003 and 2008 GDHS. They used the conventional Blinder-Oaxaca decomposition based on two linear regression models. Again only few studies have looked at socioeconomic inequalities in the use skilled birth attendants during delivery in developing countries and in Africa to be precise using a decomposition model (Zere et al., 2011a; Liu, Gao & Yan, 2014; Prusty, Gouda & Pradhan, 2015; Makate & Makate, 2017). The motivation of this study originated from this context and aims to add to empirical literature on socioeconomic inequalities in the use of skilled birth attendants globally, in sub-Saharan Africa and in Ghana. In addition, this study will use the most recent data, the 2014 Ghana Demographic and Health Survey data by giving a more recent analysis of socioeconomic inequalities in skilled birth attendants during delivery in Ghana since a lot of structural transformation have taken place since 2008. This study will also decompose the underlying factors contributing to the socioeconomic inequalities using the concentration index by Wagstaff et al., (2011).

CONCLUSION

Maternal mortality remains a major challenge to health systems, particularly in developing countries where almost all deaths occur and Ghana is no exception. Therefore, ensuring skilled birth assistance during delivery is optimal for maternal and new-born survival (WHO et al., 2015). Literature has shown that most pregnant women do not deliver with the assistance of skilled birth

attendants due to that substantial social and economic inequalities in accessing professional delivery assistance either at home or at a health facility (Gage, 2007; Mumtaz et al., 2012; Silal et al., 2012). It is in this regard that the Sustainable Development Goals (SDGs) now call for an acceleration of current progress where by 2030, each country should reduce its maternal mortality ratio (MMR) by two-thirds from the 2010 baseline. In addition, no country should have a MMR higher than 140 deaths per 100,000 live births (WHO et al., 2015). This, the World Health Organization suggests five major objectives needed to be achieved in order to end preventable maternal mortality. Among these objectives, is addressing inequities in access to and quality of sexual, reproductive, maternal and new-born health care (WHO et al., 2015). As a result, there is the need to understand the determinants and access barriers of the use of skilled birth assistance during delivery across different population groups in order to develop policies to reduce the access barriers.

The studies reviewed have confirmed the existence of socioeconomic inequalities in the use of maternal health care services but particularly, skilled birth attendants during delivery across different population groups. Furthermore, most of the inequalities in births attended by a skilled birth attendant are skewed towards the wealthier population (pro-rich) and are explained mostly by differences in income levels, educational levels and area of residence (rural/urban). A lot of studies have assessed the determinants that impede the use of skilled birth delivery especially in developing countries (Gage, 2007; Lubbock & Stephenson, 2008; Baral et al., 2010; Singh et al., 2012; Smith Greenaway, Leon & Baker, 2012; Rai et al., 2013; Islam, Islam & Yoshimura, 2014; Tarekegn, Lieberman & Giedraitis, 2014; Chamroonsawasdi et al., 2015). However, only few have decomposed the socioeconomic inequalities hindering access and use of skilled birth attendants during delivery particularly in sub-Saharan Africa (Aseweh Abor et al., 2011; Zere et al., 2011b;

Saxena et al., 2013; Pulok et al., 2016; Makate & Makate, 2017). It is against this background that this study seeks to assess the socioeconomic inequalities that affect access of use of skilled birth delivery in Ghana using concentration index and curves to identify the major contributors of socioeconomic inequalities based on a revised conceptual framework.

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PART C: JOURNAL MANUSCRIPT

Proposed Journal: BioMed Central (BMC), Pregnancy and Childbirth[10]

[10] Instructions for authors appear in the appendix

Decomposing Socioeconomic Inequalities That Impede the Use of Skilled Birth Attendants during Delivery among Women in Ghana.

Aseye Kpodotsi[11]

Abstract

Background: Equitable access to, and use of skilled birth attendance during delivery is vital for the achievement of the Sustainable Development Goals (SDGs) in reducing global maternal deaths to 70 deaths per 100, 000. Although several initiatives have been implemented to reduce maternal mortality in Ghana, inequities in the use of skilled birth attendance during delivery still exist among women of different socioeconomic groups. This study assessed the socioeconomic inequalities related to the use of skilled birth attendants during delivery in Ghana.

Methods: This study analyzed data from the 2014 Ghana Demographic and Health Survey (GDHS) using a decomposable health concentration index. Concentration index (CI) and concentration curves were employed to measure the magnitude of socioeconomic inequality in the use of skilled birth attendants during child delivery. The concentration index was decomposed to identify the underlying factors causing the inequalities.

Results: Out of a total of the 1,305 women who gave birth in the year prior to the interview, 28% of the deliveries had no skilled birth attendants of which 60% lives in rural compared to 40% in urban. A concentration index of 0.147 showed a pro-rich utilization of skilled birth attendance during delivery. The decomposition analysis revealed that, wealth, education and location of

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residence were the major contributors to socioeconomic inequalities in the use of skilled birth attendants during child delivery among Ghanaian women.

Conclusion: This study suggests that factors such as wealth, area of residence and education are worthy of increased attention in programmatic efforts, and policy interventions, because they are amenable to the reduction of observed inequality.

Keywords: inequity, socioeconomic inequality, skilled birth attendants, maternal health care utilization, child delivery, access.

BACKGROUND

"Having a health worker with midwifery skills (for example doctors, midwives or nurses) present at childbirth especially in rural areas, supported by adequate equipment, supplies and drugs, regulations that permit them to carry out necessary procedures and transport for referral in case of emergency is required, is perhaps the most critical intervention for making motherhood safer." [1].

Maternal health care services are critical inputs in addressing the problem of maternal morbidities and mortalities, hence, remains a global priority. The Safe Motherhood Initiative, was a global collaborative effort to raise awareness for the scope of high maternal mortality and to entreat the international community, countries and stakeholders to take steps to address this public health concern. This was the beginning for a number of advocacy conferences on reducing maternal mortality, with the most recent being the United Nations Agenda 2030 on Sustainable Developments Goals (SDGs) to encourage developing countries to prioritise skilled birth attendants during delivery to reduce maternal mortality [2]. The proportion of births assisted by a skilled birth attendants is a potential process indicator and there is evidence of a strong positive association with level of maternal mortality [3]. Although several international conferences have tried to tackle this problem by reducing maternal mortality ratio, progress in most countries have proven slow and challenging due to lack of equitable access and use of maternal health services as well as the absence of a functioning health care system [4]. The firm resolve with which skilled birth attendance has been promoted as a global priority indicates urgent need to offer policy makers and key stakeholders a feasible, comparatively discrete and intuitively effective intervention [5].

Equity in access to and use of skilled delivery services is critical in the attainment of the Sustainable Development Goal (SDG) 3 in Ghana. Over the years, major strides have been made towards reducing the number of women who die due to pregnancy and childbirth-related

complications. Yet, many women still die annually from these avoidable deaths. Most of these deaths have been reported to occur mostly during delivery and immediate postpartum period (48 hours).

Globally, it is reported that nearly 530,000 women die every year from pregnancy and childbirth-related complications. Approximately 99% of these deaths occur in developing countries precisely in sub-Saharan Africa followed by Asia. This accounts for the largest discrepancies between the developed and developing countries [6]. It has been confirmed that majority of maternal deaths occur during childbirth with the common causes being haemorrhage, infections, unsafe abortions, hypertensive disorders of pregnancy and obstructed labour [1]. Estimates suggest that about 16% to 33% of these complications may be prevented by the assistance of a skilled attendant during delivery [5].

In 2010, it was reported that nearly 2,700 women died from pregnancy and childbirth-related complications [7]. Out of this, it was recorded that, 56.6% of these deaths were as a result of direct causes such as haemorrhage, infection, unsafe abortion, obstructed labour and hypertensive disorders during pregnancy. Haemorrhage (39%) during childbirth was recorded as the most common cause of death followed by hypertensive disorders (35%) as the second direct cause of maternal deaths [8].

In light of this, various initiatives like the Reproductive Health Strategic Plan was put in place to help improve maternal health in Ghana. A Reproductive Health Strategic Plan (RHSP) was put in place and one of its strategic objective was to reduce maternal mortality and morbidity. Included in this objective was to expand women's access to skilled attendance at delivery, increase the availability of comprehensive essential obstetric care to treat pregnancy complications, and to

ensure an effective referral and transport system are in place to cater for women with complications [9].

Figures from the 2014 Ghana Demographic and Health Survey report showed a national coverage of 74% of births that were delivered five years prior the interview were assisted by skilled attendants. However, this national coverage, though high may hide disparities among socioeconomic groups in the country. In the same report it was reported that 90% of births by women in urban settlements were assisted by skilled birth attendants compared to only 58% of birth being assisted in rural areas. Again, while 96% of births were assisted by skilled birth attendants among the rich only 49% of births were assisted by the poor [10]. These differences in the use of skilled birth attendants during childbirth may be due to the existence of some socioeconomic inequalities that contribute to women's health, before, during and after pregnancy, that prevent women from using available health services. These inequalities may be demand or supply-side factors as explained by Levesque, Harris & Russell, (2013) and Andersen, (1995) in their conceptual framework of access and health care utilization of health services. Among these factors are physical barriers of poor roads and long distances to health facilities, financial barriers, lack of employment opportunities, low educational attainment, and low socioeconomic status [13–15].

Studies have shown the existence of huge gaps in the use of skilled birth attendants during delivery across different socioeconomic groups [16]. Studies conducted in low and middle-income countries show wide gaps in skilled birth delivery. Findings from these studies had shown wealth, women and husband's educational levels were significantly associated with skilled birth delivery [17–19]. For example in Namibia, the concentration index and curve showed statistically significant wealth-related inequities in skilled delivery to the benefit of women from economically

better off households. After decomposing, it was observed that the main drivers of inequities were household wealth and mother's education [20].

It is in this regard that the study aims to examine the extent to which socioeconomic inequalities contribute to the use of skilled birth attendants in Ghana and the underlying factors that contribute to these inequalities in the Ghanaian context.

METHODS

Data source

This study used data from the 2014 Ghana Demographic and Health Survey[12] of women who gave birth in the past year prior to the survey. Information for this analysis was drawn from the woman questionnaire. The survey was designed to provide information to monitor the population and health situation of Ghana. Thus survey used a two-stage sampling methods. The first stage involved selecting clusters and 427 clusters were selected. In the second stage sampling, a systematic sampling method was used to select 30 households from each cluster and a total of 12,831 households were selected of which 11,835 households were successfully interviewed. Among the successfully interviewed household, 9,656 women aged 15 – 49 years were eligible for individual interview. However, only 9,396 women were interviewed successfully at a response rate of 97 percent. The Women's Questionnaire collects information from all eligible women on topics such as: background characteristics (age, education, media exposure, etc.), birth history, child mortality, knowledge and use of family planning methods, fertility preferences, antenatal, delivery, and postnatal care, breastfeeding and infant feeding practices, vaccinations and childhood illnesses and marriage and sexual activity, women's work and husbands' background

[12] www.dhsprogram.com

characteristics, knowledge, awareness, and behaviour regarding HIV/AIDS and other sexually transmitted infections (STIs), and knowledge, attitudes, and behaviour related to other health issues (e.g., smoking, tuberculosis, and blood pressure). The survey offered the opportunity for analysing the socioeconomic inequalities that impede women's use of skilled birth attendants during delivery.

A total of 1,305 women between 15 – 49 years who delivered twelve months prior to the 2014 GDHS were selected for the study. The choice of twelve months prior to the survey date was to avoid memory lapse of the respondents.

Outcome variable

The outcome variable for this study is whether women who had live births in the past year preceding the interview year had deliveries assisted by skilled birth attendants or not. The outcome variable was considered a binary outcome. That is, it was given a value "1" if the delivery was attended or assisted by a skilled birth attendant and "0" if the delivery was not (i.e. any other person beside a skilled birth attendant). Information on delivery assisted or attended by a skilled birth attendant was collected based on the question "*Who assisted in the delivery of (NAME OF CHILD*)"?

A skilled birth attendant in this study was defined as a trained and licenced health professional that is a doctor, nurse/midwife or community health officer who provide basic and emergency health care services to women and their new-borns during pregnancy, childbirth and immediate postpartum period usually first 48 hours after childbirth.

Predictor variables

The predictor variables of interest for this study include woman's age at birth, woman's autonomy, woman's marital status, woman's educational level, husband/partner's education level, woman's

employment status, health insurance coverage (woman), Household wealth index, Household headship (sex), region and area of residence. The selection of predictor variables in this study were based on existing literature that reported significant association with different maternal health care services. Demographic characteristics include woman's age at birth, place of residence, woman's marital status and region. Woman's age at birth and marital status were categorised into three groups.

Socioeconomic characteristics included woman's educational level, woman's employment status, husband's educational level, health insurance coverage and household wealth index. Education was self-reported and the Ghana Demographic and Health Survey (GDHS) collects the highest level of education or schooling completed or attained by both women and their husbands/partners. Employment status is categorised into two groups: currently employed coded as "1" and unemployed coded as "0". Health insurance coverage is also categorised into two groups: those who has insurance coverage were coded as "1" and those who were not covered were coded as "0". The wealth index is used as the measure of economic status. The household wealth index is a composite measure of the cumulative living standard of a household. Household wealth index is considered a more reliable measure than income and consumption because it represents a long-term standard of living of a household and easier to implement [21]. The household wealth index is estimated from existing data on household assets, services, and amenities to assess health, population, nutrition, education, and other indicators of societal well-being according to economic status. It is based on the assumption that the possession of observable or easily asked assets, services, and amenities is related to economic position of the household of the economy [22]. The general technique used to calculate the wealth index; the principal component analysis technique was developed by Filmer and Pritchett [23]. The wealth index are then grouped into quintiles based

on the distribution of the household population [21]. The percentage of skilled birth attendants was defined as the proportion of live births in the past year preceding the survey delivered with the assistance of a skilled health professional (i.e. Doctor, Nurse/Midwife or Community health officer).

Women's autonomy was derived from the question: *person who usually decides on mother's health care* from the questionnaire. The response options were: (a) mother alone, (b) mother and husband/partner, (c) husband/partner alone and (d) other (i.e. any other person besides the fore mentioned).

Sex of household head was also considered in this study. Sex of household was categorised into two groups: male and female household heads. They were coded "1" if a male and "2" if a female.

Statistical analysis

Data analysis

Data was analysed using STATA 14 statistical software. Socio-economic inequalities in the use of skilled birth attendants during delivery was calculated using concentration index and curves to assess the magnitude of the relative inequalities. The ADePT software version 6 was used to derive the concentration indices and curves and after decomposed to examine which factors contributed most to the observed socioeconomic inequalities among the population.

Measuring inequalities

To measure equality in a health outcome, the following are required:

- Indicator of the health outcome of interest (dependent variable) which in this study is delivery by skilled health professional.
- A variable capturing the socioeconomic status of the distribution to be assessed which in this study is household wealth index, and

- A measure of socioeconomic inequality to quantify the degree of inequality in the variable of interest.

This study uses concentration curves to graphically illustrate the socioeconomic inequality that exist in the use of skilled birth attendants among women during childbirth in Ghana. The concentration curves plots the aggregate percentage share of health in a population against the aggregate percentage share of the population ranked according to their socioeconomic status from the lowest to highest [24,25]. The concentration curve may fall above or below the perfect line of equality. It is defined as twice the area between the line of equality (45 degrees line) and the concentration curves C(p) and C(p*) representing concentration among the poor and rich respectively.

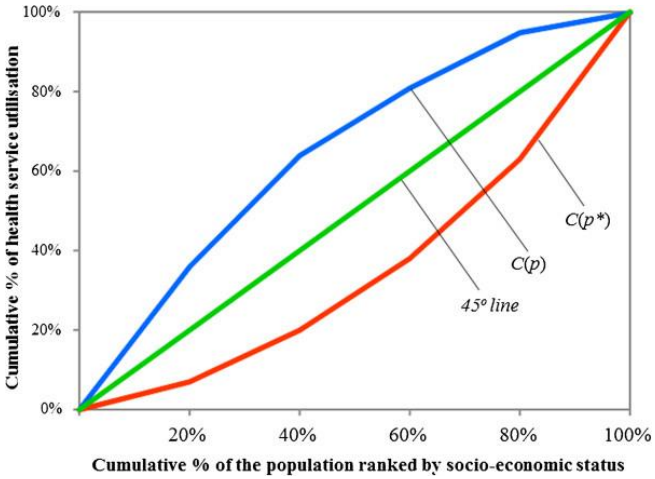

Figure 1: Concentration curve for health care utilization

In this study, concentration indices (CI) are calculated to measure the magnitude of inequality. The concentration curve is defined as twice the area between the concentration curve and the line of inequality (the 45-degrees line). This is estimated as twice the covariance of the health care utilization and a person's relative rank in terms of socioeconomic status, divided by the outcome mean [26]. This is presented in the formula below as;

$$C = \frac{2}{\mu} cov(h_i, r_i) \quad (1)$$

Where C is the concentration index; h_i is the health variable index; r_i is the fractional rank of the individual i in the distribution of socioeconomic position; μ is the mean of the health variable and cov denotes the covariance.

The value of the CI measures the severity of socio-economic inequality. The value of the CI may vary between −1 to +1. A negative value implies that the health outcome is concentrated among those with lower socioeconomic status (poor) and the concentration curve will be above the line of equality. While a positive value shows concentration among the higher socioeconomic status (rich) showing a concentration curve below the line of equality. A CI value of zero implies no inequality. The larger the absolute value of CI, the greater the disparity [27].

Decomposing the concentration Index

Understanding and explaining the extent to which an underlying factor contributes to socioeconomic inequality has become of great interest to researchers and policymakers. The concentration index is now commonly used to examine socioeconomic inequality in health [28]. According to Wagstaff, van Doorslaer, EddyO'Donnell and Lindelow, (2003) one important use of the concentration index is its ability to be decomposed into a linear combination of concentration indices of its potential causes.

Decomposition estimations have mostly been used when the health outcome is a continuous variable[13] using the Ordinary Least Square (OLS) regression model[14]

$$y = \alpha + \sum_k \beta_k x_k + \varepsilon. \quad (2)$$

[13] A variable that can take any numerical value and can be measured

[14] Ordinary Least Squares (OLS) is a method for estimating unknown parameters in a linear regression model, with the aim of minimizing the sum of squares of the differences between the observed responses (values of the variable being predicted) in the given dataset and those predicted by the linear function of a set of explanatory variables

Where *y* is the concentration index *(C)*, α is the y-intercept, β and χ are the predictor variable of health care demand and ε is the error term. However, since most health outcomes are binary[15] in nature, a number of studies have used different methods – probit analysis[16] [25] and the logit analysis [30] to help decompose a health variable with two outcomes.

In this study where skilled birth attendant is a binary outcome (i.e. using SBA during delivery or not), to decompose the concentration index, the following steps are vital: (i) regress the health utilization variable against its determinants using an appropriate model. This helps in finding the coefficients of the predictor variables (β_k). (ii) Calculate the means of the health utilization variable and each of its determinants (μ and x_k). (iii) Calculate the concentration indices of the health utilization outcome variable and the determinants (C and C_k) using the equation

$$C = \frac{2}{\mu}\, cov_w\,(y_i, R_i) \qquad (3)$$

where y_i and R_i are the health utilization of the i_{th} individual and fraction of the fractional rank of the i_{th} individual (for weighted data) in terms of the index of the household status; μ is the (weighted) mean of the health of the sample and cov_w is the weighted covariance, as well as the generalised concentration index of the error term

$$(GC_\varepsilon)\; C = \sum_k \left(\frac{\beta_k x_k}{\mu}\right) C_k + \frac{GC_\varepsilon}{\mu} = C_y + \frac{GC_\varepsilon}{\mu} \qquad (4)$$

Where μ is the mean of the outcome variable *y;* that is the mean of the deliveries by SBA x_k is the mean of x_k, C_k is the concentration index of determinant x_k (defined analogously to *C*) and $\frac{GC_\varepsilon}{\mu}$ is the generalised error term of ε. This captures wealth related inequality in using SBA during delivery. The $\left(\frac{\beta_k x_k}{\mu}\right)$ expresses the impact of each determinant on the probability of delivery using

[15] A variable that can take on only two possible outcomes

[16] Probit model is a type of regression used to analyse a binomial (consisting two terms) response variable.

a SBA in the equation above, C is a binary variable. The first is the deterministic component and the second is the error term or "unexplained" component in the equation.

ETHICAL CLEARANCE

The study employed secondary household survey data and so no ethical issues was needed. Therefore, in order to have access to the Demographic and Health Survey datasets, permission was sought from the DHS program expert by registering on the website and submitting an online research project form for dataset access approval. For this study, ethical approval was received from the Faculty of Health Sciences, University of Cape Town Human Research Ethics Committee (HREC).

RESULTS

Sociodemographic characteristics of respondents

Table 1: Distribution of respondents by selected background characteristics

Characteristics	Number	Percent (%)
Mother's age at birth		
15-24	376	28.81
25-34	636	48.74
35-49	293	22.45
Marital status		
Married	1145	87.74
Single	160	12.26
Place of residence		
Rural	786	60.23
Urban	519	39.77
Region		
Ashanti	132	10.11
Brong Ahafo	123	9.43
Central	89	6.82
Eastern	104	7.97
Greater Accra	118	9.04
Northern	130	9.96
Upper East	144	11.03
Upper West	209	16.02
Volta	137	10.50
Western	119	9.12
Wealth quintile		
Poorest (Q1)	434	33.26
Poorer (Q2)	274	21.00
Middle (Q3)	245	18.77
Richer (Q4)	200	15.33

Richest (Q5)	152	11.65
Mother's educational level		
No education	436	33.41
Primary	261	20
Secondary+	608	46.59
Husband/partner's educational level		
No Education	349	26.74
Primary	137	10.50
Secondary+	684	52.41
Mother's employment status		
No	384	29.43
Yes	921	70.57
Sex of Household Head		
Female	291	22.30
Male	1014	77.70
Health Insurance Coverage		
No	301	23.07
Yes	1004	76.93
Woman's autonomy		
Mother alone	233	20.53
Mother and husband/partner	605	53.30
Husband/partner	297	26.17

Table 1 presents selected sociodemographic characteristics of respondents. A total number of 1305 women were involved in the study. Majority (49%) of the women gave birth between the ages of 25 – 34 years. More than three quarters (88%) of the women were married. Most (16%) of the respondents were from the Upper West region (16%) while Central region had the lowest (7%) distribution of respondents. One-third (33%) of the respondents were from the poorest quintiles and 11% from the richest quintile. Majority (47%) of the mothers had secondary education but one-third (33%) had no formal education. Considering partner's educational level, 52% had secondary education or higher however, 27% had no education. Majority (71%) of the mothers were employed with only a few (29%) unemployed. Most (78%) of the households were headed by males and only 22% were headed by females. Approximately 77% of the respondents had health insurance coverage but 23% had none. For women's autonomy, more than half (53%) of the mothers and husbands were autonomous and 20% of mothers alone were autonomous.

Non-Utilization of Skilled Birth Attendants

Table 2: Non-utilization of skilled birth attendants during delivery by selected background characteristics

Characteristics	Number (N)		Total Number	Delivery by a non skilled birth attendants (%)
	No	Yes		
Mother's age at birth				
15-24	112	264	376	29.79
25-34	173	463	636	27.20
35-49	81	212	293	27.65
Marital status				
Married	320	825	1145	27.9
Single	46	114	160	28.8
Place of residence				
Rural	311	475	786	39.57
Urban	55	464	519	10.60
Region				
Ashanti	35	97	132	26.52
Brong Ahafo	37	86	123	30.08
Central	5	84	89	5.62
Eastern	33	71	104	31.73
Greater Accra	43	75	118	36.44
Northern	13	117	130	10.00
Upper East	29	115	144	20.14
Upper West	130	79	209	62.20
Volta	12	125	137	8.76
Western	29	90	119	24.37
Wealth quintile				
Poorest (Q1)	194	240	434	44.70
Poorer (Q2)	102	172	274	37.23
Middle (Q3)	60	185	245	24.49
Richer (Q4)	8	192	200	4.00
Richest (Q5)	2	150	152	1.32
Mother's educational level				
No education	195	241	436	44.72
Primary	80	181	261	30.65
Secondary+	91	517	608	14.97
Husband/partner's educational level				
No education	157	192	349	44.99

Primary	36	101	137	26.28
Secondary+	142	542	684	20.76
Mother's employment status				
No	111	273	384	28.91
Yes	255	666	921	27.69
Sex of head of Household				
Female	82	209	291	28.18
Male	284	730	1014	28.01
Health Insurance Coverage				
No	125	176	301	41.53
Yes	241	763	1004	24.00
Woman's autonomy				
Mother alone	66	167	233	28.33
Mother and husband/partner	131	474	605	21.65
Husband/partner	119	178	297	40.07

Table 2 reports an overview of the non-utilization of skilled birth attendants among women who had live births in the past year preceding the interview in Ghana. From a total of 1,305 women who had live birth in the past year prior to the interview, about 28.05% of the deliveries were unassisted by skilled birth attendants. A breakdown by various maternal and household characteristics is provided in Table 2. Please check the numbering of your tables well.

Utilization rate differed according to the various characteristics provided in Table 2. Major differences were observed among place of residence, household wealth index, mother's educational level, health insurance cover and the region of residence. From **Table 2**, with regard to place of residence, it was observed that the proportion of births unattended by skilled birth attendants were more in rural (39.6%) settlements compared to urban (10.6%) settlements. Among the household wealth index, it was observed that women for the poorest households had the highest number (44.7%) of births unattended by skilled birth attendants whereas only 0.6% of births born into affluent households were unattended by skilled birth. The rate of utilization of women not

using skilled birth attendants during childbirth were higher among the women who have no educational level (44.7%) compared to their highly educated counterpart (15%) that is an education of secondary level and higher. Likewise, women whose husbands or partners were not educated (45%) were less likely to use skilled birth attendants. Based on the region of residence, the results of the study showed that upper west region as the region with the highest percentage (62.2%) of women who gave birth without the assistance of a skilled birth attendant. This was followed by Greater Accra region (36.4%), eastern region (31.7%) and Brong Ahafo region (30.1%). Furthermore, the Central, Volta and Northern regions were observed to be the regions with the highest number of women who used skilled birth during delivery at 94.4%, 91.2% and 90% respectively. Considering health insurance coverage, the findings of the study revealed that women who were not covered with health insurance were those who did not use skilled birth attendants during delivery (41.5%) compared to women who had insurance cover (24.0%). It was also observed that working mothers were more likely to use skilled birth attendants during delivery.

Decomposition of underlying factors

Table 3: Decomposing the socioeconomic inequalities in the utilization of skilled birth attendants during delivery in Ghana

Variables	Elasticities	CI	Contribution to CI	Contribution to CI (%)
Health Insurance Coverage	0.1009	0.0441	0.00445	0.4%
Household Head	-0.006	0.1064	-0.00064	0.0%
Location of residence	0.0671	0.4311	0.02893	2.9%
Woman's employment	0.0205	-0.0115	-0.00024	0.0%
woman's marital status	0.0000	0.0000	0.00000	0.0%
Age of woman at birth				
15-24	0.0000	0.0000	0.0000	0.0%
25-34	0.0068	0.1045	0.0007	0.1%
35-49	0.0273	-0.1095	-0.0030	-0.3%
Woman's autonomy				
mother alone	0.0032	0.0799	0.0003	0.0%
mother and husband	0.0243	0.0012	0.0000	0.0%
husband alone	0.0000	0.0000	0.0000	0.0%
Woman's educational level				

No education	-0.0106	-0.4825	0.0051	0.5%
Primary	0.0000	0.0000	0.0000	0.0%
Secondary+	0.0595	0.3013	0.0179	1.8%
Husband's educational level				
No education	-0.0219	-0.5563	0.0122	1.2%
Primary	-0.0025	-0.3136	0.0008	0.1%
Secondary	-0.0542	0.1732	-0.0094	-0.9%
Higher	0.0000	0.0000	0.0000	0.0%
Household wealth index				
Poorest	0.0000	0.0000	0.0000	0.0%
Poorer	0.0165	-0.3369	-0.0056	-0.6%
Middle	0.0304	0.0389	0.0012	0.1%
Richer	0.0794	0.4207	0.0334	3.3%
Richest	0.0595	0.811	0.0483	4.8%
Region of residence				
Ashanti	-0.0460	0.1219	-0.0056	-0.1%
Brong Ahafo	-0.0641	0.0922	-0.0059	-0.6%
Central	-0.0484	0.5632	-0.0273	-2.7%
Eastern	-0.0375	-0.125	0.0047	0.5%
Greater Accra	-0.0544	-0.0105	0.0006	0.1%
Northern	-0.0692	0.3392	-0.0235	-2.3%
Upper East	-0.0305	-0.1418	0.0043	0.4%
Upper West	-0.1001	-0.6405	0.0641	6.4%
Volta	0.0000	0.0000	0.0000	0.0%
Western	-0.0085	-0.5068	0.0043	0.4%
Residual (unexplained) = 0.0004				

Table 3 presents the results of the decomposition analysis that clarifies the degree to which each observed determinant of delivery by a skilled birth attendant contributes to wealth-related inequality in the utilization of skilled birth attendants during delivery. The contribution of each determinant depends on two factors. 1) Its impact on the delivery by a skilled birth attendants. That is its elasticity. And 2) how unequally distributed over wealth the determinant is. That is its concentration index.

The results of decomposition analysis are shown in Table 3. The concentration index for delivery in the presence of a skilled birth attendant showed that the estimated value of the relative contribution to the concentration index was negative in some socioeconomic factors such as woman's employment status (-0.01), mother's age at birth (35-49=-0.11), mother's educational

level (no education=-0.48), husband's educational level (no education=-0.56, primary=-0.31), household wealth index (poorer=-0.34) and the region of residence (Eastern=-0.12, Greater Accra=-0.01, Upper East=-0.14, Upper West=-0.64, Western=-0.51). This therefore implied that, individuals who were worse off in socioeconomic status were more disadvantaged in accessing skilled birth attendants during delivery. The negative concentration indices is associated with poorer households.

A pro-rich utilization of skilled birth delivery during child birth among Ghanaian women between the age of 15-49 years old was seen among women who had health insurance coverage, male headed household, women who were located in urban areas, women aged between 25 and 34 years old, women's autonomy, women who had primary and higher educational levels, women whose husband's had secondary and higher educational level, middle and rich households, women who were located in the Ashanti, Brong Ahafo, Central and Northern regions.

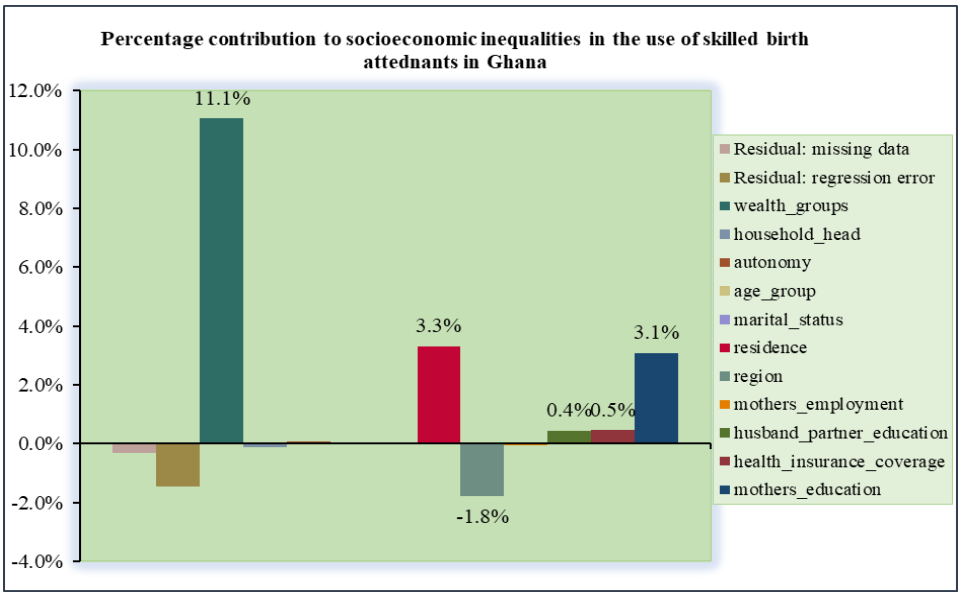

Figure 2: Percentage contribution to socioeconomic inequalities in the use of skilled birth attendants in Ghana.

Figure 2 presents socio-economic inequalities in the use of skilled birth attendants in Ghana. The findings of this study revealed that the largest relative contribution to the utilization of skilled birth attendants during delivery inequality was due to wealth index (11.4%) followed by place of residence (3.2%), woman's educational level (3.1%) and religion (1.2%). The residual in the decomposition analysis was very small (-0.01), suggesting that factors that were considered in the analysis explained most of the inequalities. Overall, results suggest that inequality in the utilization of skilled birth attendants during delivery was more concentrated among the rich, the relatively better off in society, those who lived in urban areas, as well a more educated women.

Inequality Associated Skilled Birth Attendant

The concentration index and concentration curve (Figure 3) below shows the existence of wealth-related inequality in child delivery with a skilled birth attendant. The concentration index shows the utilization rate of skilled birth attendants during child delivery to be concentrated among the better off economically households (CI= 0.147; SE=0.00[17]). This is shown in Figure 3 as the curve for women who delivered with skilled birth attendants lies below the line of inequality indicating that the economically better off women are more likely to use skilled birth attendants that women who are economically worse off.

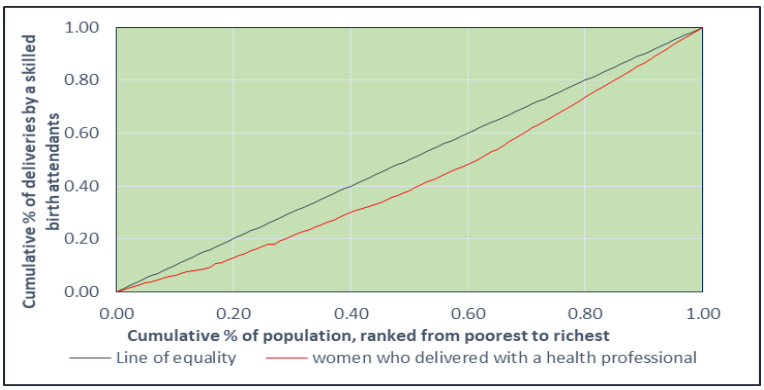

Figure 3: Concentration curve showing women who delivered with a health professional

[17] SE= standard error

DISCUSSION

The results of the study reveals huge inequality in the use of skilled birth attendants in Ghana although about 72% of women in the study population access skilled birth attendance during delivery. Place of residence, woman's autonomy, health insurance coverage, mother's educational level, husband's educational level, and household wealth were the main factors associated with the use of non-skilled birth attendance during delivery. Other factors such as mother's age, marital status, region of residence, household head, and mother's employment status were also associated with the non-use of skilled birth attendants during delivery.

Rural residence in this finding of this study was a hindering factor to the non-use of skilled birth attendants during delivery in Ghana. This finding of this study consistent with previous studies conducted in India, Sudan and Tanzania [15,18,31] which reported greater use of skilled birth attendants during delivery among urban mothers than rural mothers. The women in the rural settlement may not access skilled birth attendants due to lack of health facilities. In the rural areas only few health facilities for skilled delivery exist and pregnant women may need to walk a long distance to access such a facility because transportation difficulties. On the other hand, women in the urban areas could easily access skilled birth because there are many such facilities in the urban areas compared to rural areas. In urban areas, transportation may not be a problem and the mother does not need to walk a long distance to seek skilled birth attendants during child delivery.

According to the findings of this study, mothers with no educational level had the highest non-utilization rate of skilled birth attendants than women who had secondary or higher education. This is in agreement with other studies that revealed that better educated mothers utilized skilled birth attendants during child delivery than mothers with no education[32,33]. Studies have showed that education is one of the strongest factors in skilled birth utilization as it increases literacy rate

thereby women get to be aware of skilled delivery services available at health facilities and accept modern medical practices [32,34,35]. Similarly, mothers whose partners had no formal education had the highest non utilization rate of skilled birth attendant at child birth compared to mothers with partners with secondary or higher education. A study in northern Ghana indicated that women with partners with higher education were more likely to use skilled birth attendants during delivery [36]. This low use of skilled birth attendants may be as a result of low male partner involvement in maternal health care.

The findings of the study showed that low health insurance coverage was associated with a reduced skilled birth attendants during delivery. The study finding was in line with prior studies in Burkina Faso and Ghana which showed that high health insurance coverage contributes greatly to the utilization of mothers to skilled birth attendants during delivery[37–39]. High health insurance coverages does not only enable women initiate access to skilled birth attendants but also insures them from high cost of delivery care. However, in Ghana, although maternal health services are free for insured clients, there is low enrollment on the national health insurance scheme [40]. This is as a result of the lack of trust patients have in the insurance scheme due to long waiting time, delay in paying claims by the health insurance authority to health facilities as well as patients still paying for some services which are free to an insured patient [40].

Household wealth was found to significantly influence the utilization of skilled birth attendants during delivery. The findings of this study shows that household poverty is significantly associated with low utilization of skilled birth attendants during delivery. This is consistent with previous studies in Nigeria, Vanuatu, and Namibia [20,32,41]. This may be due to high financial burden such as the cost of transportation, inpatient cost as well as delivery cost. Rich mothers may use skilled birth delivery because they could access the financial cost associated with skilled birth

delivery than the poor mothers. For instance in the case of caesarean section the poor mother may find it difficult to pay for such service so the family may feel hesitant to access the service even though they may be aware of its necessity.

Woman's autonomy influenced the use of skilled birth attendants during delivery. Woman's autonomy was defined as their ability to decide on their own health. The result of this study indicated that situations where only the mother's partner decided the means of health care accessibility for the mother, mothers are less likely to use skilled birth attendants during delivery compared to the mother who decides on her own health care. This is consistent with studies in Ethiopia, Kenya and Nepal which revealed that women who decided on their own health care were more likely to get skilled assistance during delivery[42–44]. This could be seen from the cultural point of view where the man is the head of the family. This enables men to decide on everything concerning the family including their healthcare accessibility.

LIMITATIONS OF THE STUDY

A major limitation of this study is the problem of report and recall bias which may affect the accuracy or completeness of the recollections retrieved by survey participants regarding experiences and events from the past. Another limitation of the study may be the lack of analysis on health system factors like availability of delivery equipment, availability of skilled birth attendants, and quality of care among. Furthermore, it is worth stressing that the cross sectional nature of the data does not attempt to identify causal links.

CONCLUSION

This study looked at the extent to which socioeconomic inequalities affected the use of skilled birth attendants during child delivery among Ghanaian women. The study used the 2014 Ghana Demographic and Health Survey (GDHS) data and applied the decomposition analysis to analyse

the socioeconomic inequalities in the use of skilled birth attendants during delivery. The findings of this study points to the existence of inequalities in the use of skilled birth attendants during delivery. Women from rural areas, women with no education, male partners with no formal education, women with no health insurance cover and partners who decide on the means of health care accessibility of their partners were observed to contribute to low utilization of skilled birth attendants during delivery. This calls for attention for the government of Ghana through the Ministry of Health, Ghana Health Service, as well as other stakeholders interested in the reduction of maternal mortality in addressing the observed gaps relating to the utilization of skilled delivery services among women. Specifically, efforts should be made to invest in formal education for all especially women. Similarly, male partner involvement in maternal health care should be encouraged on the need for skilled birth delivery services for their partners. In addition, there is the need for more health facilities with skilled birth attendants like midwives should be situated in rural areas. Community-based Health Planning and Services (CHPS) should be strengthened to provide services to those in the rural communities.

In conclusion, women should be economically empowered be creating income generating opportunities for them. The country's minimum wage should be increased so that households will be able to seek skilled delivery when the need arises.

These recommendations when implemented would contribute greatly to the achievement of the SDG goal 3 target of a maximum of 70 maternal deaths per 100,000 live births by the year 2030.

Competing Interest

The authors declare that there are no competing interest regarding the publication of this paper.

Author's contributions

AK, conceived the topic for the study, performed the analysis and drafted the manuscript. OA and JHA reviewed the manuscript.

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AK, is a Master's in Public Health student, specializing in Health Economics at the University of Cape Town, South Africa. OA, is the Health Economics course convenor, at the Health Economics Unit at the University of Cape Town. JHA, is a Postdoctoral Research Fellow at the Health Economics Unit at the University of Cape Town.

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PART D: POLICY BRIEF

This policy brief is based on a study that examined the extent to which socioeconomic inequalities contribute to the use of skilled birth attendants during child delivery in Ghana. The study used a nationally representative dataset of Ghana: the Demographic and Health Survey (DHS). In addition, the study also identified the underlying causes of these socioeconomic inequalities to the use of skilled birth delivery during child delivery. The study was submitted as a mini-dissertation by Aseye Kpodotsi to the Health Economics Unit, Faculty of Health Sciences at the University of Cape Town. The study was supervised by Dr. Olufunke Alaba and Jo Hunter Adam.

PART D: POLICY BRIEF

FEBRUARY 2018

SOCIOECONOMIC INEQUALITIES IN THE USE OF SKILLED BIRTH ATTENDANTS DURING DELIVERY IN GHANA.

To what extent do socioeconomic inequalities in the use of skilled birth attendants during delivery exist and which determinants account for these inequalities in the use of skilled birth attendants during delivery among women in Ghana.

BACKGROUND

Ending preventable maternal mortality (EPMM) remains one of the world's most critical challenges over the years. It is reported that low- and middle-income countries (LMICs) account for 99% of maternal deaths in the world. The risk of maternal death is said to affect particularly the vulnerable in society. Despite recent advancement, the global maternal mortality ratio (MMR) stood at 216 deaths per 100,000 live births. It has been reported that, millions of births occur yearly without the assistance from a skilled birth attendant (SBA). Therefore, ensuring that every baby is delivered by a skilled birth attendant by 2030 as part of the SDGs targets, is regarded as a critical strategy to reduce maternal mortality and morbidity. In 2016, it was estimated that, globally, approximately 78% of births were attended by SBAs, whereas, in sub-Saharan Africa, a little above 50% of births were attended by skilled birth attendants (United Nations Children's Fund, 2017). Over the years, Ghana has made considerable improvements in reducing maternal

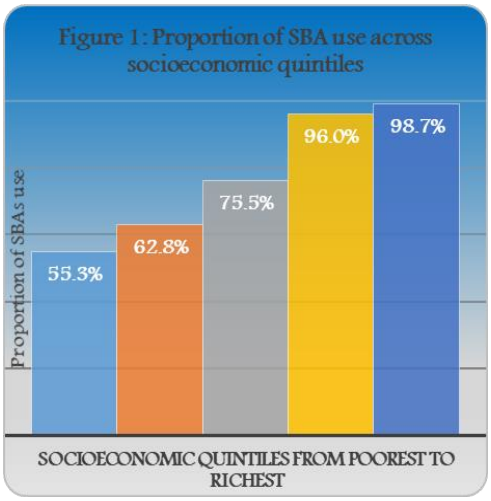
Box1: Who is a skilled birth attendant?

A skilled birth attendant is an accredited health professional – such as a midwife, doctor or nurse – who has been educated and trained to proficiency in skills needed to manage normal (uncomplicated) pregnancies, childbirth and immediate postnatal period, and in the identification, management and referral of complications in women and newborns.

mortality. However, maternal mortality still remains high at 319 per 100,000 live births as at 2015 (WHO, 2016). This evidence suggests the existence of socioeconomic inequalities in the use of SBAs during delivery. The analysis of socioeconomic inequalities related to SBA utilization during delivery may identify vulnerable groups in society for targeted policy interventions. It is in line with this that this policy brief seeks to unravel the extent of socioeconomic inequalities in using SBAs during delivery among women (between 15 - 49 years) in Ghana as well as the underlying drivers, applying the concentration index on the 2014 Ghana and Demographic and Health Survey (GDHS).

Box 2

Socioeconomic inequalities in the use of SBAs during delivery refers to the differences in the use of SBAs that is related to the individual social and economic status in society.



ARE THERE ANY DIFFERENCES IN THE PROPORTION OF SBAS DURING CHILD DELIVERY ACROSS SOCIOECONOMIC GROUPS?

Figure 1 presents the proportion of SBAs use during childbirth across different socioeconomic groups. The figure confirms that higher socioeconomic groups use SBAs more than lower socioeconomic groups.

SOCIOECONOMIC INEQUALITIES IN THE USE OF SBAS DURING CHILD DELIVERY AND THEIR DETERMINANTS.

The findings of the study showed that roughly about 28% of women who gave birth the year prior to the interview did not use skilled birth attendants during delivery. It was also observed that 39.6% of women living in rural settings did not also use SBAs during delivery compared to 10.9% in

urban areas. This reveals the inequality that exist in the use of SBAs during delivery. The results of the study also revealed a concentration index of 0.147 which is in line with the concentration curve falling below the line of equality implying that the rich use SBAs during child delivery more than the poor in society. This is presented in the figure 2 below.

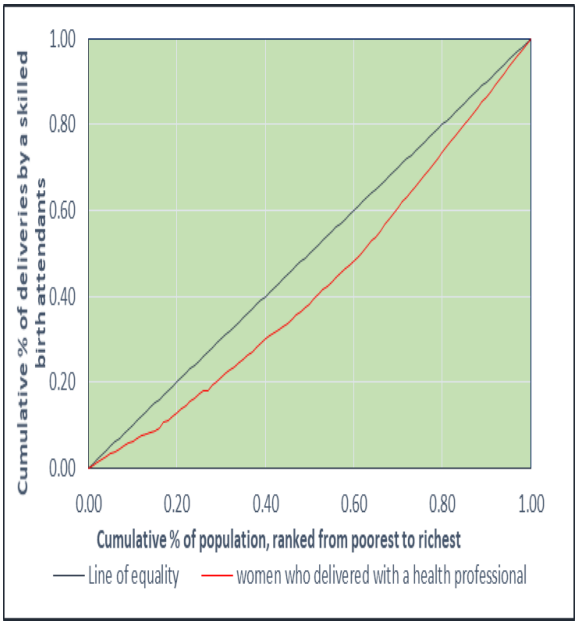
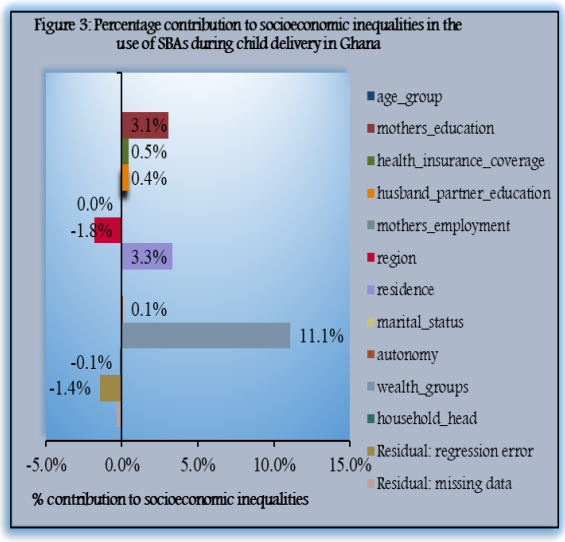


Figure 2: Concentration curve showing the use of SBAs during delivery

Upon further investigations, it was revealed that individual, household and community level factors played a key role in contributing to socioeconomic inequalities. Wealth, mother's education, and location of residence were seen as the main driving force behind the low use of SBAs during child delivery across socioeconomic status as presented in Figure 3 below.



POLICY RECOMMENDATION

The findings of the study which highlights the low utilization of SBAs during child delivery among poorer, less educated or illiterate women and women who live in rural residences calls for key policy interventions from the Ministry of Health (MOH), Ghana Health Service (GHS), Civil Society Organizations (CSOs), Non-Governmental Organizations (NGOs) and other stakeholders interested addressing the gap in low utilization of SBAs during child delivery and

maternal and reproductive health issues. These policy implications could also be used as a yards stick for other low- and middle-income countries.

- Efforts should be made by the government of Ghana to invest in education for all but most especially women. As shown in the study, mother's education was one of the main contributors to the low use of SBAs in Ghana. Hence, improving access to schooling for women will yield long-term health benefits, especially for reproductive and maternal health.
- The results of the study showed that mother's employment status was not a contributing factor socioeconomic inequalities regarding the low use of skilled birth attendants during child delivery in Ghana. Therefore, it can be suggested that the government could create income generating ventures. Furthermore, the Government of Ghana (GoG) could also increase the minimum wage for the lowest paid worker so they can also be able to access SBAs during child delivery.
- Lastly, the finding also revealed that location of residence especially women who lived in rural settlements used low SBAs during child delivery. This could be due to the fact that health facilities and their accompanied skilled delivery services are disproportionately located in urban areas compared to the rural areas. In view of this, the existence of the Community-based Health Planning Services (CHPS) established in the year 2000 to improve access and quality of healthcare throughout the country but particularly in deprived areas of the country, should be strengthened. In addition basic obstetric services and referral systems should be reinforced to encouraged women to seek maternal health services.

These policy implications when enforced would contribute greatly to securing the achievement of the SDGs goal 3 of increasing the proportion of births attended by SBAs in order to reduce maternal mortality to less than 70 maternal deaths per 100,000 live births by the year 2030.

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PART E: APPENDIX

Appendix 1: Plagiarism Declaration

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

NAME: ASEYE KPODOTSI

STUDENT NUMBER: KPDASE001

Signature: 

Date: 18th February, 2018

Appendix 2: Journal Manuscript Instructions

BMC Pregnancy and Childbirth

Research Articles

Preparing your manuscript

Title page

The title page should:

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

Abstract

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

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

'retrospectively registered'. See our editorial policies for more information on trial registration

Keywords

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

Background

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

Methods

The methods section should include:

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

Results

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

Discussion

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

Conclusions

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

List of abbreviations

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

Declarations

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

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

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

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

Ethics approval and consent to participate

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

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

Studies involving animals must include a statement on ethics approval.

See our editorial policies for more information.

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

Consent for publication

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

You can use your institutional consent form or our consent form if you prefer. You should not send the form to us on submission, but we may request to see a copy at any stage (including after publication).
See our editorial policies for more information on consent for publication.
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Availability of data and materials

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

- The datasets generated and/or analysed during the current study are available in the [NAME] repository, [PERSISTENT WEB LINK TO DATASETS]
- The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.
- All data generated or analysed during this study are included in this published article [and its supplementary information files].
- The datasets generated and/or analysed during the current study are not publicly available due [REASON WHY DATA ARE NOT PUBLIC] but are available from the corresponding author on reasonable request.
- Data sharing is not applicable to this article as no datasets were generated or analysed during the current study.
- The data that support the findings of this study are available from [third party name] but restrictions apply to the availability of these data, which were used under license for the

current study, and so are not publicly available. Data are however available from the authors upon reasonable request and with permission of [third party name].

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

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http://dx.doi.org/10.6084/m9.figshare.853801

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

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

Competing interests

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

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Funding

All sources of funding for the research reported should be declared. The role of the funding body in the design of the study and collection, analysis, and interpretation of data and in writing the manuscript should be declared.

Authors' contributions

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Acknowledgements

Please acknowledge anyone who contributed towards the article who does not meet the criteria for authorship including anyone who provided professional writing services or materials.

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institutions or societies, or any other relevant background information. Please refer to authors using their initials. Note this section should not be used to describe any competing interests.

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Endnotes should be designated within the text using a superscript lowercase letter and all notes (along with their corresponding letter) should be included in the Endnotes section. Please format this section in a paragraph rather than a list.

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Figures, tables, additional files

See General formatting guidelines for information on how to format figures, tables and additional files.

Submit your manuscript in Editorial Manager

Appendix 3: Health Research Ethics Approval

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

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Groote Schuur Hospital
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Telephone [021] 406 6492
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30 October 2017

HREC REF: 724/2017

Dr O Alaba
Department of Public Health & Family Medicine
Division of Health Economic
Falmouth Building
FHS

Dear Dr Alaba

PROJECT TITLE: SOCIOECONOMIC INEQUALITIES IN THE USE OF SKILLED BIRTH ATTENDANTS DURING DELIVERY IN GHANA; A DECOMPOSITION MODEL (MPH-Candidate-AE Kpodotsi)

Thank you for your response letter, addressing the issues raised by the Human Research Ethics Committee (HREC).

It is a pleasure to inform you that the HREC has **formally approved** the above-mentioned study.

Approval is granted for one year until the 30 November 2018.

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

We acknowledge that the student: Miss AE Kpodotsi will also be involved in this study.

Please quote the HREC REF in all your correspondence.

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

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

Yours sincerely

PROFESSOR M BLOCKMAN
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

Federal Wide Assurance Number: FWA00001637.
Institutional Review Board (IRB) number: IRB00001938

HREC 724/2017

Appendix 4: Questionnaire

FORMATTING DATE: 17 May 2016
ENGLISH LANGUAGE: 01 Mar 2016

DEMOGRAPHIC AND HEALTH SURVEYS
MODEL WOMAN'S QUESTIONNAIRE

[NAME OF COUNTRY]
[NAME OF ORGANIZATION]

IDENTIFICATION (1)

PLACE NAME _____

NAME OF HOUSEHOLD HEAD _____

CLUSTER NUMBER . . . . . | | | | |

HOUSEHOLD NUMBER . . . . . | | | | |

NAME AND LINE NUMBER OF WOMAN _____ | | |

INTERVIEWER VISITS

	1	2	3	FINAL VISIT
DATE				DAY / MONTH / YEAR
INTERVIEWER'S NAME				INT. NO.
RESULT*				RESULT*
NEXT VISIT: DATE / TIME				TOTAL NUMBER OF VISITS

*RESULT CODES: 1 COMPLETED; 2 NOT AT HOME; 3 POSTPONED; 4 REFUSED; 5 PARTLY COMPLETED; 6 INCAPACITATED; 7 OTHER _____ SPECIFY

LANGUAGE OF QUESTIONNAIRE** 0 1 | LANGUAGE OF INTERVIEW** | | NATIVE LANGUAGE OF RESPONDENT** | | TRANSLATOR USED (YES = 1, NO = 2) |

LANGUAGE OF QUESTIONNAIRE** ENGLISH

**LANGUAGE CODES:
01 ENGLISH; 02 LANGUAGE 2; 03 LANGUAGE 3; 04 LANGUAGE 4; 05 LANGUAGE 5; 06 LANGUAGE 6

SUPERVISOR		FIELD EDITOR		OFFICE EDITOR	KEYED BY
NAME	NUMBER	NAME	NUMBER	NUMBER	NUMBER

(1) This section should be adapted for country-specific survey design.
Note: Questions with blue highlighting in the question number column are HIV-related questions that may be deleted in some circumstances (see footnotes). Questions with pink highlighting in the question number column are malaria-related questions that may be deleted in some circumstances (see footnotes). Questions with yellow highlighting in the question number column are other questions that may be deleted in some circumstances (see footnotes). Brackets [ ] indicate items that should be adapted on a country-specific basis.

INTRODUCTION AND CONSENT

(1)

Hello. My name is _____. I am working with [NAME OF ORGANIZATION]. We are conducting a survey about health and other topics all over [NAME OF COUNTRY]. The information we collect will help the government to plan health services. Your household was selected for the survey. The questions usually take about 30 to 60 minutes. All of the answers you give will be confidential and will not be shared with anyone other than members of our survey team. You don't have to be in the survey, but we hope you will agree to answer the questions since your views are important. If I ask you any question you don't want to answer, just let me know and I will go on to the next question or you can stop the interview at any time.

In case you need more information about the survey, you may contact the person listed on the card that has already been given to your household.

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

SIGNATURE OF INTERVIEWER _____ DATE _____

RESPONDENT AGREES TO BE INTERVIEWED . . 1 ↓

RESPONDENT DOES NOT AGREE TO BE INTERVIEWED . . 2 → END

SECTION 1. RESPONDENT'S BACKGROUND

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
101	RECORD THE TIME.	HOURS . . . . . ☐☐ MINUTES . . . . . ☐☐	
102	How long have you been living continuously in (NAME OF CURRENT CITY, TOWN OR VILLAGE OF RESIDENCE)? IF LESS THAN ONE YEAR, RECORD '00' YEARS.	YEARS . . . . . ☐☐ ALWAYS . . . . . 95 VISITOR 96	→ 105
103	Just before you moved here, did you live in a city, in a town, or in a rural area?	CITY . . . . . 1 TOWN . . . . . 2 RURAL AREA 3	
104	Before you moved here, which [PROVINCE/REGION/STATE] did you live in?	[PROVINCE/REGION/STATE] . . . . . 01 [PROVINCE/REGION/STATE] . . . . . 02 [PROVINCE/REGION/STATE] . . . . . 03 OUTSIDE OF [COUNTRY] 96	
105	In what month and year were you born?	MONTH . . . . . ☐☐ DON'T KNOW MONTH . . . . . 98 YEAR . . . . . ☐☐☐☐ DON'T KNOW YEAR 9998	
106	How old were you at your last birthday? COMPARE AND CORRECT 105 AND/OR 106 IF INCONSISTENT.	AGE IN COMPLETED YEARS . . . . . ☐☐	
107	Have you ever attended school?	YES . . . . . 1 NO 2	→ 111
108 (2)	What is the highest level of school you attended: primary, secondary, or higher?	PRIMARY . . . . . 1 SECONDARY . . . . . 2 HIGHER 3	

SECTION 1. RESPONDENT'S BACKGROUND

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
109 (2)	What is the highest [GRADE/FORM/YEAR] you completed at that level? IF COMPLETED LESS THAN ONE YEAR AT THAT LEVEL, RECORD '00'.	[GRADE/FORM/YEAR] . . . . . ☐☐	
110	CHECK 108: PRIMARY OR SECONDARY ☐ ↓ HIGHER ☐ → 113		
111 (3)	Now I would like you to read this sentence to me. SHOW CARD TO RESPONDENT. IF RESPONDENT CANNOT READ WHOLE SENTENCE, PROBE: Can you read any part of the sentence to me?	CANNOT READ AT ALL . . . . . 1 ABLE TO READ ONLY PART OF THE SENTENCE . . . . . 2 ABLE TO READ WHOLE SENTENCE . . . . . 3 NO CARD WITH REQUIRED LANGUAGE _____ (SPECIFY LANGUAGE) 4 BLIND/VISUALLY IMPAIRED 5	
112	CHECK 111: CODE '2', '3' OR '4' CIRCLED ☐ ↓ CODE '1' OR '5' CIRCLED ☐ → 114		
113	Do you read a newspaper or magazine at least once a week, less than once a week or not at all?	AT LEAST ONCE A WEEK . . . . . 1 LESS THAN ONCE A WEEK . . . . . 2 NOT AT ALL 3	
114	Do you listen to the radio at least once a week, less than once a week or not at all?	AT LEAST ONCE A WEEK . . . . . 1 LESS THAN ONCE A WEEK . . . . . 2 NOT AT ALL 3	
115	Do you watch television at least once a week, less than once a week or not at all?	AT LEAST ONCE A WEEK . . . . . 1 LESS THAN ONCE A WEEK . . . . . 2 NOT AT ALL 3	
116	Do you own a mobile telephone?	YES . . . . . 1 NO 2	→ 118
117	Do you use your mobile phone for any financial transactions?	YES . . . . . 1 NO 2	
118	Do you have an account in a bank or other financial institution that you yourself use?	YES . . . . . 1 NO 2	
119	Have you ever used the internet?	YES . . . . . 1 NO 2	→ 122
120	In the last 12 months, have you used the internet? IF NECESSARY, PROBE FOR USE FROM ANY LOCATION, WITH ANY DEVICE.	YES . . . . . 1 NO 2	→ 122
121	During the last one month, how often did you use the internet: almost every day, at least once a week, less than once a week, or not at all?	ALMOST EVERY DAY . . . . . 1 AT LEAST ONCE A WEEK . . . . . 2 LESS THAN ONCE A WEEK . . . . . 3 NOT AT ALL 4	

SECTION 1. RESPONDENT'S BACKGROUND

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
122	COUNTRY-SPECIFIC QUESTION ON RELIGION, IF APPROPRIATE.		
123	COUNTRY-SPECIFIC QUESTION ON ETHNICITY, IF APPROPRIATE.		
124 (4)	In the last 12 months, how many times have you been away from home for one or more nights?	NUMBER OF TIMES . . . . . [ ][ ] NONE 00	→ 201
125 (4)	In the last 12 months, have you been away from home for more than one month at a time?	YES . . . . . 1 NO 2	

(1) Increase the time reported to the respondent if modules are added to the questionnaire.

(2) Revise according to the local education system.

(3) Each card should have four simple sentences appropriate to the country (e.g., "Parents love their children.", "Farming is hard work.", "The child is reading a book.", "Children work hard at school."). Cards should be prepared for every language in which respondents are likely to be literate.

(4) The question may be considered for deletion in countries with a very low HIV prevalence.

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
201	Now I would like to ask about all the births you have had during your life. Have you ever given birth?	YES . . . . . 1 NO 2	→ 206
202	Do you have any sons or daughters to whom you have given birth who are now living with you?	YES . . . . . 1 NO 2	→ 204
203	a) How many sons live with you? b) And how many daughters live with you? IF NONE, RECORD '00'.	a) SONS AT HOME . . . . . [ ][ ] b) DAUGHTERS AT HOME . . . . . [ ][ ]	
204	Do you have any sons or daughters to whom you have given birth who are alive but do not live with you?	YES . . . . . 1 NO 2	→ 206
205	a) How many sons are alive but do not live with you? b) And how many daughters are alive but do not live with you? IF NONE, RECORD '00'.	a) SONS ELSEWHERE . . . . . [ ][ ] b) DAUGHTERS ELSEWHERE . . . . . [ ][ ]	
206	Have you ever given birth to a boy or girl who was born alive but later died? IF NO, PROBE: Any baby who cried, who made any movement, sound, or effort to breathe, or who showed any other signs of life even if for a very short time?	YES . . . . . 1 NO 2	→ 208
207	a) How many boys have died? b) And how many girls have died? IF NONE, RECORD '00'.	a) BOYS DEAD . . . . . [ ][ ] b) GIRLS DEAD . . . . . [ ][ ]	
208	SUM ANSWERS TO 203, 205, AND 207, AND ENTER TOTAL. IF NONE, RECORD '00'.	TOTAL BIRTHS . . . . . [ ][ ]	
209	CHECK 208: Just to make sure that I have this right: you have had in TOTAL _____ births during your life. Is that correct? YES ↓ NO → PROBE AND CORRECT 201-208 AS NECESSARY.		
210	CHECK 208: ONE OR MORE BIRTHS ↓ NO BIRTHS →		→ 226

SECTION 2. REPRODUCTION

211 Now I would like to record the names of all your births, whether still alive or not, starting with the first one you had. RECORD NAMES OF ALL THE BIRTHS IN 212. RECORD TWINS AND TRIPLETS ON SEPARATE ROWS. IF THERE ARE MORE THAN 10 BIRTHS, USE AN ADDITIONAL QUESTIONNAIRE, STARTING WITH THE SECOND ROW.

212 What name was given to your (first/ next) baby? RECORD NAME. BIRTH HISTORY NUMBER.	213 Is (NAME) a boy or a girl?	214 Were any of these births twins?	215 On what day, month, and year was (NAME) born?	216 Is (NAME) still alive?	217 IF ALIVE: How old was (NAME) at (NAME)'s last birthday? RECORD AGE IN COMP-LETED YEARS.	218 IF ALIVE: Is (NAME) living with you?	219 IF ALIVE: RECORD HOUSEHOLD LINE NUMBER OF CHILD. RECORD '00' IF CHILD NOT LISTED IN HOUSEHOLD.	220 IF DEAD: How old was (NAME) when (he/she) died? IF '12 MONTHS' OR '1 YR', ASK: Did (NAME) have (his/her) first birthday? THEN ASK: Exactly how many months old was (NAME) when (he/she) died? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Were there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
01	BOY 1 GIRL 2	SING 1 MULT 2	DAY ☐☐ MONTH ☐☐ ☐☐☐☐ YEAR	YES 1 NO 2 → (SKIP TO 220)	AGE IN YEARS ☐☐	YES 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ → (NEXT BIRTH)	DAYS 1 ☐☐ MONTHS 2 ☐☐ YEARS 3 ☐☐	
02	BOY 1 GIRL 2	SING 1 MULT 2	DAY ☐☐ MONTH ☐☐ ☐☐☐☐ YEAR	YES 1 NO 2 → (SKIP TO 220)	AGE IN YEARS ☐☐	YES 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ → (SKIP TO 221)	DAYS 1 ☐☐ MONTHS 2 ☐☐ YEARS 3 ☐☐	YES 1 (ADD BIRTH) ↵ NO 2 (NEXT BIRTH) ↵
03	BOY 1 GIRL 2	SING 1 MULT 2	DAY ☐☐ MONTH ☐☐ ☐☐☐☐ YEAR	YES 1 NO 2 → (SKIP TO 220)	AGE IN YEARS ☐☐	YES 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ → (SKIP TO 221)	DAYS 1 ☐☐ MONTHS 2 ☐☐ YEARS 3 ☐☐	YES 1 (ADD BIRTH) ↵ NO 2 (NEXT BIRTH) ↵
04	BOY 1 GIRL 2	SING 1 MULT 2	DAY ☐☐ MONTH ☐☐ ☐☐☐☐ YEAR	YES 1 NO 2 → (SKIP TO 220)	AGE IN YEARS ☐☐	YES 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ → (SKIP TO 221)	DAYS 1 ☐☐ MONTHS 2 ☐☐ YEARS 3 ☐☐	YES 1 (ADD BIRTH) ↵ NO 2 (NEXT BIRTH) ↵
05	BOY 1 GIRL 2	SING 1 MULT 2	DAY ☐☐ MONTH ☐☐ ☐☐☐☐ YEAR	YES 1 NO 2 → (SKIP TO 220)	AGE IN YEARS ☐☐	YES 1 NO 2	HOUSEHOLD LINE NUMBER ☐☐ → (SKIP TO 221)	DAYS 1 ☐☐ MONTHS 2 ☐☐ YEARS 3 ☐☐	YES 1 (ADD BIRTH) ↵ NO 2 (NEXT BIRTH) ↵

212 What name was given to your (first/ next) baby? RECORD NAME. BIRTH HISTORY NUMBER.	213 Is (NAME) a boy or a girl?	214 Were any of these births twins?	215 On what day, month, and year was (NAME) born?	216 Is (NAME) still alive?	217 IF ALIVE: How old was (NAME) at (NAME)'s last birthday? RECORD AGE IN COMP-LETED YEARS.	218 IF ALIVE: Is (NAME) living with you?	219 IF ALIVE: RECORD HOUSEHOLD LINE NUMBER OF CHILD. RECORD '00' IF CHILD NOT LISTED IN HOUSEHOLD.	220 IF DEAD: How old was (NAME) when (he/she) died? IF '12 MONTHS' OR '1 YR', ASK: Did (NAME) have (his/her) first birthday? THEN ASK: Exactly how many months old was (NAME) when (he/she) died? RECORD DAYS IF LESS THAN 1 MONTH; MONTHS IF LESS THAN TWO YEARS; OR YEARS.	221 Were there any other live births between (NAME OF PREVIOUS BIRTH) and (NAME), including any children who died after birth?
06	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)
07	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)
08	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)
09	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)
10	BOY 1 GIRL 2	SING 1 MULT 2	DAY MONTH YEAR	YES 1 NO 2 (SKIP TO 220)	AGE IN YEARS	YES 1 NO 2	HOUSEHOLD LINE NUMBER (SKIP TO 221)	DAYS 1 MONTHS 2 YEARS 3	YES 1 (ADD BIRTH) NO 2 (NEXT BIRTH)

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
222	Have you had any live births since the birth of (NAME OF LAST BIRTH)?	YES . . . . . 1 (RECORD BIRTH(S) IN TABLE) NO 2	
223	COMPARE 208 WITH NUMBER OF BIRTHS IN BIRTH HISTORY NUMBERS ARE SAME ☐ NUMBERS ARE DIFFERENT ☐ (PROBE AND RECONCILE)		
224 (1)	CHECK 215: ENTER THE NUMBER OF BIRTHS IN 2010-2015	NUMBER OF BIRTHS . . . . . ☐☐ NONE 0	→ 226
225 (1)	**C** FOR EACH BIRTH IN 2010-2015, ENTER 'B' IN THE MONTH OF BIRTH IN THE CALENDAR. WRITE THE NAME OF THE CHILD TO THE LEFT OF THE 'B' CODE. FOR EACH BIRTH, ASK THE NUMBER OF COMPLETED MONTHS THE PREGNANCY LASTED AND RECORD 'P' IN EACH OF THE PRECEDING MONTHS ACCORDING TO THE DURATION OF PREGNANCY. (NOTE: THE NUMBER OF 'P's MUST BE ONE LESS THAN THE NUMBER OF MONTHS THAT THE PREGNANCY LASTED.)		
226	Are you pregnant now?	YES . . . . . 1 NO . . . . . 2 UNSURE 8	→ 230
227	How many months pregnant are you? RECORD NUMBER OF COMPLETED MONTHS. **C** ENTER 'P's IN THE CALENDAR, BEGINNING WITH THE MONTH OF INTERVIEW AND FOR THE TOTAL NUMBER OF COMPLETED MONTHS.	MONTHS . . . . . ☐☐	
228	When you got pregnant, did you want to get pregnant at that time?	YES . . . . . 1 NO 2	→ 230
229	CHECK 208: TOTAL NUMBER OF BIRTHS ONE OR MORE ☐ a) Did you want to have a baby later on or did you not want any more children? NONE ☐ b) Did you want to have a baby later on or did you not want any children?	LATER . . . . . 1 NO MORE/NONE 2	
230	Have you ever had a pregnancy that miscarried, was aborted, or ended in a stillbirth?	YES . . . . . 1 NO 2	→ 239
231	When did the last such pregnancy end?	MONTH . . . . . ☐☐ YEAR . . . . . ☐☐☐☐	

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
232 (1)	CHECK 231: LAST PREGNANCY ENDED IN 2010-2015 ☐ → 234 LAST PREGNANCY ENDED IN 2009 OR EARLIER ☐ → 239		

LINE NO.	233 In what month and year did the preceding such pregnancy end?	234 How many months pregnant were you when that pregnancy ended?	235 (1) Since January 2010, have you had any other pregnancies that did not result in a live birth?	
01		☐☐ NUMBER OF MONTHS	YES . . . . . 1 NO 2	→ NEXT LINE → 236
02	☐☐ MONTH ☐☐☐☐ YEAR	☐☐ NUMBER OF MONTHS	YES . . . . . 1 NO 2	→ NEXT LINE → 236
03	☐☐ MONTH ☐☐☐☐ YEAR	☐☐ NUMBER OF MONTHS	YES . . . . . 1 NO 2	→ NEXT LINE → 236
04	☐☐ MONTH ☐☐☐☐ YEAR	☐☐ NUMBER OF MONTHS	YES . . . . . 1 NO 2	→ 236

236 (1)	**C** FOR EACH PREGNANCY THAT DID NOT END IN A LIVE BIRTH IN 2010-2015 OR LATER, ENTER 'T' IN THE CALENDAR IN THE MONTH THAT THE PREGNANCY TERMINATED AND 'P' FOR THE REMAINING NUMBER OF COMPLETED MONTHS OF PREGNANCY. IF THERE ARE MORE THAN FOUR PREGNANCIES THAT DID NOT END IN A LIVE BIRTH, USE AN ADDITIONAL QUESTIONNAIRE STARTING ON THE SECOND LINE.	
237 (1)	Did you have any miscarriages, abortions or stillbirths that ended before 2010?	YES . . . . . 1 NO . . . . . 2 → 239
238 (1)	When did the last such pregnancy that terminated before 2010 end?	MONTH . . . . . ☐☐ YEAR . . . . . ☐☐☐☐

SECTION 2. REPRODUCTION

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
239	When did your last menstrual period start? _____ (DATE, IF GIVEN)	DAYS AGO . . . . . 1 [ ][ ] WEEKS AGO . . . . . 2 [ ][ ] MONTHS AGO . . . . . 3 [ ][ ] YEARS AGO . . . . . 4 [ ][ ] IN MENOPAUSE/ HAS HAD HYSTERECTOMY . . . . . 994 BEFORE LAST BIRTH . . . . . 995 NEVER MENSTRUATED 996	
240	From one menstrual period to the next, are there certain days when a woman is more likely to become pregnant?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 242
241	Is this time just before her period begins, during her period, right after her period has ended, or halfway between two periods?	JUST BEFORE HER PERIOD BEGIN . . . . . 1 DURING HER PERIOD . . . . . 2 RIGHT AFTER HER PERIOD HAS ENDE . . . . . 3 HALFWAY BETWEEN TWO PERIODS . . . . . 4 OTHER _____ (SPECIFY) 6 DON'T KNOW 8	
242	After the birth of a child, can a woman become pregnant before her menstrual period has returned?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	

(1) Year of fieldwork is assumed to be 2015. For fieldwork beginning in 2016, all references to calendar years should be increased by one; for example, 2009 should be changed to 2010, 2010 should be changed to 2011, 2011 should be changed to 2012, and similarly for all years throughout the questionnaire.

SECTION 4. PREGNANCY AND POSTNATAL CARE

401 (1)	CHECK 224: ONE OR MORE BIRTHS IN 2010-2015 ☐ ↓ NO BIRTHS IN 2010-2015 ☐ → 648		
402 (1)	CHECK 215. RECORD THE BIRTH HISTORY NUMBER IN 403 AND THE NAME AND SURVIVAL STATUS IN 404 FOR EACH BIRTH IN 2010-2015. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE LAST BIRTH. IF THERE ARE MORE THAN 2 BIRTHS, USE LAST COLUMN OF ADDITIONAL QUESTIONNAIRE(S). Now I would like to ask some questions about your children born in the last five years. (We will talk about each separately.)		
403	BIRTH HISTORY NUMBER FROM 212 IN BIRTH HISTORY.	LAST BIRTH BIRTH HISTORY NUMBER . . . . . ☐☐	NEXT-TO-LAST BIRTH BIRTH HISTORY NUMBER . . . . . ☐☐
404	FROM 212 AND 216:	NAME _____ LIVING ☐ ↓ DEAD ☐ ↓	NAME _____ LIVING ☐ ↓ DEAD ☐ ↓
405	When you got pregnant with (NAME), did you want to get pregnant at that time?	YES . . . . . 1 (SKIP TO 408) ← NO 2	YES . . . . . 1 (SKIP TO 426) ← NO 2
406	CHECK 208: ONLY ONE BIRTH ☐ ↓ / MORE THAN ONE BIRTH ☐ ↓ a) Did you want to have a baby later on, or did you not want any children? b) Did you want to have a baby later on, or did you not want any more children?	LATER . . . . . 1 NO MORE/NONE . . . . . 2 (SKIP TO 408) ←	LATER . . . . . 1 NO MORE/NONE . . . . . 2 (SKIP TO 426) ←
407	How much longer did you want to wait?	MONTHS . . . . . 1 ☐☐ YEARS . . . . . 2 ☐☐ DON'T KNOW 998	MONTHS . . . . . 1 ☐☐ YEARS . . . . . 2 ☐☐ DON'T KNOW 998
408	Did you see anyone for antenatal care for this pregnancy?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 414) ←	
409 (2)	Whom did you see? Anyone else? PROBE TO IDENTIFY EACH TYPE OF PERSON AND RECORD ALL MENTIONED.	**HEALTH PERSONNEL** DOCTOR . . . . . A NURSE/MIDWIFE . . . . . B AUXILIARY MIDWIFE . . . . . C **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT . . . . . D COMMUNITY/ VILLAGE HEALTH WORKER . . . . . E OTHER _____ X (SPECIFY)	

SECTION 4. PREGNANCY AND POSTNATAL CARE

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____
410 (2)	Where did you receive antenatal care for this pregnancy? Anywhere else? PROBE TO IDENTIFY THE TYPE OF SOURCE. IF UNABLE TO DETERMINE IF PUBLIC OR PRIVATE SECTOR, WRITE THE NAME OF THE PLACE. _____ (NAME OF PLACE)	**HOME** HER HOME . . . . . A OTHER HOME . . . . . B **PUBLIC SECTOR** GOVERNMENT HOSPITAL . . C GOVERNMENT HEALTH CENTER . . . . . D GOVERNMENT HEALTH POST . . . . . E OTHER PUBLIC SECTOR _____ F (SPECIFY) **PRIVATE MEDICAL SECTOR** PRIVATE HOSPITAL/ CLINIC . . . . . G OTHER PRIVATE MEDICAL SECTOR _____ H (SPECIFY) OTHER _____ X (SPECIFY)	
411	How many months pregnant were you when you first received antenatal care for this pregnancy?	MONTHS . . . . . ☐☐ DON'T KNOW 98	
412	How many times did you receive antenatal care during this pregnancy?	NUMBER OF TIMES . . . . . ☐☐ DON'T KNOW 98	
413	As part of your antenatal care during this pregnancy, were any of the following done at least once: a) Was your blood pressure measured? b) Did you give a urine sample? c) Did you give a blood sample?	YES NO a) BP . . . . . 1 2 b) URINE . . . . . 1 2 c) BLOOD 1 2	
414 (3)	During this pregnancy, were you given an injection in the arm to prevent the baby from getting tetanus, that is, convulsions after birth?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 417) DON'T KNOW 8	
415	During this pregnancy, how many times did you get a tetanus injection?	TIMES . . . . . ☐ DON'T KNOW 8	
416	CHECK 415:	2 OR MORE TIMES → (SKIP TO 420) OTHER ↓	

SECTION 4. PREGNANCY AND POSTNATAL CARE

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____
417	At any time before this pregnancy, did you receive any tetanus injections?	YES . . . . . 1 NO . . . . . 2 → (SKIP TO 420) DON'T KNOW 8	
418	Before this pregnancy, how many times did you receive a tetanus injection? IF 7 OR MORE TIMES, RECORD '7'.	TIMES . . . . . ☐☐ DON'T KNOW 8	
419	CHECK 418: ONLY ONE ☐ → a) How many years ago did you receive that tetanus injection? MORE THAN ONE ☐ → b) How many years ago did you receive the last tetanus injection prior to this pregnancy?	YEARS AGO . . . . . ☐☐	
420 (4)	During this pregnancy, were you given or did you buy any iron tablets or iron syrup? SHOW TABLETS/SYRUP.	YES . . . . . 1 NO . . . . . 2 → (SKIP TO 422) DON'T KNOW 8	
421 (4) (5)	During the whole pregnancy, for how many days did you take the tablets or syrup? IF ANSWER IS NOT NUMERIC, PROBE FOR APPROXIMATE NUMBER OF DAYS.	DAYS . . . . . ☐☐☐ DON'T KNOW 998	
422 (6)	During this pregnancy, did you take any drug for intestinal worms?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
423 (7)	During this pregnancy, did you take SP/Fansidar to keep you from getting malaria?	YES . . . . . 1 NO . . . . . 2 → (SKIP TO 426) DON'T KNOW 8	
424 (7)	How many times did you take SP/Fansidar during this pregnancy?	TIMES . . . . . ☐☐	
425 (7)	Did you get the SP/Fansidar during any antenatal care visit, during another visit to a health facility or from another source? IF MORE THAN ONE SOURCE, RECORD THE HIGHEST SOURCE ON THE LIST.	ANTENATAL VISIT . . . . . 1 ANOTHER FACILITY VISIT . . . . . 2 OTHER SOURCE 6	

SECTION 4. PREGNANCY AND POSTNATAL CARE

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____
426	When (NAME) was born, was (NAME) very large, larger than average, average, smaller than average, or very small?	VERY LARGE . . . . . 1 LARGER THAN AVERAGE . . . . . 2 AVERAGE . . . . . 3 SMALLER THAN AVERAGE . . . . . 4 VERY SMALL . . . . . 5 DON'T KNOW 8	VERY LARGE . . . . . 1 LARGER THAN AVERAGE . . . . . 2 AVERAGE . . . . . 3 SMALLER THAN AVERAGE . . . . . 4 VERY SMALL . . . . . 5 DON'T KNOW 8
427	Was (NAME) weighed at birth?	YES . . . . . 1 NO . . . . . 2 → (SKIP TO 429) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 → (SKIP TO 429) DON'T KNOW 8
428	How much did (NAME) weigh? RECORD WEIGHT IN KILOGRAMS FROM HEALTH CARD, IF AVAILABLE.	KG FROM CARD 1 ☐☐.☐☐☐ KG FROM RECALL 2 ☐☐.☐☐☐ DON'T KNOW 99998	KG FROM CARD 1 ☐☐.☐☐☐ KG FROM RECALL 2 ☐☐.☐☐☐ DON'T KNOW 99998
429 (2)	Who assisted with the delivery of (NAME)? Anyone else? PROBE FOR THE TYPE(S) OF PERSON(S) AND RECORD ALL MENTIONED. IF RESPONDENT SAYS NO ONE ASSISTED, PROBE TO DETERMINE WHETHER ANY ADULTS WERE PRESENT AT THE DELIVERY.	**HEALTH PERSONNEL** DOCTOR . . . . . A NURSE/MIDWIFE . . . . . B AUXILIARY MIDWIFE . . . . . C **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT . . . . . D RELATIVE/FRIEND . . . . . E OTHER _____ X (SPECIFY) NO ONE ASSISTED . . . . . Y	**HEALTH PERSONNEL** DOCTOR . . . . . A NURSE/MIDWIFE . . . . . B AUXILIARY MIDWIFE . . . . . C **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT . . . . . D RELATIVE/FRIEND . . . . . E OTHER _____ X (SPECIFY) NO ONE ASSISTED . . . . . Y

SECTION 4. PREGNANCY AND POSTNATAL CARE

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____
430 (2)	Where did you give birth to (NAME)? PROBE TO IDENTIFY THE TYPE OF SOURCE. IF UNABLE TO DETERMINE IF PUBLIC OR PRIVATE SECTOR, WRITE THE NAME OF THE PLACE. _____ (NAME OF PLACE)	**HOME** HER HOME . . . . . 11 (SKIP TO 434) OTHER HOME . . . . . 12 **PUBLIC SECTOR** GOVERNMENT HOSPITAL . . 21 GOVERNMENT HEALTH CENTER . . . . . 22 GOVERNMENT HEALTH POST . . . . . 23 OTHER PUBLIC SECTOR _____ 26 (SPECIFY) **PRIVATE MEDICAL SECTOR** PRIVATE HOSPITAL/ CLINIC . . . . . 31 OTHER PRIVATE MEDICAL SECTOR _____ 36 (SPECIFY) OTHER _____ 96 (SPECIFY) (SKIP TO 434)	**HOME** HER HOME . . . . . 11 (SKIP TO 434) OTHER HOME . . . . . 12 **PUBLIC SECTOR** GOVERNMENT HOSPITAL . . 21 GOVERNMENT HEALTH CENTER . . . . . 22 GOVERNMENT HEALTH POST . . . . . 23 OTHER PUBLIC SECTOR _____ 26 (SPECIFY) **PRIVATE MEDICAL SECTOR** PRIVATE HOSPITAL/ CLINIC . . . . . 31 OTHER PRIVATE MEDICAL SECTOR _____ 36 (SPECIFY) OTHER _____ 96 (SPECIFY) (SKIP TO 434)
431	How long after (NAME) was delivered did you stay there? IF LESS THAN ONE DAY, RECORD HOURS; IF LESS THAN ONE WEEK, RECORD DAYS.	HOURS . . . . . 1 DAYS . . . . . 2 WEEKS . . . . . 3 DON'T KNOW 998	
432	Was (NAME) delivered by caesarean, that is, did they cut your belly open to take the baby out?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 434)	YES . . . . . 1 NO . . . . . 2 (SKIP TO 434)
433	When was the decision made to have the caesarean section? Was it before or after your labor pains started?	BEFORE . . . . . 1 AFTER 2	BEFORE . . . . . 1 AFTER 2
434	Immediately after the birth, was (NAME) put on your chest?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 434B) DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 (SKIP TO 459) DON'T KNOW 8
434A	Was (NAME)'s bare skin touching your bare skin?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8
434B	CHECK 430: PLACE OF DELIVERY	CODE 11, 12, OR 96 CIRCLED (SKIP TO 449) OTHER	

SECTION 4. PREGNANCY AND POSTNATAL CARE

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____
435	I would like to talk to you about checks on your health after delivery, for example, someone asking you questions about your health or examining you. Did anyone check on your health while you were still in the facility?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 438)	
436	How long after delivery did the first check take place? IF LESS THAN ONE DAY, RECORD HOURS; IF LESS THAN ONE WEEK, RECORD DAYS.	HOURS . . . . . 1 ☐☐ DAYS . . . . . 2 ☐☐ WEEKS . . . . . 3 ☐☐ DON'T KNOW 998	
437 (2)	Who checked on your health at that time? PROBE FOR MOST QUALIFIED PERSON.	**HEALTH PERSONNEL** DOCTOR . . . . . 11 NURSE/MIDWIFE . . . . . 12 AUXILIARY MIDWIFE . . . . . 13 **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT . . . . . 21 COMMUNITY/ VILLAGE HEALTH WORKER . . . . . 22 OTHER _____ 96 (SPECIFY)	
438	Now I would like to talk to you about checks on (NAME)'s health after delivery – for example, someone examining (NAME), checking the cord, or seeing if (NAME) is OK. Did anyone check on (NAME)'s health while you were still in the facility?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 441) DON'T KNOW 8	
439	How long after delivery was (NAME)'s health first checked? IF LESS THAN ONE DAY, RECORD HOURS; IF LESS THAN ONE WEEK, RECORD DAYS.	HOURS . . . . . 1 ☐☐ DAYS . . . . . 2 ☐☐ WEEKS . . . . . 3 ☐☐ DON'T KNOW 998	
440 (2)	Who checked on (NAME)'s health at that time? PROBE FOR MOST QUALIFIED PERSON.	**HEALTH PERSONNEL** DOCTOR . . . . . 11 NURSE/MIDWIFE . . . . . 12 AUXILIARY MIDWIFE . . . . . 13 **OTHER PERSON** TRADITIONAL BIRTH ATTENDANT . . . . . 21 COMMUNITY/ VILLAGE HEALTH WORKER . . . . . 22 OTHER _____ 96 (SPECIFY)	

SECTION 7. MARRIAGE AND SEXUAL ACTIVITY

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
701	Are you currently married or living together with a man as if married?	YES, CURRENTLY MARRIED . . . . . 1 YES, LIVING WITH A MAN . . . . . 2 NO, NOT IN UNION 3	→ 704
702	Have you ever been married or lived together with a man as if married?	YES, FORMERLY MARRIED . . . . . 1 YES, LIVED WITH A MAN . . . . . 2 NO 3	→ 712
703	What is your marital status now: are you widowed, divorced, or separated?	WIDOWED . . . . . 1 DIVORCED . . . . . 2 SEPARATED 3	→ 709
704	Is your (husband/partner) living with you now or is he staying elsewhere?	LIVING WITH HER . . . . . 1 STAYING ELSEWHERE 2	
705	RECORD THE HUSBAND'S/PARTNER'S NAME AND LINE NUMBER FROM THE HOUSEHOLD QUESTIONNAIRE. IF HE IS NOT LISTED IN THE HOUSEHOLD, RECORD '00'.	NAME _____ LINE NO.	
706 (1)	Does your (husband/partner) have other wives or does he live with other women as if married?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 709
707 (1)	Including yourself, in total, how many wives or live-in partners does he have?	TOTAL NUMBER OF WIVES AND LIVE-IN PARTNERS . . . . . DON'T KNOW 98	
708 (1)	Are you the first, second, … wife?	RANK	
709	Have you been married or lived with a man only once or more than once?	ONLY ONCE . . . . . 1 MORE THAN ONCE 2	
710	CHECK 709: MARRIED/ LIVED WITH A MAN ONLY ONCE → a) In what month and year did you start living with your (husband/partner)? MARRIED/ LIVED WITH A MAN MORE THAN ONCE → b) Now I would like to ask about your first (husband/partner). In what month and year did you start living with him?	MONTH . . . . . DON'T KNOW MONTH . . . . . 98 YEAR . . . . . DON'T KNOW YEAR 9998	→ 712
711	How old were you when you first started living with him?	AGE	

SECTION 9. HUSBAND'S BACKGROUND AND WOMAN'S WORK

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
901	CHECK 701: CURRENTLY MARRIED/ LIVING WITH A MAN ☐ ↓	NOT IN UNION ☐ →	→ 909
902	How old was your (husband/partner) on his last birthday?	AGE IN COMPLETED YEARS ..... ☐☐	
903	Did your (husband/partner) ever attend school?	YES ..... 1 NO 2	→ 906
904 (1)	What was the highest level of school he attended: primary, secondary, or higher?	PRIMARY ..... 1 SECONDARY ..... 2 HIGHER ..... 3 DON'T KNOW 8	→ 906
905 (1)	What was the highest [GRADE/FORM/YEAR] he completed at that level? IF COMPLETED LESS THAN ONE YEAR AT THAT LEVEL, RECORD '00'.	[GRADE/FORM/YEAR] ..... ☐☐ DON'T KNOW 98	
906	Has your (husband/partner) done any work in the last 7 days?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 908
907	Has your (husband/partner) done any work in the last 12 months?	YES ..... 1 NO ..... 2 DON'T KNOW 8	→ 909
908	What is your (husband's/partner's) occupation? That is, what kind of work does he mainly do?	_____ _____ ☐☐ _____	
909	Aside from your own housework, have you done any work in the last seven days?	YES ..... 1 NO 2	→ 913
910	As you know, some women take up jobs for which they are paid in cash or kind. Others sell things, have a small business or work on the family farm or in the family business. In the last seven days, have you done any of these things or any other work?	YES ..... 1 NO 2	→ 913
911	Although you did not work in the last seven days, do you have any job or business from which you were absent for leave, illness, vacation, maternity leave, or any other such reason?	YES ..... 1 NO 2	→ 913
912	Have you done any work in the last 12 months?	YES ..... 1 NO 2	→ 917
913	What is your occupation? That is, what kind of work do you mainly do?	_____ _____ ☐☐ _____	

SECTION 9. HUSBAND'S BACKGROUND AND WOMAN'S WORK

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
914	Do you do this work for a member of your family, for someone else, or are you self-employed?	FOR FAMILY MEMBER . . . . . 1 FOR SOMEONE ELSE . . . . . 2 SELF-EMPLOYED 3	
915	Do you usually work throughout the year, or do you work seasonally, or only once in a while?	THROUGHOUT THE YEAR . . . . . 1 SEASONALLY/PART OF THE YEAR . . . . . 2 ONCE IN A WHILE 3	
916	Are you paid in cash or kind for this work or are you not paid at all?	CASH ONLY . . . . . 1 CASH AND KIND . . . . . 2 IN KIND ONLY . . . . . 3 NOT PAID 4	
917	CHECK 701: CURRENTLY MARRIED/LIVING WITH A MAN ☐ ↓	NOT IN UNION ☐ →	925
918	CHECK 916: CODE '1' OR '2' CIRCLED ☐ ↓	OTHER ☐ →	921
919	Who usually decides how the money you earn will be used: you, your (husband/partner), or you and your (husband/partner) jointly?	RESPONDENT . . . . . 1 HUSBAND/PARTNER . . . . . 2 RESPONDENT AND HUSBAND/PARTNER JOINTLY . . . . . 3 OTHER _____ 6 (SPECIFY)	
920	Would you say that the money that you earn is more than what your (husband/partner) earns, less than what he earns, or about the same?	MORE THAN HIM . . . . . 1 LESS THAN HIM . . . . . 2 ABOUT THE SAME . . . . . 3 HUSBAND/PARTNER HAS NO EARNINGS . . . . . 4 DON'T KNOW 8	→ 922
921	Who usually decides how your (husband's/partner's) earnings will be used: you, your (husband/partner), or you and your (husband/partner) jointly?	RESPONDENT . . . . . 1 HUSBAND/PARTNER . . . . . 2 RESPONDENT AND HUSBAND/PARTNER JOINTLY . . . . . 3 HUSBAND/PARTNER HAS NO EARNINGS . . . . . 4 OTHER _____ 6 (SPECIFY)	
922	Who usually makes decisions about health care for yourself: you, your (husband/partner), you and your (husband/partner) jointly, or someone else?	RESPONDENT . . . . . 1 HUSBAND/PARTNER . . . . . 2 RESPONDENT AND HUSBAND/PARTNER JOINTLY . . . . . 3 SOMEONE ELSE . . . . . 4 OTHER 6	
923	Who usually makes decisions about making major household purchases?	RESPONDENT . . . . . 1 HUSBAND/PARTNER . . . . . 2 RESPONDENT AND HUSBAND/PARTNER JOINTLY . . . . . 3 SOMEONE ELSE . . . . . 4 OTHER 6	

SECTION 9. HUSBAND'S BACKGROUND AND WOMAN'S WORK

NO.	QUESTIONS AND FILTERS	CODING CATEGORIES	SKIP
924	Who usually makes decisions about visits to your family or relatives?	RESPONDENT . . . . . 1 HUSBAND/PARTNER . . . . . 2 RESPONDENT AND HUSBAND/PARTNER JOINTLY . . . . . 3 SOMEONE ELSE . . . . . 4 OTHER 6	
925	Do you own this or any other house either alone or jointly with someone else?	ALONE ONLY . . . . . 1 JOINTLY ONLY . . . . . 2 BOTH ALONE AND JOINTLY . . . . . 3 DOES NOT OWN 4	→ 928
926	Do you have a title deed for any house you own?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 928
927	Is your name on the title deed?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
928	Do you own any agricultural or non-agricultural land either alone or jointly with someone else?	ALONE ONLY . . . . . 1 JOINTLY ONLY . . . . . 2 BOTH ALONE AND JOINTLY . . . . . 3 DOES NOT OWN 4	→ 931
929	Do you have a title deed for any land you own?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	→ 931
930	Is your name on the title deed?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8	
931	PRESENCE OF OTHERS AT THIS POINT (PRESENT AND LISTENING, PRESENT BUT NOT LISTENING, OR NOT PRESENT)	PRES./ LISTEN. / PRES./ NOT LISTEN. / NOT PRES. CHILDREN < 10 . . . . . 1 2 3 HUSBAND . . . . . 1 2 3 OTHER MALES . . . . . 1 2 3 OTHER FEMALES 1 2 3	
932	In your opinion, is a husband justified in hitting or beating his wife in the following situations: a) If she goes out without telling him? b) If she neglects the children? c) If she argues with him? d) If she refuses to have sex with him? e) If she burns the food?	YES / NO / DK a) GOES OUT . . . . . 1 2 8 b) NEGLECTS CHILDREN . . 1 2 8 c) ARGUES . . . . . 1 2 8 d) REFUSES SEX . . . . . 1 2 8 e) BURNS FOOD 1 2 8	

(1) Revise according to the local educational system.