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Socioeconomic inequalities in skilled birth attendance in Zimbabwe: A comparative analysis

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9th February 2020

Dedicated

To my beloved wife, late son and family (Faith Vimbai Nhokwara, Bryce Tanatswa Lukwa and Lukwa family).

Thesis Abstract

This dissertation assessed socioeconomic inequalities in skilled birth attendance in Zimbabwe. High maternal mortality in low-income countries is a cause of concern globally. Skilled birth attendance prevents a substantial number of maternal deaths and it is critical for ensuring overall maternal health. However, sub-Saharan Africa is characterized by challenges in accessing skilled birth attendance. The existence of health inequalities has been demonstrated when simple comparisons are made by residence (rural-urban), education and wealth (poor-rich) in developing nations.

The study used data from the Zimbabwe Demographic and Health Surveys (ZDHS) of 2010/11 and 2015. The analysis focused on women of child-bearing age (15-49 years). Skilled birth attendance was determined by women assisted by health personnel with midwife training. Health personnel was defined as a nurse, midwife or doctor. A binary logistic regression model was computed to understand the relationship between skilled birth attendance, demographic attributes and some explanatory variables. Standard concentration curves and Wagstaff normalized concentration indices were used to assess whether skilled birth attendance was dominant among the poor or rich in Zimbabwe.

Overall skilled birth attendance prevalence increased for the periods under review. Regression results showed that antenatal care visits, residence status, place of delivery, women level of education, employment status and marital status are statistically significant predictors of skilled birth attendance. Wagstaff normalized concentration indices of aggregated use of skilled birth personnel reflected that wealthy women were more likely to receive skilled birth attendance. The concentration curves for aggregated skilled birth attendance showed minimal existence of health inequalities, as the concentration curves almost coincided with the line of equality. However, a disaggregated analysis by health personnel revealed the existence of health inequalities.

In summary, minimal socioeconomic inequalities exist if skilled birth attendance aggregated, but when assessed by different health personnel categories, widening socioeconomic inequalities are observed.

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PART A: Research Protocol

1. Introduction

Low utilisation of maternal health services over the years has dominated the research agenda. Long-distance to health facilities, high health care costs, multiple demands for women's time, low coverage and poor quality of care have been attributed to the low utilisation of maternal health services (Mrisho *et al.*, 2007; Darmstadt *et al*, 2009). Due to high maternal deaths globally in 2000, the United Nations (UN) member states made a pledge to reduce 75% of maternal deaths by 2015 (Torre *et al.*, 2018).

Sub-Saharan Africa (SSA) contributed most of the maternal mortality globally in 2008; recording 920 deaths per 100,000 live births (UNICEF, 2008). Individual socio-demographic and national-level environmental factors have been cited to affect women's use of maternal health care (McTavish *et al.*, 2010a). However, many factors shape the health and well-being of populations.

Therefore, the well-being of populations does not solemnly depend on lifestyle and behavioural factors but rather on a wide variety of social, economic and environmental factors including health care. Poverty, housing, ethnicity and place of residence are argued to be determinants of population health with health deterioration likely to occur if no efforts are made in reducing socio-economic gaps (Schnohr *et al.*, 2006; Kamphuis, 2008; Royal College of Nursing, 2012).

Socioeconomic inequalities in health have been defined to take the form of a social gradient, characterised with higher socioeconomic groups likely to enjoy better health (Graham, 2004). However, socioeconomic differences are not only common in developing nations but also exist in developed nations. For instance, in the Netherlands on average, those belonging to lower socioeconomic classes have a life expectancy that is 3-5 years shorter than their higher status counterparts (Jago *et al.*, 2007; Kamphuis, 2008).

In a nutshell, those worse-off in terms of power, knowledge and wealth are worse-off in terms of health (Schnohr *et al.*, 2006; Kamphuis, 2008; Royal College of Nursing, 2012). This entails the existence of an inverse relationship between socioeconomic status (SES) and health. Socially disadvantaged groups are likely to report more health problems and complaints (Kearney and McElhone, 1999) and usually have poorer self-perceived health than their richer counterparts (Giskes *et al.*, 2002).

Modern society literature argues that there has been no significant reduction in health inequalities however, health inequalities are cited to have widened (Giles-Corti and Donovan, 2002). Globally nations, reached a consensus stating that there is need to improve maternal health and reduce maternal mortality. Several ways have been proposed, for instance ensuring that pregnant women are assisted by competent health care professionals, equipped with the required equipment, drugs and supplies with the aforementioned working coherently with an adequate referral system (Adegoke and Broek, 2017).

It is amusing that as of 2014 only about 50% of deliveries were attended by health personnel in sub-Saharan Africa (United Nations, 2014). Even though maternal health has many benefits associated with skilled birth attendance (SBA). As of 2010/11 statistics in Zimbabwe, ten women died every day of pregnancy-related complications (Zimbabwe National Statistics Agency (ZIMSTAT) and International, 2012). The statistics reflect little progress regarding skilled birth attendance.

From the latter discussions, it can be deduced that health inequalities are a global problem. Several studies reviewed in literature reported health inequalities to be widening in developing countries. It is the widening of health inequalities which informed this study to assess inequalities in the utilisation of skilled birth attendance in Zimbabwe. The research seeks to find entry-points for policies and interventions to reduce socioeconomic health inequalities in skilled birth attendance in Zimbabwe.

1.1 Problem statement

Improving health, social & economic development and human rights are current objectives enticing global health policy. However, the vast growing body of evidence emphasises that the improvement of health for all people requires action to address underlying causes of health inequalities (Sen and Östlin, 2009; Sadana *et al*, 2011). Skilled attendance at birth is an indicator for assessing maternal health progress, as highlighted in the Sustainable Development 3.1 (Campbell *et al.*, 2016). However, despite such international focus, less than 50% of deliveries were facility-based in many sub-Saharan African countries with a lower coverage rate among the poor (Montagu *et al.*, 2011; Moyer and Mustafa, 2013a).

In sub-Saharan Africa, about 162,000 women die each year during pregnancy and childbirth (Lawn *et al.*, 2006; Ronsmans and Graham, 2006; United Nations Department of Economic Affairs, 2008; Kinney *et al.*, 2010; WHO and UNICEF, 2012). Majority of the deaths have

been argued to be as a result of; lack of access to skilled delivery attendants and emergency care

Universal access to skilled birth attendance (SBA) and emergency obstetric care (EmOC) are among known essential tools of reducing maternal mortality (Graham *et al.*, 2001; World Health Organization, 2004). One of the nine basic principles of the World Health Organization's constitution stipulates that "the enjoyment of the highest attainable standard of health is one of the fundamental rights of every human being without distinction of race, religion, political belief, economic or social condition" (Sadana *et al.* 2011,pp 7). However, literature reflects that particular attention has not been paid to health inequalities by socioeconomic status, even though they reflect performance within and across health care systems (Thouez, 2006; Hernandez-Quevedo and Masseria, 2013).

Skilled birth attendance coverage was reported to be the least equitable amongst twelve key maternal and child health interventions from an equity analysis of interventions in 54 countries. Results of the study showed skilled birth attendance coverage between the wealthiest and poorest population quintiles having a 52% difference (Barros *et al.*, 2012). In addition, many countries particularly developing nations recorded existence of widening inequalities (Hart, 1971; Cissé *et al.*, 2007; Szwarcwald *et al.*, 2010; Balarajan *et al.*, 2011; Mills *et al.*, 2012; Ataguba and McIntyre, 2013). An inverse care law argues that those with the greatest need for health services do not get fair share of health services.

Zimbabwe is a land locked country located in southern Africa, made up of 10 administrative provinces. Out of her 10 provinces 8 are rural provinces and majority of Zimbabweans reside in rural areas (Zimbabwe Ministry of Health and Child Care, 2013). Zimbabwe inherited the Rhodesian health care system at independence in 1980 which had divided health services along racial lines.

In this health system, distribution of resources was highly skewed towards hospital service provision for the small white population at the expense of the indigenous population. However, post-independence the government advocated for the readdressing of health inequalities through investing in health services in rural areas (Choguya, 2014). In a bid to reduce health inequalities the government invested in improving and increasing primary health facilities. Hence, by 1989 rural health centres and clinics increased from 247 at independence to 1062 enabling much better geographical accessibility of primary care services.

Variation in access to skilled birth attendance is always mirrored or revealed in maternal mortality (World Health Organization *et al.*, 2012). However, maternal deaths continue to be concentrated among poor women. Constitutional amendments done in Zimbabwe up to 2013 did not focus or reflect upon the issue of the right to health or health care, even though Zimbabwe is among member states who were signatories of the International Covenant on Economic, Social and Cultural Rights since 1991 (Loewenson *et al.*, 2014). However, national health policies incorporated issues of equity and universalism as policy objectives and central principles. The main aim was to have a more organized health system and improved primary health care (PHC).

Zimbabwe's health system is no exception as it experienced a significant rise in maternal mortality in recent decades. The rise in maternal mortality has been attributed to health service issues such as; limited availability of skilled birth attendants at first referral level, limited access to health facilities and transport, unwanted teenage pregnancies, abortion complications, social attitudes and inadequate services to address gender violence (CSO and Macro International Inc, 2000; Government of Zimbabwe, 2007; Loewenson and Shamu, 2008; Parliament of Zimbabwe, 2008). In 2015, new commitments were set by the Sustainable Development Goals (SDGs) in an effort at ensuring significant improvements in maternal health indicators. ***SDG 3.1*** sets a target to decrease the global maternal mortality ratio (MMR) to less than 70 per 100,000 live births by 2030 (Torre *et al.*, 2018).

With skilled birth attendance cited as one of the major reasons for the rise in maternal mortality. This study seeks to evaluate changes in socioeconomic inequalities in skilled birth attendance in Zimbabwe. Zimbabwe's health system also strives to meet one of the global objectives as stated by the WHO in the World Health Report 2000: "improving the health attainment of the population and reducing the health gap across socio-economic groups are the main goals in any health care system" (World Health Organisation, 2000).

1.2 Study rationale

Health inequalities are unjust as they are mostly biased against socially disadvantaged groups. However, good health and freedom of choice are essential attributes within populations. Vast gains in public health can be realised through the upgrading of lower socio-economic groups' health status to the level of their advantaged counterparts (Lynch *et al.*, 1997; Ball *et al.*, 2007).

A study done in the USA revealed that apart from promoting social justice, reducing health inequalities had economic gains. In a national study of medical costs and vital statistics reports from 2003 through 2006, economic gains were illustrated. The study reported that eliminating health inequalities for people of colour would reduce direct medical care expenditure by $229.4 billion and indirect costs associated with illness and premature death by more than $1 trillion (LaVeist *et al.*, 2011; Swain, 2016).

The measuring of health inequalities is an essential attribute for the implementation and the monitoring of health policies (Makdissi and Yazbeck, 2014). One of the many objectives of health systems is to narrow inequalities in access to health care across socioeconomic groups. The latter reflects the importance of understanding socioeconomic inequalities in skilled birth attendance.

1.3 Research objectives

Primary objective

Assessed socioeconomic inequalities in skilled birth attendance in Zimbabwe

Secondary objectives

- ✓ Assessed socioeconomic inequalities in births attended to by skilled birth attendants in Zimbabwe between 2010\11 and 2015.
- ✓ Assessed changes in socioeconomic inequalities in skilled birth attendance in Zimbabwe between 2010\11 and 2015.

2. Brief literature review

The literature review presents and elaborates theoretical and empirical background about inequalities in the utilisation of maternal health services. Detailed insights about theories put forward on inequalities and maternal health services by previous researchers were written under theoretical literature review. While findings and arguments obtained from different countries by different researchers were compiled and reviewed under empirical literature review. Therefore, the theoretical literature review informed the study on existing theories while the empirical literature reviewed analysed the results from earlier studies that were relevant to this study.

2.1 Theoretical literature review

Social inequality has been identified as a fundamental dimension of social institutions and a factor in health-related behaviour and outcomes (Bollen *et al.*, 2001; Elo, 2009).

What is equality in health?

Equality in health can be expressed as the absence of systematic disparities of health between social groups (Braveman and Gruskin, 2003). Health inequalities have been part of political debates more than 150 years ago. Modern understanding was best explained by the 1980 Black Report which reflected that unequal life chances were not exclusive to societies but rather to most disadvantaged people (Cheng and Jenkins, 2017; Gagné and Ghenadenik, 2018).

In this study health inequality is defined as, existence of disparities in utilisation of skilled birth attendance among pregnant women of different socioeconomic standing.

What is socioeconomic status?

Socioeconomic status (SES) has been defined as ; social standing, rank or class of an individual or group in society in early epidemiological studies (Liberatos, Link and Kelsey, 1988), one's access to financial, social, cultural, and human capital resources (Culling, Allison and Barr, 1985), one's access to collectively desired resources, be they material goods, money, power, friendship networks, healthcare, leisure time, or educational opportunities (Cirino *et al.*, 2002).

Socioeconomic status is often operationalized and measured as a combination of education, income and occupation (Berkman and Macintyre, 1997; Seid, Bloomfield and Hesse, 2018). Literature argues that socioeconomic status does not only encompass income, but also educational attainment, financial security, and subjective perceptions of social status and social class((APA), 2020). Socioeconomic status has been argued to influence health through a combination of increased knowledge, access to financial resources, and access to social support (Krieger *et al.*, 1997; Macintyre, 1997; Galobardes *et al.*, 2006a, 2006b; Jones, 2006; Cheng and Jenkins, 2017).

Research has been continuously done to support researchers in the conceptualisation, operationalisation and measurement of socioeconomic status in health (Krieger *et al.*, 1997; Oakes and Rossi, 2003; Braveman *et al.*, 2005; Galobardes *et al.*, 2006b, 2006a). To date health has been argued to be affect by socioeconomic status (SES) in many specific ways, however the ways are still not fully understood.

2.1.1 Theories of health inequalities

Background

Health inequality generally refers to differences in the health of individuals or groups. Therefore, any attribute of health that changes across individuals or according to socially relevant groupings is a health inequality (Kawachi *et al.*, 2002). Social inequality in health as a subject vanished from public debate in the past, although some research reports in the 1970s demonstrated that the well-known patterns were still evident (Allern, 1974; Haldorsen and Glattre, 1976).

However, in the eighties and nineties, social health inequalities gained increased attention (Grøholt *et al.*, 2007). And to date, there is an increase in the number of theoretical contributions to health inequalities research and public health more broadly. A positive association between health and socioeconomic resources was well established in social epidemiology (Whitehead *et al.*, 1992; Townsend *et al.*, 1992; Bartley *et al.*, 1997; Smith *et al.*, 1998; Mcdonough and Brennenstuhl, 2011).

Egalitarianism

Egalitarianism is a social philosophy concept that advocates for removing economic inequalities among people or the decentralisation of power. The core concept of this theory is that all humans are equal in fundamental worth or social status (Gabrani *et al.*, 2015). Egalitarian principles argue that health care should be distributed based on a need principle rather than people's willingness and ability to pay.

Therefore, suggesting that if health care is distributed appropriately health equity will be promoted (Duy Kien *et al.*, 2014). Hence, for health care, egalitarians argue that every individual in the society is entitled to accessing health care at a time when they need care and at an affordable cost.

Neo-Marxist

Neo-Marxist views social class in terms of class relations that give persons control over productive assets and the labour-power of others. The theory argues a social class is viewed as a causal mechanism hence, it becomes a catalyst of informing social change which later reduces health inequalities (Muntaner *et al.*, 2015a).

Health inequality analysis adopting the neo-Marxian theory entails revealing mechanisms of inequalities through social relations of control over productive assets in capitalist societies

(Lynch and Kaplan, 2000; Navarro, 2009; Muntaner *et al.*, 2015b). The latter however, cannot be captured using conventional socioeconomic position (SEP) indicators.

Welfare State

The term welfare state was accepted in Scandinavia in the 1930s, but was only used more widely after the second world war (Kaufmann, 2000). The welfare state is a shorthand for the state's role in education, health, housing, poor relief and social insurance in developed capitalist countries (Ginsburg, 1979). To note, public health services such as health promotion are also included (Eikemo and Bambra, 2008). Health inequalities in societies depend on how a society is organised (Grøholt, Dahl and Elstad, 2007).

Welfare state capitalism is commonly associated with Esping-Andersen's modern classic. The Three Worlds of Welfare Capitalism define a welfare state as not just a set of social transfers and welfare services but rather tools used to intervene and possibly correct structure of health inequalities (Eikemo and Bambra, 2008; Chakraborty *et al.*, 2014). Welfare state theory argues that health care should be given to citizens, irrespective of their status, class or the market value of their labour and property.

Conclusion

The study adopted the Egalitarian approach as the core concept of this theory, argues that all humans are equal in fundamental worth or social status. This would imply that all women are expected to have skilled birth attendance access irrespective of their socioeconomic status thus addressing the health inequality gaps. Therefore, Egalitarian approach avails an opportunity of ensuring universal access and fulfilment of core concepts of universal health coverage (UHC); affordable health care for all.

2.2 Methodological literature review

Many approaches can be used to assess inequalities in health. The slope index of inequality (SII), relative index of inequality (RII), Gini coefficient, Atkinson index and concentration index (CI) are amongst the approaches (Wagstaff *et al.*, 1991; Carr-Hill and Chalmers-Dixon, 2005). These approaches quantify health inequalities in relative and absolute terms as well as explain the linear association between the socioeconomic ranks of individuals and health outcomes (Moreno-Betancur *et al.*, 2015a).

2.2.1 Slope index of inequality (SII)

The slope index of inequality is a regression-based measure that incorporates the whole socioeconomic distribution (Morris, 1991). The SII is based on calculating the mean health

outcome or status for each socioeconomic group and then ranking groups by their socioeconomic status. The SII is defined as the gradient of the regression line between a group's (mean) health status and its relative socioeconomic rank. In conclusion, the slope index of inequality explains the absolute effect on health of moving from the lowest socioeconomic status (SES) to the highest socioeconomic status (SES).

2.2.2 Relative index of inequality (RII)

The relative index of inequality (RII) is a complex weighted measure of inequality. The index expresses the ratio of estimated values of a health indicator of the most-advantaged to the most-disadvantaged or vice versa for health outcome indicators (World Health Organization, 2018). However, it takes into account all the other subgroups using an appropriate regression model.

An RII value of 1 denotes the absence of inequality. The relative index of inequality only takes positive values. Values larger than one indicate a concentration of the indicator among the advantaged (pro-rich) and values smaller than one indicating a concentration of the indicator among the disadvantaged (pro-poor). Therefore, the further the value of RII from 1, the higher the level of inequality.

2.2.3 Concentration index (CI)

The concentration index is a derivative of the concentration curve. Concentration curves identify the existence of socioeconomic inequalities in some health variable and the concentration curve is only sensitive to relative inequality (Moreno-Betancur *et al.*, 2015a). Equi-proportional changes in health have no effect on the CI as they leave the socioeconomic inequality unchanged. The bounds of this measure are -1 and 1 with a negative (positive) value representing inequality favouring the worse-off (better-off).

As skilled birth attendance is a cardinal measure meaning differences between values are meaningful. The study used the modified concentration index (Wagstaff normalized index) as the standard concentration index is not necessarily invariant to arbitrary retransformations of skilled birth attendance

2.2.4 Conclusion

The study assessed health inequalities using the Wagstaff normalised concentration indices. Considering that concentration indices are summative measures of the degree of inequality in a health-related variable, it undoubtedly made them the ideal approach in assessing health inequalities in skilled birth attendance. In addition, concentration curves avail a graphical picture of the health inequalities.

2.3 Empirical literature review

Chinelo and Ahizechukwu, (2015) conducted a study using data from the fourth round of the Multiple Indicator Cluster Survey (MICS4) in Nigeria in 2011. The sample was restricted to women who were within two years of postpartum (weighted n=9,879). Findings of the study revealed that approximately half of the women (49%) had skilled birth attendance during their last childbirth (Chinelo and Ahizechukwu, 2015). Women that had skilled birth attendant during their last childbirth were older (25 – 39 years), had more education (secondary and higher), lived in rural areas and were richer.

The study also reflected that rural women in Nigeria had better chances of having skilled birth attendance compared to urban women. The latter result implied that efforts may have been focused disproportionately on rural areas at the expense of urban areas. However, some African researchers have suggested the disappearance of the so-called 'urban advantage' in light of the high levels of urban poverty (Ezeh *et al.*, 2010).

A cross-sectional study targeting women who had delivered within a year was done in Tharaka-Nithi County Kenya. The research aimed to establish associated factors of skilled birth attendance among women in Tharaka-Nithi County. Health facilities were selected using stratified sampling as a means of ensuring that all the levels of the facilities were represented. For this study, about 345 respondents were enrolled, with birth deemed recent if it occurred within one year of the study. However, because of recall bias, births that occurred beyond a year were excluded (Gitonga, 2017). About 77% of the respondents had skilled birth attendance in their most recent delivery.

Women aged 20–24 years (90%), women aged 25–29 years (80%) and women aged 40–44 years (50%) delivered under SBA. The proportion of women who delivered under SBA increased by level of women's education (Gitonga, 2017). Gitonga and Eliphas, (2017) study results also reflected a positive relationship between the proportion of women who delivered under SBA and level of education. The study also revealed significant association of skilled birth attendance to level of income and distance to the health facility.

Data drawn from the 2008 Ghana Demographic and Health Survey (GDHS) were used to study skilled birth attendant utilisation by Asamoah, Agardh and Cromley, (2014). The GDHS interviewed 4,916 women aged 15 to 49 and the response rate was 96%, out of which 2,144 had at least one birth experience. The study employed geographically weighted odds ratios to

examine the spatially varying relationships between low socioeconomic status (low education and low income) and non-utilisation of skilled birth attendants (Asamoah *et al.*, 2014).

Results from the study showed that non-use of skilled birth attendants varied by education and income strata, with 41.5% of women lacking skilled attendants when giving birth. The study also revealed that 92.5% of women with secondary or higher education accessed skilled care at birth. About 88.3% of women in the high-income strata utilised skilled birth attendants compared to 45.0% in the low-income strata. There were geographical variations in the association between delivering without a skilled birth attendant and socioeconomic status (low education and low income) in Ghana (Asamoah *et al.*, 2014).

The literature reviewed also reflected the negative effects of applying disproportionate efforts on disadvantaged and advantaged societies when striving to reduce socioeconomic gaps. If efforts to reduce socioeconomic gaps are applied disproportionately among the disadvantaged and advantaged groups, socioeconomic gaps may not reduce but rather transferred from the disadvantaged to the advantaged.

For example, Chinelo and Ahizechukwu (2015) showed that rural women in Nigeria were more likely to have had skilled birth attendance compared to urban women. This just shows that efforts may have been focused disproportionately on rural areas at the expense of urban areas. Asamoah *et al.*, (2014) and Gitonga & Eliphas, (2017) cited the existence of a positive association between women with higher education who are economically well off and skilled birth attendance.

2.4 Conclusion

Several studies in literature cited a significant association of; women age, level education, residence status, income (socioeconomic status) and distance to health facility with skilled birth attendance. Citing existence of socioeconomic inequalities among different age groups, with different levels of education, of different residence (urban/rural) and different socioeconomic status. Mostly rich young women (less 35years), with at least secondary education, residing in the rural areas were cited to be most likely to receive skilled birth attendance.

3. Methods

3.1 Data sources

Data from Zimbabwe Demographic and Health Surveys (ZDHS) of 2010/11 and 2015 was used for analyses. For both 2010/11 and 2015, the ZDHS samples were nationally representative with a sample of more than 11,000 households, designed to yield representative information (*urban and rural areas*) for most indicators, for each of Zimbabwe's ten provinces: Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare, and Bulawayo. The 2002 and 2012 population censuses sampling frames were used for the 2010/11 and 2015 ZDHS, respectively.

3.2 Study population

A total of 9,171 (2010/11) and 9,955 (2015) women aged 15-49 years were interviewed in the ZDHS. For this study, the study population was child bearing women aged 15-49 years interviewed in ZDHS of 2010/11 and ZDHS 2015.

3.3 Study variables

The maternal health status indicator used in this study was skilled birth attendance. Skilled birth attendance (SBA) referred to pregnant women assisted by health personnel. Skilled birth status was divided into two groups: births assisted by health personnel (e.g. by doctors, nurses or midwives) or non-health personnel (e.g. traditional birth attendant, relative or friend and village health worker (VHW)).

Part A; Table 1: Description of variables

	Explanatory variables
Age	Women of childbearing age were considered (15-49 years)
Place of delivery	Recoded as: 0 for home and 1 for a health facility delivery
Maternal education	Re-coded as; 0 no education, 1 primary, 2 secondary & 3 tertiary educated
Antenatal Care Visits	Recoded as: 0 attending less than 4 ANC visits and 1 attending at least 4 ANC visits

Wealth index	Recoded into 3 categories at the household level coded as; 1 Poor (poorer & poorest), 2 Middle, 3 Rich (richer & richest)
Marital Status	Recoded into 2 groups; 0 Not Married, 1 Married
Urban-rural residence	The variable "place of residence" re-coded 0 for rural and 1 for an urban location
Occupation	The variable recoded as: 0 not-employed and 1 employed
	Dependent variable
Skilled birth status	SBS dichotomised; 1 for skilled birth attendance and 0 for non-skilled birth attendance

3.4 Analytical Methods for assessing socioeconomic inequalities in health

3.4.1 Health concentration index

The health Concentration Index C(h) was introduced by Wagstaff, Paci and van Doorslaer, (1991). It can be expressed mathematically as;

$$C(h) = 1 - \frac{\sum_{i=1}^{n}(2\gamma_i - 1)h_i}{n^2\mu_n}$$

γ_ii denotes socioeconomic position, with the best well-off individual ranked first and the least well-off individual ranked last

h_i denotes real number which measures the health status

μ_n denotes the average health of the population

The health concentration index measures socioeconomic inequalities of health based upon information on the socioeconomic ranks and the health levels of all individuals in the population (Erreygers, 2009). A positive value of C(h) indicates that health is distributed in favour of the rich (+1), and a negative one that it is distributed in favour of the poor (-1). The higher the absolute value of the index, the more extreme the pro-rich or pro-poor character of the distribution is supposed to be.

A health variable exists in three forms thus; ordinal, cardinal or of the ratio-scale (Erreygers, 2009). In this case skilled birth attendance is a cardinal health variable, as the differences between health states can be compared. Wagstaff, (2005) suggested a normalization formula

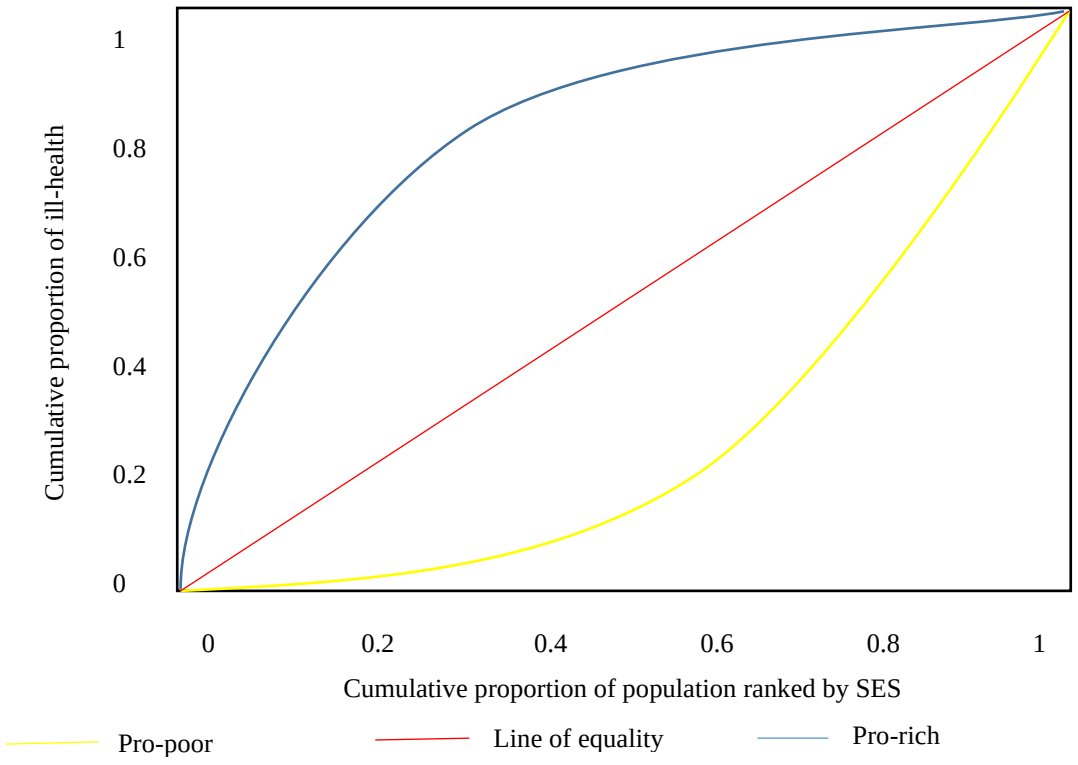
aimed at remedying the bounds issue for a binary cardinal health variable. He proposed to divide the health concentration index by its (upper/lower) bound, which leads to a normalized health concentration index equal. The Wagstaff normalized index (W(h)) can be expressed as:

$$W(h) = \frac{\mu_n(b_n - a_n)}{(b_n - \mu_n)(\mu_n - a_n)} C(h)$$

The W(h) values range from -1 and +1, hence the procedure tackles the bounds issue by stretching the index in such a way that it always has a uniform range. Therefore, for this study the Wagstaff normalised index was used to assess health inequalities in skilled birth attendance.

The CI is a derivative of the concentration curve (CC). Figure 1 illustrates the concentration curve. A concentration curve ranks the variable of interest (e.g. skilled birth attendance) by socioeconomic status as illustrated in figure 1 (Hernandez-Quevedo and Masseria, 2013).

Part A; Figure 1: Concentration curve for ill-health (hypothetical data)



4. Data analysis

For data management, data exploration and analysis, this study used Stata version 13.1 (Stata Corp, Texas, United States).

5. Research ethics

There are existing data sets for this study—the ZDHS 2010/11 and 2015 data sets. The study used secondary data. Therefore, ethical matters were not of concern. However, for both ZDHS data sets, informed consent for the surveys were obtained from the respondent at the beginning of the individual interview in the parent studies. For this study ethics approval was sought from the University of Cape Town's Human Research Ethics Committee (HREC). The study ethics reference number is HREC REF: 570/2019.

6. Budget

Part A; Table 2: Budget for this study

Item	Details	Amount
Stationary	Inclusive of data storage; the bindings of various study sections; it also includes other supplies such as paper and pens.	R 2 500
Transport	Domestic travel (transportation, accommodation, meals)	R 2 000
Communication	Internet and phone call costs	R 800
Overhead cost	@10% of all other costs	R 530
Total		R 5 830

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PART B
Literature Review

1. Conceptual literature review

While the estimated risk of a woman dying during pregnancy, child-birth and puerperium in her lifetime for Niger was 1 in 6, in Ireland the lifetime risk was 1 in 48,000 according to the 2007 WHO statistics (WHO, 2007). The conceptual literature review section reflects an overview of 1) conceptual issues on the determinants of maternal health; 2) definition of health inequalities; 3) conceptual explanations for rural-urban disparities in maternal health with specific attention given to skilled birth attendance; 4) conceptual explanations for wealth disparities in maternal health; 5) conceptual frameworks for evaluation of maternal health inequalities.

The literature included in this section was obtained from electronic database' searches including google scholar, PubMed, Medline, ECONLIT and Google. The search terms used include; health inequalities and skilled birth attendance or maternal health services or socioeconomic inequalities or gender or age or geographical location. Manual search of the references from the included articles was also done to complement the review.

Over the years, conceptual frameworks have been applied in studying health inequalities in a bid to understand their existence using pre-existing data sets or findings, with the latter process informing future decisions on how best to conduct health inequalities studies and the best approach in tackling health inequalities (Smith and Schrecker, 2015).

1.1 Determinants of maternal health: skilled birth attendance

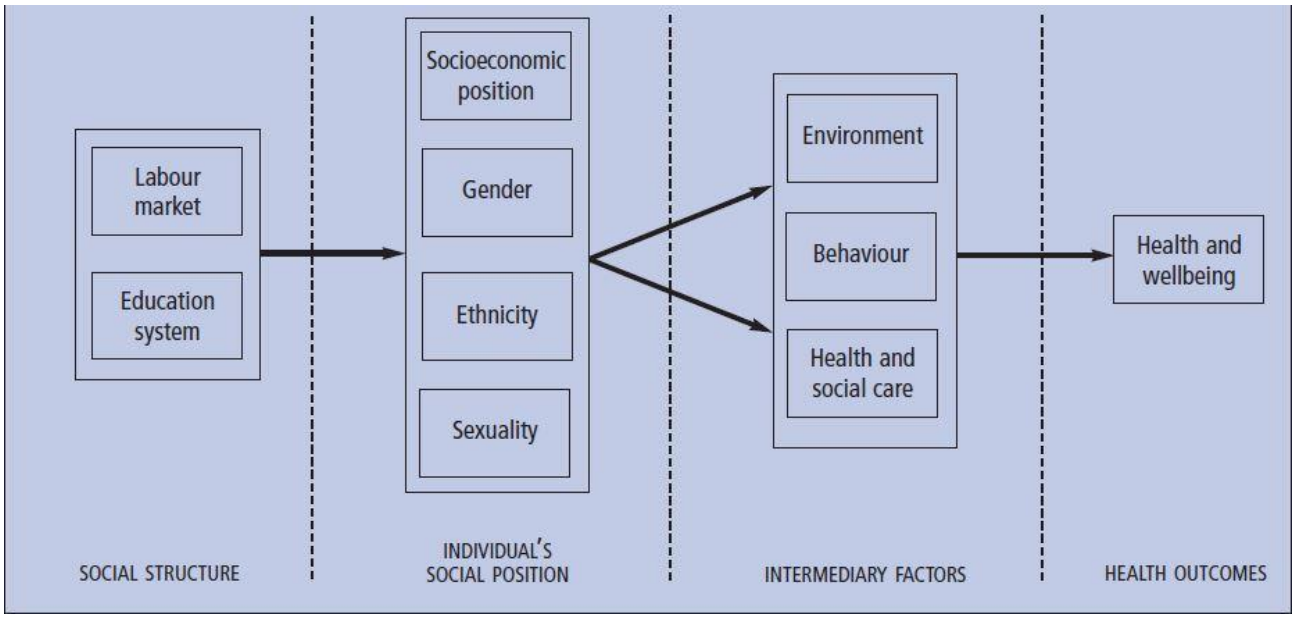
Population and individuals' poor health are attributes highly associated with social and economic disadvantages, with the unequal distribution of the social and economic determinants of health (*income, employment, education, housing and environment*) yielding health inequalities (Graham and Kelly, 2004a). Maternal health determinants are no exception as they are systematically associated with social disadvantages and marginalisation.

Many studies reflect core determinants of maternal health service utilisation as sociocultural factors such as; education, birth order, occupation, and place of residence (Ronsmans *et al.*, 2003; Jamison *et al.*, 2006; Kruk, Prescott and Galea, 2008; Kinney *et al.*, 2010b; McTavish *et al.*, 2010b; Abor *et al.*, 2011; Crowe *et al.*, 2012; Mselle *et al.*, 2013; Alam *et al.*, 2015; WHO,

2017; Makate and Makate, 2017; Woldegiorgis *et al.*, 2018, 2019; Goli *et al.*, 2018) (Gabrysch and Campbell, 2009). Therefore, the basis of maternal health services starts with good quality antenatal care (ANC), followed by skilled birth attendance (SBA) and postnatal care (PNC), with skilled birth attendance as the cornerstone of maternal and child health services (Darmstadt *et al.*, 2005).

Part B; Figure 1 gives a graphical insight, through examples of determinants operating at different points, running from social structure to health and wellbeing. Structural determinants such as education impact people's health and wellbeing through their social position and the intermediary factors associated with it (Graham and Kelly, 2004b).

Part B; Figure 1: How key health determinants are connected



Source; "Graham and Kelly (2004a)*"*

Skilled birth attendance is associated with several factors including age, level of education, type of employment, average family income, level (or type) of facility attended during antenatal care (dispensary, health centre, or hospital), timing of initiation of antenatal care, distance to the health facility, birth preparedness status, and parity (Gitonga, 2017).

Low-middle-income countries are no exception as they are also affected by a complex set of factors influencing the likelihood of delivery care use and maternal mortality namely education and economic status, physical distance to facilities, availability of transportation, quality of care, and sociocultural norms or beliefs (Thaddeus 1994; Koblinsky *et al*, 2006). The literature

argues that the survival of women and new-borns improves depending on professional care at childbirth, for instance, care by a skilled birth attendant (SBA) (Shimamoto and Gipson, 2015).

Nations that have successfully reduced maternal mortality have channelled resources to training, recruiting and supporting skilled birth attendants for deliveries (Koblinksy 2003;Gitonga and Eliphas 2017). However, with such merits associated with skilled birth attendance, the provision of an adequate number of skilled birth attendants has remained a big challenge in sub-Saharan Africa with political, social and cultural problems cited to be major determinants (Ugboaja, 2018). For instance in Ghana, many factors have been attributed to low skilled birth attendance, namely: physical accessibility, socio-cultural factors, economic factors and health care delivery problems (Apanga, Awoonor-williams and Apanga, 2017).

Several studies have examined the determinants of the use of SBAs or deliveries in health facilities and a huge proportion of the reviewed studies show large socioeconomic and rural/urban disparities in skilled attendance, with higher education, higher wealth, and urban residence consistently associated with higher rates of using SBAs (Afulani and Moyer, 2016). The literature also supports that the factors vary at different levels including individual, household, and community levels when predicting maternal health service utilisation (Babalola and Fatusi, 2009). Country-level factors such as health workers to population ratio (Gerein, Green and Pearson, 2006) and socioeconomic status (Kruk *et al.*, 2008; McTavish *et al.*, 2010b; Woldegiorgis *et al.*, 2018) are key factors in understanding variations in maternal health usage.

The latter factors such as; age, level of education, type of employment, average family income, level (or type) of facility attended during antenatal care (dispensary, health centre, or hospital), timing of initiation of antenatal care, distance to the health facility, birth preparedness status, and parity are also problematic in Zimbabwe. To note, variables that have been in global health statistics showing huge disparities between poor and rich countries are the death of a woman during pregnancy, childbirth and the puerperium (Adegoke and Broek, 2017).

1.1.1 Geographical accessibility

There has been growing interest in recent years with researchers concerned with links between health and place, drawing a wide array of methodological and theoretical innovations to examine how health and illness are socially and physically shaped in place and by place (Elliott, 2018). Several studies cited geographic accessibility to be a significant fundamental barrier in determining maternal health care in developing countries with persistently high maternal and

neonatal mortality rates associated with the latter determinant (Gething *et al* 2012; Ebener *et al* 2015). At some time in the past, Ghana experienced low skilled birth attendance which was largely attributed to geographic access (Moyer 2013; Nesbitt *et al* 2014; Cofie *et al* 2015).

Access to a skilled birth attendant has been reported to be unequal between poor and non-poor in many low-income countries thus reflecting equity gaps (Lawn *et al.*, 2009). Also, inequality gaps between rural and urban areas appear to be widening (Ronsmans *et al.*, 2003; Koblinsky *et al.*, 2006; Kinney *et al.*, 2010; Crowe *et al.*, 2012). Two dated population-based studies done on sixteen sites in eight West African countries (Senegal, Guinea-Bissau, Gambia, Burkina Faso, Ivory Coast, Mali, Mauritania and Niger) revealed that about 80% of women residing in rural areas gave birth at home without a skilled birth attendant (Ronsmans *et al.*, 2003; Crowe *et al.*, 2012).

Where one resides is an important determinant of skilled birth attendance. Sakeah *et al* (2015) observed that pregnant women living in urban areas were more likely to deliver with the assistance of a skilled birth attendant than their rural counterparts. One of the reasons cited for the rural-urban disparity was easy accessibility to motorable roads in urban areas that is lacking in rural communities making accessibility to skilled delivery a problem (Gething *et al*, 2013).

1.1.2 Maternal education

Some studies cited high illiteracy rates and geographic access to be major drivers of low skilled birth attendance in developing nations (Moyer 2013; Nesbitt *et al,* 2015). To note, better educated pregnant women tend to utilise maternal health services (skilled birth services among others) than their peers with lower education. And researchers have argued that it could be due to the reason that mothers with lower education may not be well informed about the benefits of skilled birth attendance (Esena 2013; Amoakoh- Coleman *et al,* 2015). Some studies have consistently argued that formal education significantly increases the utilisation of maternal health services, even after controlling for other socioeconomic factors (Dimbuene *et al.*, 2018), with systematic review done on factors affecting the utilisation of antenatal care in developing countries drawing similar conclusions (Simkhada *et al.*, 2008).

Women's education improves literacy, increasing their capacity to make healthy choices, yielding positive health outcomes. This is as a result of the advantages with 'health literacy' *defined* as 'the degree to which individuals have the capacity to obtain, process and understand

basic health information and services needed to make appropriate health decisions' (Nielsen-Bohlman and Panzer, 2004).

1.1.3 Socio-cultural beliefs

Cultural beliefs drive and inform the day to day living in communities globally (Cofie *et al*, 2015). Therefore, socio-cultural beliefs also have a huge impact on communities seeking maternal health services. For instance, some mothers argue that their previous deliveries were successful at home without a skilled birth attendant, hence they see no need of 'wasting time' to attend a health facility for delivery (Cofie *et al*, 2015). Some of the African communities value the elderly as 'the wisest' hence some multiparous women seek for unskilled support during labour as they perceive the elderly tradition midwives to be better experienced than trained young health personnel when it comes to labour (Amoakoh- Coleman *et al*, 2015). Therefore, socio-cultural factors often affect the decision to seek care compared to whether women reach the health facility, as the influence on delivery with skilled attendance is strongly associated with factors related to women's perception of the benefit of skilled attendance towards their health including that of their new-borns (Gabrysch and Campbell, 2009).

It can be deduced that in some cases, religious beliefs pose a barrier to skilled birth attendance, as observed in northern Ghana were even though Muslim women wanted to access skilled delivery services, the unlawful bodily exposure or contact with certain people including male or alien caregivers in health facilities prevented them from using such services as it is prohibited for men who are not their husbands to see their nakedness (Ganle *et al.*, 2016).

1.1.4 Socio-economic factors

Even after accounting for the influence of age, gender, and other confounding factors likely to influence the risk of death, in India, individuals from the poorest quintile families are 86% more likely to die than those from the wealthiest families (Subramanian *et al.*, 2008). Poverty was attributed to be a driving factor on low level of skilled birth attendance, for instance in Ghana. Despite the nation having adopted free maternal health care policy some pregnant women could not access skilled delivery as they could not afford the cost of transport to get to a health facility (Atinga and Baku 2014; Ganle *et al*, 2016). In a study in Uganda, mothers who perceived the cost of care to be low were more likely to use health facilities at delivery compared to those who perceived it to be high (Atusiimire *et al.*, 2019).

In South Sudan when they were assessing health facility utilisation at birth, findings revealed that mothers of higher socioeconomic status were more likely to give birth at a health facility

or receive skilled assistance when giving birth as majority of women of lower economic status encountered difficulties in attaining transport or meeting the indirect costs related to childbirth, opting out from seeking institutional delivery (Tongun *et al.*, 2019). The literature reviewed also reflected that even women who could afford transport to a health facility for skilled delivery may have limited access due to other informal costs (cost associated with health facility delivery), despite waived facility fees at health facilities (Crissman *et al*, 2013). The informal costs associated with skilled birth delivery means that it would be 'cheaper' and preferable to deliver at home than to deliver at a health facility (Crissman *et al*, 2013).

1.1.5 Antenatal care visits

Maternal deaths are associated with many factors with most of them preventable or treatable to avoid maternal deaths. Evidence shows that early and regular attendance of antenatal care and delivery in a health facility under the supervision of trained personnel is associated with improved maternal health outcomes (Doctor *et al*, 2018). A study in Uganda revealed that women who attended ANC less than 4 times were less likely to go for health facility delivery than those who attended at least 4 times, and also women who had their ANC visit in the 2nd and 3rd trimesters of pregnancy were less likely to use health facilities at delivery compared to those who had their ANC in the 1st trimester (Atusiimire *et al.*, 2019). Therefore, it can be argued that factors associated with a non-health facility delivery include starting ANC late and attending less than 4 ANC visits. Thus, ANC visits are an important determinant of skilled birth attendance.

1.1.6 Conclusion

One of the most important interventions in granting safe motherhood is to ensure that a skilled health provider with midwifery skills attends every birth. However, the reality in many low-income countries is the existence of a gap between the training of skilled health personnel and their competence to manage deliveries (Starrs, 1998; Woldegiorgis *et al.*, 2019). Research conducted in Ethiopia and Tanzania revealed disappointments experienced when attending health facilities for labouring women due to the inexperienced and neglectful health workforce attending to them (Mselle *et al.*, 2013; Shiferaw *et al.*, 2013).

In a nutshell, low-income countries are characterised with an inadequate enabling environment for skilled birth delivery service utilisation, as most of the health facilities have limited capacity in delivering a full range of basic services.

1.2 Frameworks for understanding health inequalities

The previous section gives an overview of the determinants of maternal health and service utilisation, which aid in the assessment of health inequalities. The following section details some of the concepts that are useful in considering how inequalities arise, and for exploring causal mechanisms. The generic concepts are useful to the studying of social inequalities in health and in understanding health inequalities across individuals.

1.2.1 Causal pathways and conditional health effects

In understanding the relationship between exposure and an outcome, it is of utmost importance to acknowledge that they are other confounding factors that matter as well. Mediators, defined as variables lying on the causal pathway between exposure and outcome, explain how a given exposure leads to an outcome of interest (Baron and Kenny, 1986).

For instance, studying the determinants of skilled birth attendance (area of residence, age, education, socio-economic status, marital status and occupation) and their effects on inequalities on skilled birth delivery, we might deduce that where one resides could be the link that explains who attends to them during delivery. In this example, the area of residence could determine socio-economic status, which then might affect skilled birth delivery.

In summary, when designing policies or programmes to influence an outcome like skilled birth delivery, it may be effective to consider ways that area of residence, age, education, socio-economic status, marital status, occupation and other determinants could be used as a policy tool. Therefore, studies of health inequalities should aim to identify these pathways whenever possible because doing so helps to understand better the mechanisms by which health differences arise and avails wider options for designing policy solutions to real-world problems (Arcaya, Arcaya and Subramanian, 2015).

1.2.2 Selection

Another fundamental concept for understanding health inequalities is the selection framework (Heckman, 2013). The selection theoretical framework argues that people tend to sort

themselves into neighbourhoods, social groups and other clusters. For instance, individuals who value physical activities more are more likely to move to walkable areas, while sedentary individuals might choose to live in auto-dependent suburbs. Hence, when analysing data suggesting that neighbourhood walkability affects whether residents are physically active, it is of paramount importance to question the extent of the observed relationship, and to what extent it simply reflects self-selection into the neighbourhoods (Arcaya, Arcaya and Subramanian, 2015).

The relationship between socio-economic status and health can be argued to be a product of selection. As in most cases, genetically superior individuals are more likely to have good health and high IQ. As a result, highly educated and high-income earners are generally healthier (Arcaya, Arcaya and Subramanian, 2015). However, studies estimating the causal effects of social factors on health generally reject such hypothesis, arguing that exposures such as occupation, income, discrimination, and neighbourhood poverty influence health (Buchanan, 2003).

1.2.3 Context versus composition

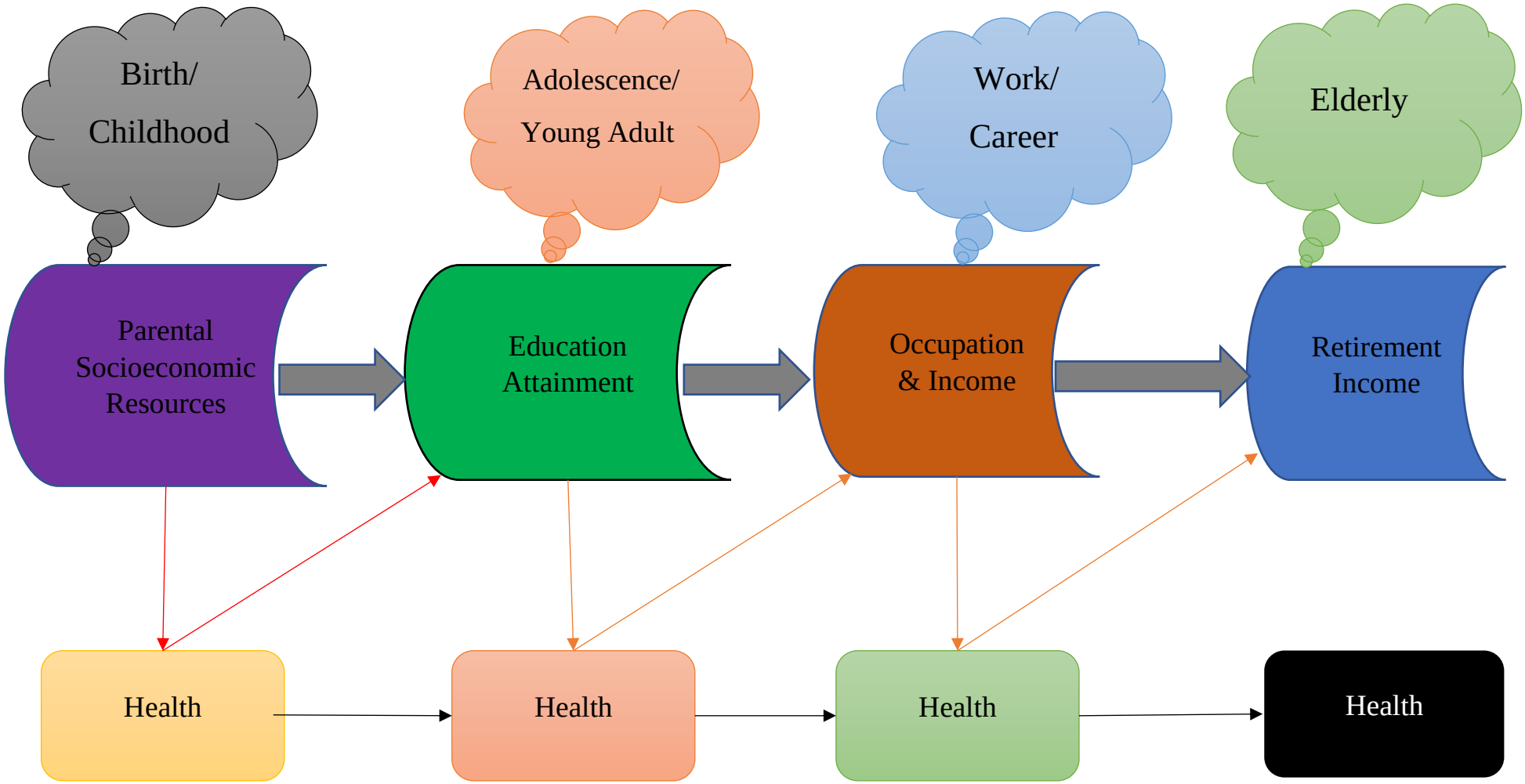
The context versus composition theoretical framework is an extension of the selection framework (Arcaya, Arcaya and Subramanian, 2015). Selection may be as a result of geographic health inequalities, therefore, some researchers generally want to distinguish contextual from compositional effects (Subramanian, Jones and Duncan, 2009). Contextual effects are defined as the influence a neighbourhood or other types of higher-level units has on people, while compositional effects are just a reflective of the characteristics of individuals composing the neighbourhood or other setting (Arcaya, Arcaya and Subramanian, 2015). However, variations in health attributable to the health status of the individuals who are members in a given context are also defined as compositional effects (Kawachi, Subramanian and Almeida-Filho, 2002b). When the construction of a new specialised health care facility suddenly attracts a large number of chronically ill residents to move to that neighbourhood, the health status of residents in that neighbourhood in comparison to surrounding areas would be compositional. Social groupings such as classrooms, schools, neighbourhoods, states, hospitals, and other units of organisation can all exert contextual effects on health inequalities. A number of contextual factors (policies, infrastructural resources, and public support programmes) have been cited to affect health (Kawachi, Subramanian and Almeida-Filho,

2002b), therefore the latter contextual factors can be used as potential targets of interventions in reducing health inequalities.

From these discussions, it can be deduced that differentiation of compositional versus contextual effects is a fundamental step and of primary importance in arguing causal inferences on how settings impact health. In summary, knowing that health inequalities exist across contexts does not explain the existence of the differences. For instance, does living in high poverty neighbourhoods reduce skilled birth attendance? After taking individual-level risk factors into account, are there still variations in health outcomes across high and low poverty neighbourhoods? Furthermore, does neighbourhood poverty have the same health impact on all social groups, or are some at particular risk? Therefore, concentrated poverty and many other contextual characteristics may not just impact the average health of a community, but also health disparities between social groups (Kawachi, Subramanian and Almeida-Filho, 2002b).

1.2.4 Life-course perspective

Part B; Figure 2: The impact of socioeconomic status on health across the life course



Source; Adopted directly from Adler et al, (2009)

Part B; Figure 2 gives a diagrammatic illustration of the impact of socioeconomic status on health across the life course. The persistent and powerful impact of geography and social group membership on health cannot be ignored. It can be deduced that differences in early life and in *utero* circumstances may impact health later in life irrespective of subsequent life events, resulting in health inequalities among social groups (Krieger, 2001; Ben-Shlomo, 2002). This theoretical framework argues that there are critical or sensitive developmental periods during which health is affected in ways that cannot be completely reversed (Arcaya, Arcaya and Subramanian, 2015). Therefore, habits that develop early in life may influence the trajectory of one's health choices and also long-term exposure to conditions throughout a lifetime also affects health. Low-income earnings, for instance, may have a huge effect on individuals from lower socioeconomic class than on those from a higher class due to prolonged deprivation (Arcaya, Arcaya and Subramanian, 2015). This has the possibility of amplifying health effects of poverty.

In summary, the life course perspective theoretical framework acknowledges that health inequalities are also as a result of both prior and contemporary conditions, including in utero and childhood effects, and this framework recognises 3 major perspectives—the impact of latent (*health effects caused by prior conditions that impact later health, regardless of subsequent life events*), pathway (*health effects resulting from early life conditions, which continue to impact future behaviour and health*), and cumulative effects (*health effects resulting from long-term exposure to conditions that affect health*) on later health (Arcaya, Arcaya and Subramanian, 2015).

1.2.5 Conclusion

The aforementioned theoretical frameworks give a critical insight into the analysis of health inequalities, citing some of the essential attributes/factors to take in account in the analysis as researchers for instance; lagged exposures or parental occupation or childhood neighbourhood (residence) which might be crucial in explaining current health outcomes.

For this the researcher adopted the causal pathways and conditional health effects framework, as it explores health inequalities by identifying pathways hence assists in understanding better mechanisms by which health differences arise and avails wider options for designing policy solutions to skilled birth attendance for Zimbabwe.

2. Methodological literature review

Health inequalities can be measured using several approaches. In this section, the slope index of inequality (SII), relative index of inequality (RII), Gini coefficient & Lorenz curve and concentration index (CI) will be discussed in detail.

2.1 Slope index of inequality (SII) & Relative index of inequality (RII)

The slope index and relative index of inequality are regression-based indices. They are mostly used for the measurement of socioeconomic inequalities in epidemiologic health studies, for comparisons and quantification of socioeconomic gradient in relative and absolute terms (Moreno-Betancur *et al.*, 2015a). The aim of the latter approaches is to avail summary measures of the linear association between socioeconomic status and health in a way that enables validation between-populations being compared.

However, the validity of these indices in making comparisons of cross-populations relies on the use of socioeconomic rank (Moreno-Betancur *et al.*, 2015a).

The general norm when comparing health inequalities uses the 20/20 ratio (Khang *et al.*, 2019), which compares the top 20% to bottom 20% of a population relative to income distribution. The latter approach only assesses differences between income quintiles in health hence could be criticised as it does not reflect the patterns of health status in the middle (60%), obscuring the overall patterns of inequalities. However, the SII in health reflects the patterns of all social groups hence, could be desirable (Mackenbach and Kunst, 1997; Harper and Lynch, 2006; Howe, 2014)

In a nutshell, the SII explains the absolute effect on health of moving from the lowest socioeconomic status to the highest socioeconomic status while the RII expresses the ratio of estimated values of a health indicator of the most-advantaged to the most-disadvantaged or vice versa for health outcome indicators.

2.2 Gini coefficient & Lorenz curve

Lorenz curves and Gini coefficients avail the opportunity to measure inequalities in health variables in disregard of the socioeconomic dimension of the inequalities (Hernandez-Quevedo and Masseria, 2013). The Lorenz curve plots the cumulative proportion of population ranking individuals by their level of health from the sickest to the healthiest individual relative to the cumulative proportion of health. Gini coefficients capture the area between the 45-degree line, which represents perfect equality, and the Lorenz curve. However, the Lorenz curve and the Gini index do not account for the socioeconomic dimensions of health inequalities.

2.3 Concentration index

Concentration indices are widely used methods in measuring health inequalities, mainly due to the advantages associated with it. The index captures the socioeconomic dimension of health inequalities using information from the whole income distribution rather than just the extremes (Hernandez-Quevedo and Masseria, 2013). Related concepts of a concentration curve and index can measure the extent to which inequalities in health are related to indicators of socioeconomic status (e.g. *income or education*) (Wagstaff, Paci and van Doorslaer, 1991).

The concentration index is defined as a derivative of the concentration curve that can be used in identifying the existence of socioeconomic inequalities in some health sector variable, and only sensitive to relative inequalities (Moreno-Betancur *et al.*, 2015b). The index is defined by bounds of -1 and 1, with a negative (positive) value representing inequality 'favouring' the worse-off (better-off). A concentration curve explains the cumulative distribution of health in a population ranked by socioeconomic status and the concentration index (CI), measures the deviation from an equal distribution as (twice) the area between the concentration curve and the line of equality (Hernandez-Quevedo and Masseria, 2013).

2.4 Conclusion

For this study concentration indices and concentration curves were used in assessing socioeconomic inequalities in maternal health focusing on skilled birth attendance in Zimbabwe.

3. Empirical literature review

This section aimed to review studies that assessed socioeconomic inequalities in the utilisation of maternal health services to identify gaps and also discuss inequalities in the utilisation of maternal health services with the main focus on skilled birth attendance. Studies included in the review come from the following databases: ACADEMIC SEARCH PREMIER, ECONLIT, MEDLINE, AFRICA WIDE INFORMATION, PUBMED and CINAHL. The search terms included health inequalities and maternal health services or socioeconomic status or gender or age or geographical location. A manual search of the references from the included articles was also done to complement the review.

Studies had to be included on condition that they assessed inequalities in the utilisation of maternal health services. Studies that assessed socioeconomic inequalities in the utilisation of maternal health services were included because they also looked at determinants of health such as; employment status, level of education, geographical location and income status which were also of interest to this study.

A study was excluded from the process if English language was not used to write it, inaccessibility of full article, and if the paper did not focus on inequalities in the utilisation of maternal health services. Most of the studies were from low-income and middle-income countries. Regression analysis, decomposition and concentration indices were the most common methods used to measure socioeconomic inequalities among the studies included in the review.

3.1 Empirical findings

The literature shows the existence of limited access and utilisation of maternal health services in low-income countries, especially in sub-Saharan Africa (Kruk *et al.*, 2007; Jean-Christophe, Hildah, 2011; Alam *et al.*, 2015). Some studies revealed that at the country level, rural areas score less on the utilisation of maternal health services compared to urban areas (Babalola and Fatusi, 2009; López-Cevallos and Chi, 2010; Abor *et al.*, 2011; Silal *et al.*, 2012; Rutaremwa *et al.*, 2015).

High maternal mortality is associated with low utilisation of maternal health services. This is particularly the case in developing countries and rural areas where maternal mortality is high mainly due to low utilisation of maternal health services (Alam *et al.*, 2015). Several studies cited economic status and geographical location to be key determinants of maternal health services utilisation (Babalola and Fatusi, 2009; Dzakpasu, Powell-Jackson and Campbell, 2014; Mezmur *et al.*, 2017).

Factors influencing access and utilisation of maternal health services can be categorized into physical or infrastructural, professional, educational, social-cultural, and political (Weinhold and Gurtner, 2014). In Zimbabwe, inequalities in the utilisation of maternal health services are known to be pro-rich irrespective of geographical location with wealth and education cited to be key factors increasing inequalities in the utilisation of maternal health services in the country (Makate and Makate, 2017).

Few studies have been conducted on access and utilisation of maternal health services in Zimbabwe (Bour *et al.*, 2009; Makate and Makate, 2017; Ovikuomagbe, 2017; Bui *et al.*, 2018). Increasing socioeconomic gaps in the utilisation of maternal health services in Zimbabwe have been cited despite several interventions by the government to reduce them (Makate and Makate, 2017). There is, therefore, a need to design strategic policies that allow for inclusive access and utilisation of maternal health services in Zimbabwe and the latter can only be a success if more studies on socioeconomic inequalities in maternal health are available to inform policies.

Part B; Table 1: Summary of studies that assessed inequalities in utilisation of maternal health services

Author and year	**Title of the study**	**Country of study**	**Analytical methods**	**Type of study**	**Key explanatory variables**	**Results**
Alam Nazmul, Mohammad Hajizadeh, Alexandre Dumont, and Pierre Fournier (2015)	Inequalities in maternal health care utilisation in sub-Saharan African countries: A multiyear and multi-country analysis	Selected sub-Saharan African countries (Ethiopia, Madagascar, Uganda Cameroon, Zambia, and Zimbabwe)	Concentration indices Rate ratios	Cross-sectional	Geographical location Wealth status	Results revealed that in the countries which have made sufficient progress (i.e. Ethiopia, Madagascar, and Uganda), ANC use increased by 8.7%, 9.3% and 5.7%, respectively, while the utilisation of facility based delivery increased by 4.7%, 0.7% and 20.2% per cent, respectively, over the last decade. By contrast, utilisation of these services either plateaued or decreased in countries which did not make progress towards reducing maternal mortality, except for Cameroon. Utilisation of maternal care increased in all six countries but remained very low, with a high of 40.5% in Zimbabwe and a low of 16.1% in Cameroon as of 2011. In general, relative measures of inequalities were found to have declined over time in countries making progress towards reducing maternal mortality. In countries with insufficient progress towards maternal mortality reduction, these indicators remained stagnant or increased. Absolute measures for geographical and wealth-based inequalities remained high invariably in all six countries. The increasing trend in the utilisation of maternal care services was found to concur with a steady decline in maternal mortality. Relative inequality declined overtime in countries which made progress towards reducing maternal mortality.

Goli Srinivas, Dipty Nawal, Anu Rammohan, T.V. Sekher, and Deepshikha Singh (2018)	Decomposing the Socioeconomic inequality in utilisation of maternal health care services in selected countries of South Asia and sub-Saharan Africa	Bangladesh, Ethiopia, Nepal and Zimbabwe	Concentration indices	Cross-sectional	Socioeconomic status	The results showed that although the CI was negative for the selected indicators, meaning maternal health care was poorer among lower socioeconomic groups, the level of CI varied across the different countries for the same outcome indicator: CI of −0.1147, −0.1146, −0.2859 and −0.0638 for <3 antenatal care visits; CI of −0.1338, −0.0925, −0.1960 and −0.2531 for non-institutional delivery; and CI of −0.1153, −0.0370, −0.1817 and −0.0577 for no postnatal care within 2 days of delivery for Bangladesh, Ethiopia, Nepal and Zimbabwe, respectively. The marginal effects suggested that the strength of the association between the outcome and explanatory factors varied across the different countries. Decomposition estimates revealed that the key contributing factors for socioeconomic inequalities in maternal health care varied across the selected countries. The findings are significant for a global understanding of the various determinants of maternal health care use in high-maternal-mortality settings in different geographical and socio-cultural contexts.
Mezmur Markos, Kannan Navaneetham, Gobopamang Letamo, and Hadgu Bariagaber (2017)	Socioeconomic inequalities in the uptake of maternal healthcare services in Ethiopia	Ethiopia	Concentration index Concentration curves	Cross-sectional study	Socioeconomic status	This study revealed a general improvement in the uptake of maternal health services in Ethiopia over the past decade, which is inequitable to the disadvantage of the poor. Inequalities are much larger in care during giving birth than in other maternal healthcare indicators. Furthermore, despite the progress made in reducing inequalities in the uptake of at least four antenatal care consultation (ANC) and tetanus toxoid (TT) injection, inequalities in access to health facilities for delivery and skilled assistance during delivery have rather widened over the same period. In all the survey years, inequalities in education and media access significantly contribute to inequalities in maternal health service utilisation favouring the non-poor.
Maguranyanga Brian (2011)	Apostolic religion, health and utilisation of maternal and	Zimbabwe	Thematic analysis	Cross-sectional	Religion social structures	The findings of this study indicate that religion (religious beliefs, teaching, doctrine, regulation etc.) including its associated social structure (socio-cultural systems, organisational forms, education) is a key

	child health services in Zimbabwe					determinant of healthcare-seeking among Apostolic Christian groups
Memirie Solomon Tessema, Stéphane Verguet, Ole F Norheim, Carol Levin, and Kjell Arne Johansson (2016)	Inequalities in utilisation of maternal and child health services in Ethiopia: The role of primary health care	Ethiopia	Decomposition analysis concentration indices	Cross-sectional	Primary health care	Improvements in aggregate coverage have been observed for MCH interventions in Ethiopia (between 2005 and 2011). Wealth-related inequality has remained persistently high in all surveys. Socioeconomic factors were the main predictors of differences in maternal and child health services utilisation and child health outcome. Utilisation of primary care facilities for selected maternal and child health interventions showed marked pro-poor improvement over the period 2005-2011.
Muchabaiwa, Lazarus. Mudavanhu, D. Mazambani, L. Chigusiwa, S. Bindu, V. (2012)	Determinants of maternal healthcare utilisation in Zimbabwe	Zimbabwe	Logistic regression	Cross-sectional study	Socioeconomic Demographic Cultural factors	Secondary education increases the odds of use of maternal health services by at least 2 times at the 1 per cent level of significance while access to information increases the odds by 1.52 at the 5 per cent level of significance. Women in urban areas are more likely to give birth at healthcare facilities with an odds ratio of 3.49 compared to their rural counterparts at the 1 per cent significance level. Women from the highest income households are more likely to give birth at health facilities than those from poorest households with an odds ratio of 6.44 at the 1 per cent level of significance while the pattern is consistent for other services as well. Other important determinants are age, education, wealth, polygamy and religious affiliation. Generally, policymakers have to appreciate that these factors affect different maternal health services differently. Consequently, strategies to improve the uptake of maternal healthcare like mass media and health workers, particularly for disadvantaged sections of the population like rural areas and the uneducated, should be targeted at specific components rather than planning umbrella strategies.
Bui Ha Thi Thu Le, Thi Minh Van Pham, Tac Doan, Duong Thi Thuy	The association between gender inequalities	Vietnam	Multiple Logistic Regression	Cross-sectional study	Gender	The utilisation rate of maternal health services varied from 53.9% for ANC to 87.7% forever used a contraceptive method and 97% for institutional delivery. Ethnicity was identified as the most influential variable out of all sociodemographic

Nguyen, Duy Anh Nguyen, Canh Chuong Duong, Duc Minh (2018)	and women's utilisation of maternal health services: A cross-sectional survey in eight South central coast provinces, Vietnam.					determinants of health. Regarding gender inequalities, couple communication was the only variable having a significant association with women's utilisation of maternal health services. Women's equal role within the context of their daily life and relations with their husbands (discussing maternal care with husband and having an equal income to husband) supported their use of maternal health services. Therefore, there should be concerted efforts from all relevant stakeholders including the health system to focus on disadvantaged women in planning and delivery of maternal health services, especially to ethnic minority women. Male involvement strategy should be implemented to promote maternal health care, especially during the prenatal and postpartum period. To provide more culturally sensitive and right-based approaches in the delivery of maternal health services to disadvantaged women in Vietnam, interventions are recommended that promote male involvement, that is, to engage men in service delivery to adapt and ensure the most appropriate and effective maternal health care.
Makate, Marshall, and Clifton Makate (2017)	The evolution of socioeconomic status-related inequalities in maternal health care utilisation: evidence from Zimbabwe, 1994–2011	Zimbabwe	Decomposition analysis Concentration indices	Longitudinal study	Socioeconomic status	The computed concentration indices for professional delivery assistance and prenatal care reveal a mostly pro-rich distribution of inequalities between 1994 and 2011. Particularly, the concentration index [95% confidence interval] for the receipt of prenatal care was 0.111 [0.056, 0.171] in 2005/06 and 0.094 [0.057, 0.138] in 2010/11. For professional delivery assistance, the concentration index stood at 0.286 [0.244, 0.329] in 2005/06 and 0.324 [0.283, 0.366] in 2010/11. The pro-rich inequality was also increasing in both rural and urban areas over time. The decomposition exercise revealed that wealth, education, religion and information access were the underlying drivers of the observed inequalities in maternal health care. In Zimbabwe, socioeconomic disparities in maternal health care use are mostly pro-rich and have widened over time regardless of the location of residence.

						Overall, we established that inequalities in wealth and education are amongst the top drivers of the observed disparities in maternal health care. These findings suggest that addressing inequalities in maternal health care utilisation requires coordinated public policies targeting the poor and vulnerable segments of the population in Zimbabwe.

Whereas the majority of the studies (Part B; Table 1) that assessed inequalities in the utilisation of maternal health services included socioeconomic status, only one of them included geographical location as an aspect of assessing access and utilisation of maternal health services (Alam *et al.*, 2015). Socioeconomic inequalities in maternal health services were not favorable to individuals who stay far away from health centres and have inadequate money to travel to such centres (Alam *et al.*, 2015). Most of the studies (Bour *et al.*, 2009; Makate and Makate, 2017; Ovikuomagbe, 2017; Goli *et al.*, 2018) recognised socioeconomic status of a household to be the determinant for maternal health service access.

Other factors linked to inequities in maternal health service access include gender (Bui *et al.*, 2018), religion (Bour *et al.*, 2009) and health interventions/programmes like primary health care (Memirie *et al.*, 2016). Good relations between couples in a household increases opportunities for access and utilisation of maternal health services (Bui *et al.*, 2018). Bui *et al.* (2018) argue that such relations increase access to resources by women which can be transformed into maternal health services. On the other hand, religious beliefs and social structures influence the uptake of health services among groups within the community (Bour *et al.*, 2009). Primary health care interventions, if well designed to target, especially the poor, can enhance the utilisation of maternal health services (Memirie *et al.*, 2016).

These studies, therefore, reveal the following. Firstly, socioeconomic inequalities in the utilisation of maternal health services exist in low-income countries like Zimbabwe. Secondly, these inequalities are often pro-rich thus mostly the rich have better access to health care (Makate and Makate, 2017). Furthermore, the studies suggest that socioeconomic inequalities in the utilisation of maternal health services greatly vary by income status and geographical location.

Many studies (Makate and Makate, 2017; Mezmur *et al.*, 2017) revealed that maternal health services are likely to favour the rich than the poor. Makate and Makate (2017) acknowledge the need for more studies to support the design of effective and efficient policy interventions that can enhance the utilisation of maternal health services in countries like Zimbabwe.

3.2 Conclusion

Inequalities in the utilisation of maternal health services especially in low-income countries like Zimbabwe remains a significant public health concern. Evidence reveals huge inequalities between different groups of people based on factors like income level, religion, gender and geographical location in accessing maternal health services. There is still a need to undertake studies to strengthen knowledge regarding these inequities to design health interventions strategically. Moreover, in Africa, where more

than three-quarters of the human population resides in rural areas, such studies are handy. It is against this background that this study seeks to add on the existing knowledge regarding inequities in the utilisation of maternal health services in Zimbabwe.

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PART C: JOURNAL MANUSCRIPT

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Socioeconomic inequalities in skilled birth attendance in Zimbabwe: A comparative analysis

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1. Abstract

Background

This paper assessed socioeconomic inequalities in skilled birth attendance in Zimbabwe. High maternal mortality in low-income countries is a cause of concern globally. Skilled birth attendance prevents a substantial number of maternal deaths and it is critical for ensuring overall maternal health. However, sub-Saharan Africa is characterized by challenges in accessing skilled birth attendance. The existence of health inequalities has been demonstrated when simple comparisons are made by residence (rural-urban), education and wealth (poor-rich) in developing nations.

Methods

The study used data from the Zimbabwe Demographic and Health Surveys (ZDHS) of 2010/11 and 2015. The analysis focused on women of child-bearing age (15-49 years). Skilled birth attendance was determined by women assisted by health personnel with midwife training. Health personnel was defined as a nurse, midwife or doctor. A binary logistic regression model was computed to understand the relationship between skilled birth attendance, demographic attributes and some explanatory variables. Standard concentration curves and Wagstaff normalized concentration indices were used to assess whether skilled birth attendance was dominant among the poor or rich in Zimbabwe.

Results

Overall skilled birth attendance prevalence increased for the periods under review. Regression results showed that antenatal care visits, residence status, place of delivery, women level of education, employment status and marital status are statistically significant predictors of skilled birth attendance. Wagstaff normalized concentration indices of aggregated use of skilled birth personnel reflected that wealthy women were more likely to receive skilled birth attendance. The concentration curves for aggregated skilled birth attendance showed minimal existence of health inequalities, as the concentration curves almost coincided

with the line of equality. However, a disaggregated analysis by health personnel revealed the existence of health inequalities.

Conclusion

In summary, minimal socioeconomic inequalities exist if skilled birth attendance aggregated, but when assessed by different health personnel categories, widening socioeconomic inequalities are observed.

Keywords: Socioeconomic inequalities, concentration indices, maternal health, skilled birth attendance, Zimbabwe

2. Background

Globally, huge strides have been made in reducing maternal mortality. Between 1990 and 2015, there was a significant decline in maternal mortality by 44% [1]. However, the decline in maternal mortality was below the target set of the Millennium Development Goal (MDG) 5, which was to reduce maternal mortality globally by 75% by 2015.

Due to the failed target of MDG 5, the Sustainable Development Goal (SDG) 3 on health was born and it advocates for the reduction of global maternal mortality ratio (MMR) to less than 70 deaths per 100,000 live births by 2030 [2]. In the adoption of SDG 3, a critical progress indicator was identified with a bid to end preventable maternal mortality; namely; "proportion of births attended by skilled health personnel" (SDG indicator 3.1.2) [3–6].

In 2015, an estimated 303,000 maternal deaths occurred due to pregnancy and child-birth related complications [1]. A greater proportion of the 303,000 deaths occurred in sub-Saharan Africa [7], an estimated 162,000 women still die each year during pregnancy and childbirth, with majority of the deaths attributed to lack of access to skilled delivery attendants and emergency care [3,6,8,9].

Skilled birth attendants (SBA) are people with midwifery skills (doctors, midwives, nurses) trained to be competent in the skills necessary to manage normal deliveries and diagnose or refer obstetric complication [10]. Surprisingly, with all the benefits associated with using SBA, only about 50% of deliveries are attended by health personnel [11]. Without a doubt, sub-Saharan Africa has made little progress in increasing the proportion of skilled birth attendance in the past decades.

One of the nine basic principles of the World Health Organization's constitution stipulates that "the enjoyment of the highest attainable standard of health is a fundamental right for every human being without distinction of race, religion, political belief, economic or social condition"[8]. However, several countries, particularly developing nations, have reported widening health inequalities [12-17].

An inverse care law is argued to be dominating in developing nations. The inverse care law argues that, "those with the greatest need for health services are not getting a fair share of health services". An equity analysis of twelve key maternal and child health interventions in 54 countries showed, skilled birth attendance coverage to be the least equitable maternal indicator and also reported of a 52 % difference between the wealthiest and poorest population quintiles [18]. The variations in access to skilled birth

attendance are always mirrored or revealed in maternal mortality; however, maternal deaths continue to be concentrated among poor women [19].

Part C:Table 1; Income, urban/rural and education differentials by skilled personnel at birth in Zimbabwe

% birth attended by skilled personnel	Past periods *(1980-2008)*		Latest reported to date	
	Level	**Year**	**Level**	**Year**
	69.2	1994	52.0	2009
	72.5	1999	66.2	2010/11
	68.5	2005/6	80	2014
Urban: rural ratio	1.70	2005/6	1.48	2010/11
Highest to lowest wealth quintile ratio	2.07	2005/6	2.38	2010/11
Highest to lowest mother's education ratio	2.85	2005/6	2.44	2010/11

The proportion of women of childbearing age attended by skilled birth from the '80s has been fluctuating with the highest proportions recorded in 2014 [80%] and the lowest recorded in 2009 [52%] (Part C: Table 1). However, there has been a significant decline in the urban-rural ratios and highest lowest mother's education ratios in relation to skilled birth attendance in Zimbabwe since the '80s, while the highest to lowest wealth quintile ratio significantly increased (Part C; Table 1).

As of 2010/11 statistics in Zimbabwe, ten women died every day of pregnancy-related complications [20]. Zimbabwe health system over the years has suffered from high maternal mortality attributed to health service issues such as; limited availability of skilled birth attendants at first referral level, limited access to health facilities and transport, unwanted teenage pregnancies, abortion complications, social attitudes and inadequate services to address gender violence [21–26].

Informed by arguments reviewed in the literature on maternal health, this study conducted a comparative analysis on socioeconomic inequalities in skilled birth attendance in Zimbabwe.

3. Methods

3.1 Data sources

The study used data from the Zimbabwe Demographic and Health Surveys (ZDHS) of 2010/11 and 2015. The ZDHS samples were nationally representative with a sample of more than 11,000 households obtained from each of Zimbabwe's ten provinces (***Manicaland, Mashonaland Central, Mashonaland East, Mashonaland West, Matabeleland North, Matabeleland South, Midlands, Masvingo, Harare, and Bulawayo***). The data sets used the 2002 and 2012 population censuses sampling frames, respectively.

3.2 Study population

The study population was composed of women of child-bearing age (15-49 years) interviewed in 2010/11 and 2015, while population samples were 4,251 (in 2010/11) and 4,643 (in 2015).

3.3 Data analysis

Stata version 13.1 (Stata Corp, Texas, United States) was used for data management, data exploration and analysis in this study. Chi-square tests were used to assess the difference between skilled birth prevalence and household wealth, residence type, antenatal care visits, age groups and other background characteristics. The study computed a binary logistic regression using skilled birth attendance, a dichotomous variable as the dependant variable. Binary logistic regression is known to be most useful when the dependent variable is dichotomous [27].

Since skilled birth attendance was binary, the study adopted the Wagstaff normalized index (W(h)). The study opted to use the normalised formulae as, Wagstaff, (2005) argued that normalization of the health concentration index formula ensures remedying the bounds issue for a binary cardinal health variable. The Wagstaff normalized index (W(h)) can be expressed as:

$$W(h) = \frac{\mu_n(b_n - a_n)}{(b_n - \mu_n)(\mu_n - a_n)} C(h)$$

C(h) is denoted by;

$$C(h) = 1 - \frac{\sum_{i=1}^{n}(2\gamma_i - 1)h_i}{n^2\mu_n}$$

γ_ii denotes socioeconomic position, with the best well-off individual ranked first and the least well-off individual ranked last

h_i denotes real number which measures the health status

μ_n denotes the average health of the population

a_n, b_n denotes defined lower and upper limits

n denotes a given individual in a population N

The Wagstaff health concentration index (W(h)) measures socioeconomic inequalities in health based upon information on the socioeconomic ranks and the health levels of all individuals in the population [29]. The W(h) values range from -1 and +1 and tackle the bounds issue by stretching the index in such a way that it always has a uniform range. A positive value of W(h) indicates that health is distributed in favour of the rich (+1), and a negative one that it is distributed in favour of the poor (-1). The higher the absolute value of the index, the more extreme the pro-rich or pro-poor character of the distribution is supposed to be.

Concentration curves were computed to present a graphical picture of the concentration indices. Concentration curves are derivatives of concentration indices and they rank the variable of interest (e.g. skilled birth attendance) by socioeconomic status [30].

4. Results

4.1 Descriptive statistics

Sample size and overall prevalence for 2010/11 and 2015 were: 4,278; overall skilled birth attendance prevalence [90.78%] and 4,785 women; overall skilled birth attendance prevalence [94.57%] respectively. For the periods under review overall skilled birth attendance prevalence increased by 3.79 percentage points (**p.p**), while among women who had attended at least 4 antenatal care visits, skilled birth attendance prevalence increased by 14.1**p.p** and lastly rural women experienced a sharp decline of 2.92**p.p** in the SBA prevalence (*Part C; Table 2*).

Part C:Table 2: Percentage prevalence of skilled birth attendance across demographic characteristics

Skilled birth attendance determinants	**2010/11**	**2015**
Antenatal care		
<4ANC visits	50.61***	36.63***
>4ANC visits	49.39***	63.37***
Postnatal care		
No PNC	36.00***	12.43***
Attended PNC	64.00***	87.57***
Household wealth		
Poor	42.74**	34.88***
Middle	17.90**	15.71***
Rich	39.36**	49.42***
Women's education		
No education	1.87***	0.89***
Primary	30.71***	27.38***
Secondary	64.46***	65.40***
Tertiary	2.96***	6.34***
Place of delivery		
Home	24.92***	9.48***
Health facility	75.08***	90.52***
Residence status		
Urban	30.37	40.23***
Rural	69.63	59.77***
Household head sex		
Male	56.14	62.46**
Female	43.86	37.54**
Women's age groups		
15-24yrs	35.67**	31.98
25-34yrs	47.88**	47.82
35-44yrs	15.41**	19.06
45-49yrs	1.04**	1.14
Marital status		
Not married	16.08	16.78
Married	83.92	83.22
Employment status		
Unemployed	59.29**	48.64
Employed	40.71**	51.36
*** p<0.01, ** p<0.05, * p<0.1		

There was a significant increase in skilled birth attendance prevalence of; 13.98, 23.57 and 15.44 percentage points (p.p) among women who had at least four antenatal care visits, attended postnatal care and delivered in at a health facility between the two time periods (Part C: Table 2). However, the results also show significant diclines in skilled birth attendance among poor (7.86p.p), rural (9.86) women for the period under review (Part C: Table 2). In general skilled birth attendance was highest among women with secondary education, attended postnatal care, aged between 24-34 years and delivered at health facilities.

Part C:Table 3; Binary logistic regression of skilled birth attendance for 2010/11 and 2015

Skilled birth attendance determinants	**2010/11**	**2015**
Antenatal care		
<4ANC visits	ref	ref
>4ANC visits	67.04*** (32.72)	79.14*** (34.62)
Postnatal care		
No PNC	ref	ref
Attended PNC	2.592*** (0.332)	8.013*** (1.135)
Household wealth		
Household wealth	1.000 (1.34e-06)	1.000** (1.62e-07)
Women's education		
No education	ref	ref
Primary	0.710 (0.350)	0.353 (0.230)
Secondary	0.960 (0.475)	0.488 (0.318)
Tertiary	1.266 (1.012)	3.238 (5.101)
Place of delivery		
Home	ref	ref
Health facility	1.789*** (0.239)	2.442*** (0.400)
Residence status		
Urban	ref	ref
Rural	1.746*** (0.331)	1.501 (0.446)
Household head sex		
Male	ref	ref
Female	0.953 (0.124)	0.554*** (0.0821)
Women's age		
Women's age	1.026*** (0.00995)	1.005 (0.0106)
Marital status		
Not married	ref	ref
Married	1.226 (0.217)	0.623** (0.130)
Employment status		
Unemployed	ref	ref
Employed	1.239* (0.160)	0.619*** (0.0889)

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

In 2010/11 older (1.03), employed (1.24), rural (1.75), women who attended postnatal care (2.59) were more likely to receive skilled birth attance while, women who had at gone for at least four antenatal care visits (67.04) were less likely to be attended by a skilled birth attendant (Part C; Table 3). In 2015, women who attended postnatal care (8.01) and delivered at a health facility (2.44) were more likely to be attended by a skilled birth attendant (Part C;Table 3). However, employed (0.62), married (0.62),women with at least four antenatal care visits (79.14) and from female headed households (0.55) were less likely to receive skilled birth attendance.

4. Concentration indices

Part C:Table 4; Wagstaff normalized indices of skilled birth attendance, doctor-assisted, nurse mid-wife and nurse

	Period	***Wagstaff normalized indices (W(h))***	***$\{(W(h))_{2015} - (W(h))_{2010/11}$***
SBA	2010/11	0.0884*** (0.0306)	**0.1658↑**
	2015	0.2542*** (0.0372)	
Doctor-assisted	2010/11	0.4207*** (0.0290)	**0.0502↑**
	2015	0.4709 (0.0243)	
Midwife assisted	2010/11	0.1456*** (0.0213)	**-0.0198↓**
	2015	-0.1258*** (0.0187)	
Nurse assisted	2010/11	-0.1590*** (0.0199)	**-0.1088↓**
	2015	0.0502** (0.0204)	

All the concentration indices computed in this study were statistically significant at the 95% confidence interval (Part C: Table 4). Wagstaff normalised indices for skilled birth attendance (SBA) were all positive (pro-rich) [2010/11 (W(h) = 0.0875), 2015 (W(h) = 0.2563)] (Part C: Table 4). Favouring women who are well-off (wealthy). Thus, wealthy women were more likely to have skilled birth attendance.

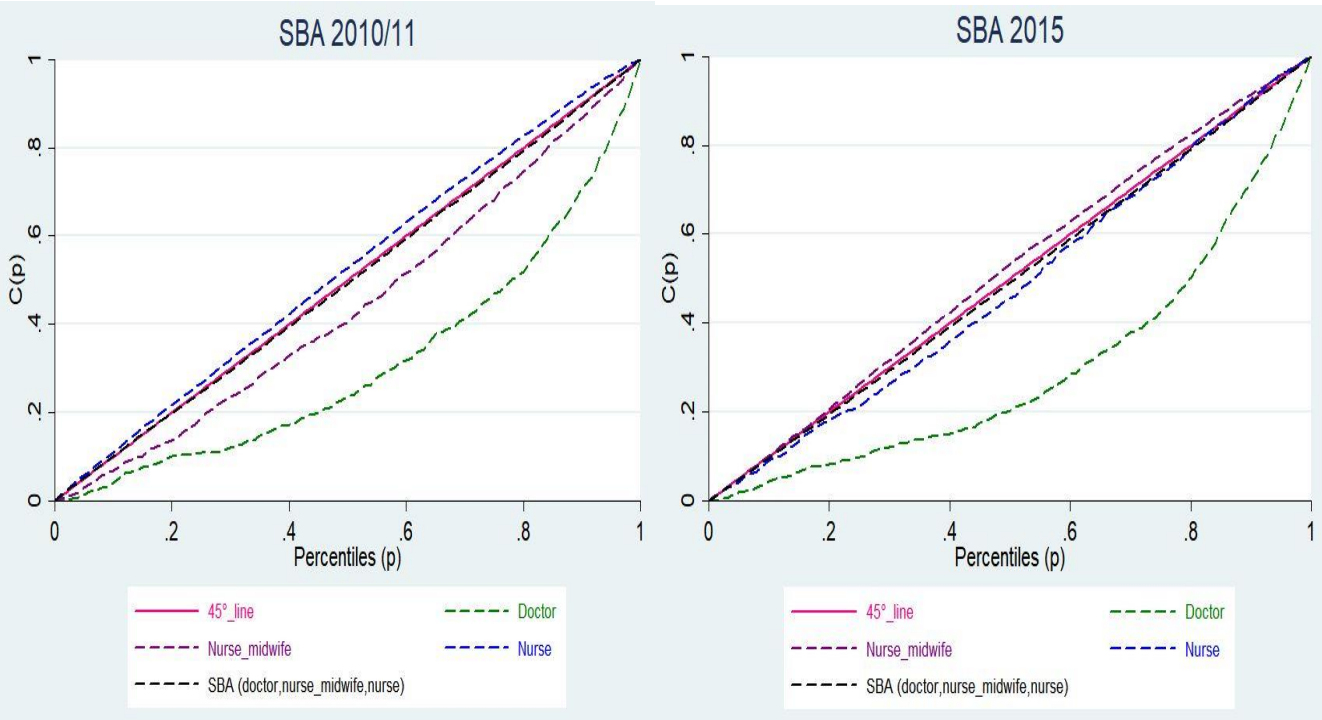
For women assisted by a doctor, the indices were both positive, translating to a pro-rich distribution [2010/11 (W(h) = 0.4210), 2015 (W(h) = 0.4710)] (Part C: Table 4). Wealthy women were more likely to be assisted by a doctor during delivery. For women assisted by a midwife in both periods the indices were negative [2010/11 (W(h) = -0.1248), 2015 (W(h) = -0.1578)] (Part C: Table 4), thus pro-poor. This translates to poor women being less likely to have skilled birth attendance in both periods.

Poor women were less likely to be assisted by a nurse in 2010/11, as the concentration index was negative (pro-poor) [2010/11 (W(h) = -0.1578) (Part C: Table 4). However, in 2015 the index was positive (W(h) =

0.0501)] (Part C: Table 4), thus pro-rich meaning wealthy women were more likely to be assisted by a nurse.

Overall, Wagstaff's normalised concentration index absolute differences of aggregated skilled birth attendance, reported an increase [0.1688] (Part C: Table 4). This was also true for the disaggregate skilled birth attendance, as all 3 indices for doctor-assisted, midwife and nurse increased [0.050, 0.0183 and 0.1077].

Part C: Figure 1a,1b: Concentration curves for skilled birth attendance by health personnel, 2010/11 and 2015



The concentration curves concurred with the findings of the concentration indices. As in 2010/11, doctors and midwives were more likely to assist wealthy people (pro-rich), while nurses were more likely to assist wealthy women (pro-rich). (Part C; Figure 1a). Also in 2015, the concentration curve concurred with concentration indices as nurses and doctors were more likely to assist wealthy women, while midwives were less likely to assist poor women (Part C; Figure 1b).

5. Discussion

The main aim of this study was to demonstrate the existence of socioeconomic inequalities in the use of SBA and assess changes in socioeconomic inequalities of skilled birth attendance in Zimbabwe. The findings showed that skilled birth attendance was prevalent among young educated women residing in rural areas. The findings were consistent with other studies that showed wealthy women being more likely to access skilled birth personnel than the worse off (poorer) [21,31–38].

Greater proportions of skilled birth attendance (SBA) prevalence among rural women reflected in this study concur with arguments posed by some African researchers who cited the disappearance of the so-called 'urban advantage' in light of the high levels of urban poverty [39].

Also, SBA prevalence across women age groups was consistent with the findings from the Tharaka-Nithi County Kenyan study [40]. However, the prevalence of skilled birth attendance was highest among poor unemployed women attending less than 4 ANC visits in 2010/11; a result that was inconsistent with other study findings which argue for the existence of an inverse relationship between socioeconomic status and health. This is the case where those that are worse-off in terms of power, knowledge and wealth are also worse-off in terms of health [41–43].

The study shows minimal differentials in the socioeconomic inequality in skilled birth attendance among women of childbearing age between 2010/11 and 2015 as the concentration indices are very similar. However, when the inequalities are assessed by health personnel (*assisted by; doctor, nurse or midwife*), a clearer picture emerges. A doctor mostly assisted rich women in 2010/11 and 2015, a midwife in 2010/11 and a nurse in 2015. These results are similar to those of other studies that argued that socioeconomic disparities in maternal health care use are mostly pro-rich [25,44–47].

Majority of developing countries are advocating for the reduction of maternal deaths through the use of antenatal clinics, immunization, and insistence to deliver in health facilities to ensure SBA [18,33–35,37,48–50]. Reviewed literature arguing for institutional birthing and/or skilled attendance at birth, which is a colorful dream for the majority of rural women in Zimbabwe [24].

Results from this study show a totally different picture altogether as rural women accounted for a greater proportion of skilled birth attendance to their urban counterparts. Socio-economic inequalities are still dominant among the poor as reflected in the study results. Even though the skill birth attendance prevalence was higher in rural areas, it was still concentrated among the rich, educated and employed women.

6. Study strengths and limitations

The study used latest data sets of the Zimbabwe DHS which gives a better status or reflection of the most current scenario in relation to skilled birth attendance in Zimbabwe hence, availing more sound evidence in informing maternal health policies in Zimbabwe. Also, little has been done on maternal health and its relation to socio-economic status in Zimbabwe. So, the study's methodology provides a detailed analysis of disaggregated skilled birth assistance by health personnel, hence reports a detailed picture of health inequalities in relation to skilled birth attendance.

However, DHS data sets are composed mainly of responses based on self-reported data which might not reflect actual attributes (socio-economic status, education…) of women under review. For future research; undertaking a study that uses actual income earned on the wealth index would reflect better results on socio-economic status and its relation to skilled birth attendance.

7. Conclusion

This paper demonstrated the existence of socioeconomic inequalities in skilled birth attendance, especially by health personnel. Interestingly, the prevalence of skilled birth attendance was high among rural women. These findings may well indicate the public health gains resulting in reducing maternal inequalities among

rural women. Still, there is a need for continuous maternal health policy reforms which strongly advocates for skilled birth attendance and health facility deliveries in Zimbabwe.

Abbreviations

ANC - Antenatal care

CC- Concentration curve

MDG- Millennium Development Goals

SDG- Sustainable Development Goals

SES – Socioeconomic status

SBA - Skilled birth attendance

p.p- percentage points

ZDHS - Zimbabwe Demographic Health Survey

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Availability of data and materials

All data sets are publicly available on the Demographic Health Survey website at (https://dhsprogram.com/what-we-do/survey/survey-display-406.cfm) and can be accessed upon request from the Demographic Health Survey team.

Authors' contributions

ATL designed the study, wrote the paper, analysed results, reviewed the paper and submitted it for publication.

Ethics approval and consent to participate

This study used secondary analysis based on publicly available DHS datasets. However, ethics approval was obtained from the Human Research Ethics Committee (HREC) at the University of Cape Town (HREC REF: 570/2019).

Competing interests

No competing interests between the authors

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PART D: POLICY BRIEF

Disparities in the use of maternal health services in Zimbabwe

- **Avail more access opportunities for poor women**-our study showed that even though skilled birth attendance proportion increased in the rural areas, it was still dominant among wealthy educated women
- **Formation of a coalition between ministry of health and other ministries**-considering that level of education increased the chances of women having skilled birth attendance. It would be ideal to collaborate with ministries such as arts and culture or education in designing educational entertainment programs on maternal health.
- **Providing incentives to encourage antenatal care visits**-our study results also showed that women with more than four antenatal care visits had better chances of having skilled birth attendance
- **Investing in maternal health research**- also our study results showed that rural women had better chances of skilled birth attendance against urban women. However, Zimbabwes' health system has health personnel concentrated in the urban. Therefore, there is need to further investigate

Disparities in the use of maternal health services

Around the world, low utilisation of maternal health services and increasing maternal mortality in developing countries are cited as threats in ensuring sustainable health systems. Skilled birth attendance is the core of maternal health; however, in sub-Saharan Africa, there is very minimal access to skilled birth attendance in many countries. Sub-Saharan Africa (SSA) alone contributed to most of the maternal mortality globally in 2007; recording 920 deaths per 100,000 live births, with an estimated 162,000 women still dying each year during pregnancy and childbirth. The majority of the deaths are caused by a lack of access to skilled delivery attendants and emergency care.

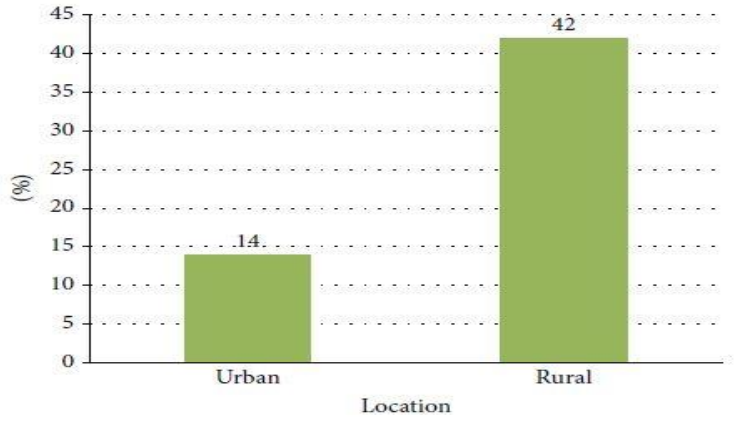
Research evidence argues that births without skilled personnel and access to life-saving medication to be an acceptable norm among millions of mothers belonging to the lowest socioeconomic class. Lowest socioeconomic class maternal statistics are characterised by high mortality and morbidity rates globally. Zimbabwe is no exception as to date it is characterised with vast social and geographical disparities existing in health indicators and health services. Health care in Zimbabwe exists in many forms as it is composed of western biomedicine, faith healing, patent medicine shops, and traditional medicine coexisting in one space with those seeking health care faced with many such options.

A number of maternal health targeting polices have been rolled out by the Ministry of Health and Child Care in Zimbabwe since independence. For instance, the National Reproductive Health policy, National Health Strategy 2009–2013 and Zimbabwe National Maternal and Neonatal Health Road Map 2007–2015 are frameworks that reflect such efforts.

However, even after such frantic efforts, the prevalence of home births has remained high with rural women, especially among the poor depending more on traditional birth attendance for assistance during delivery. Majority of the skilled birth attendant personnel are based in urban areas; as a result, rural areas record the highest percentage of home births compared to urban areas in Zimbabwe as presented by Part D;Figure 1.

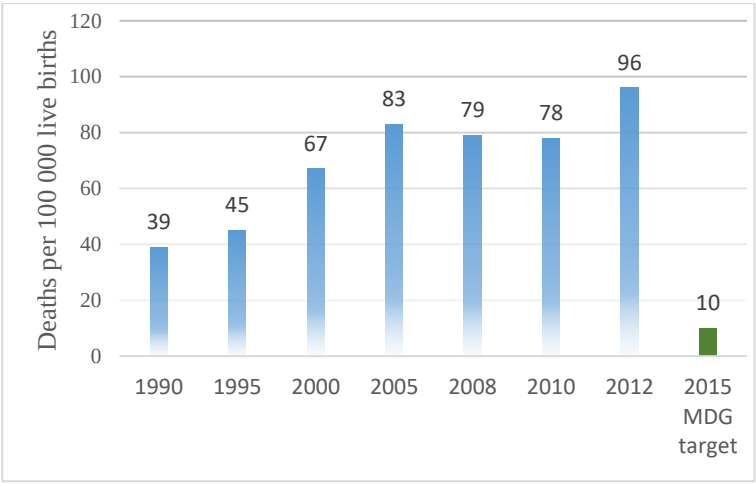
As of 2010/11 statistics of Zimbabwe, ten women died every day of pregnancy-related complications. For sub-Saharan Africa and Zimbabwe in particular, high maternal and infant mortality rates have been attributed to the use of unskilled personnel.

Part D; Figure 1: Rural-urban distribution of home births



Source: Zimbabwe Demographic Health Survey (2011)

Part D; Figure 2: Maternal mortality trend in Zimbabwe



Source: WORLD BANK (2011), GONDA (2012)

PART D; Figure 2 shows maternal mortality gradually increasing over the periods presented with a few successive years when they were marginal declines in the deaths per million.

Ministry of Health and Child Care of Zimbabwe reported an increase in the underutilization of the public health services, yet it is the major supplier of health care. As the global community is pushing for health access for all, it can be deduced that indeed maternal health poses a significant threat to universal health coverage in Zimbabwe. Statistics globally for developing countries show that skilled birth attendance is an issue of significant concern especially to the universal health coverage framework, hence there is a need to ensure a reduction in disparities in maternal health service use in Zimbabwe.

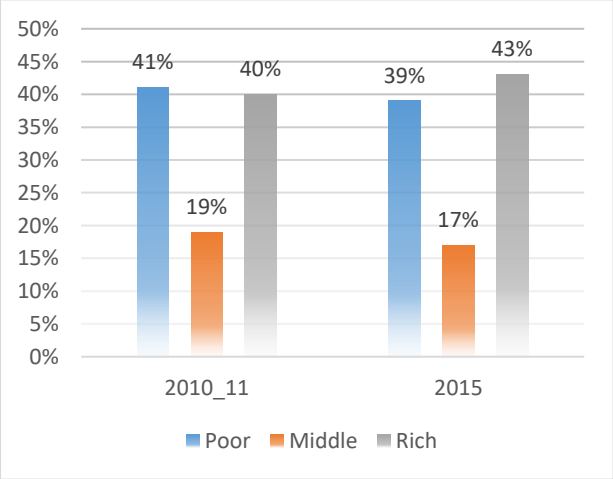
Importance of reducing disparities in maternal health service use

Skilled-personnel attendance at birth to date is still among key indicators for assessing progress in maternal health. Also, apart from promoting social justice, research has shown that reducing disparities in health has economic gains. Therefore, ensuring health access for all reduces direct and indirect costs associated with maternal health service use.

Research evidence

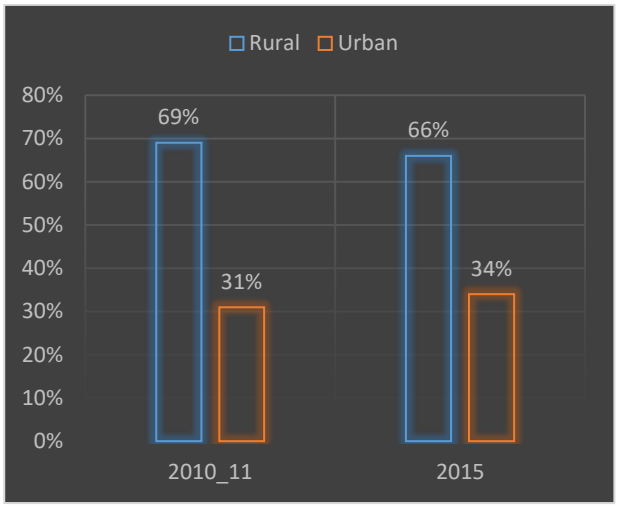
Results from our study showed a decline in the prevalence of skilled birth attendance among the poor by 2% between the two periods while among the rich it increased by 3% (Part D;Figure 3) and also the prevalence of skilled birth attendance among rural women declined by 3% with urban women gaining the same margin. Such results are worrisome considering that Zimbabwe is also participating in the universal health coverage mantra ensuring health access for all. Disadvantaged populations seem to be continually facing challenges in accessing maternal health care in relation to skilled birth attendance.

Part D; Figure 3: Prevalence of skilled birth attendance by socioeconomic class for 2010/11 and 2015



Source: Own computations

Part D; Figure 4: Prevalence of skilled birth attendance by residence for 2010/11 and 2015



Source: Own computations

Very small disparities exist in in the use of skilled birth attendance between the poor and the rich. However, when skilled birth attendance was disaggregated by type, it showed that rich women had better access to highly skilled health personnel such as doctors compared to poor women.

Policy recommendations

There is need to now assess skilled birth attendance by health personnel, as lumping the analysis does not give a detailed picture of existence of health inequalities. We recommend a number of tools which can be used in reducing health inequalities in skilled birth attendance.

There is a need to:

- Incentivise pregnant women to come for antenatal care visits. It can be done on reimbursement basis, were at each visit on is reimburse transport costs to health facility
- Considering that education is an important attribute to skilled birth attendance. The Ministry of Health and Child Care can put more funding in social behavioural activities such as, dramas, road shows or community meetings
- An also important aspect is investing in maternal health research. Especially qualitative studies so that there is detailed evidence to support informed policy decisions as to why women are not having skilled birth attendance. It is important to capture thoughts from both parties the health personnel and the consumers (pregnant women)

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PART E: APPENDICES

Part E; Appendix 1: Plagiarism declaration

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23 August 2019

HREC REF: 570/2019

A/Prof J Ataguba
School of Public Health & Family Medicine
Falmouth Building-FHS

Dear A/Prof Ataguba

PROJECT TITLE: INEQUALITIES IN THE UTILIZATION OF MATERNAL HEALTH SERVICES IN ZIMBABWE (MPH candidate - MR A T LUKWA)

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

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 August 2020.

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)

The HREC acknowledge that the student: Mr Akim Lukwa 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

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401	CHECK 224: ONE OR MORE BIRTHS IN 2005 OR LATER ☐ ↓ / NO BIRTHS IN 2005 OR LATER ☐ → 556			
402	CHECK 215: ENTER IN THE TABLE THE BIRTH HISTORY NUMBER, NAME, AND SURVIVAL STATUS OF EACH BIRTH IN 2005 OR LATER. ASK THE QUESTIONS ABOUT ALL OF THESE BIRTHS. BEGIN WITH THE LAST BIRTH. (IF THERE ARE MORE THAN 3 BIRTHS, USE LAST 2 COLUMNS OF ADDITIONAL QUESTIONNAIRES). 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 ☐☐	SECOND-FROM-LAST BIRTH BIRTH HISTORY NUMBER ☐☐
404	FROM 212 AND 216	NAME _____ LIVING ☐ DEAD ☐	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 430) ← NO 2	YES ..... 1 (SKIP TO 430) ← NO 2
406	Did you want to have a baby later on, or did you not want any (more) children?	LATER ..... 1 NO MORE ..... 2 (SKIP TO 408) ←	LATER ..... 1 NO MORE ..... 2 (SKIP TO 430) ←	LATER ..... 1 NO MORE ..... 2 (SKIP TO 430) ←
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	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 415) ←		
409	Whom did you see? Anyone else? PROBE TO IDENTIFY EACH TYPE OF PERSON AND RECORD ALL MENTIONED.	HEALTH PERSONNEL DOCTOR ..... A NURSE MIDWIFE B NURSE ..... C OTHER PERSON TRADITIONAL BIRTH ATTENDANT D VILLAGE HEALTH WORKER ... E OTHER _____ X (SPECIFY)		

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____	SECOND-FROM-LAST BIRTH NAME _____
410	Where did you receive antenatal care for this pregnancy? Anywhere else? PROBE TO IDENTIFY TYPE(S) OF SOURCE(S). IF UNABLE TO DETERMINE IF PUBLIC OR PRIVATE SECTOR, WRITE THE NAME OF THE PLACE. _____ (NAME OF PLACE(S))	HOME YOUR HOME . . . A OTHER HOME . . . B PUBLIC SECTOR CENTRAL HSP C PROVINCIAL HOSPITAL . . . D DISTRICT HSP . . . E RURAL HSP . . . F URBAN MUNCPL CLINIC . . . . . G RURAL HEALTH CENTRE . . . . . H OTHER PUBLIC SECTOR _____ I (SPECIFY) MISSION HSPV CLINIC . . . . . J PRIVATE MED. SECTOR PVT. HOSPITAL/ CLINIC . . . . . K OTHER PRIVATE MED. SECTOR _____ L (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: Was your blood pressure measured? Did you give a urine sample? Did you give a blood sample?	YES NO BP . . . . . 1 2 URINE . . . . . 1 2 BLOOD . . . 1 2		
414	During (any of) your antenatal care visit(s), were you told about things to look out for that might suggest problems with the pregnancy?	YES . . . . . 1 NO . . . . . 2 DON'T KNOW 8		
415	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 418) ← DON'T KNOW 8		

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ______	NEXT-TO-LAST BIRTH NAME ______	SECOND-FROM-LAST BIRTH NAME ______
426	CHECK 425: SP/FANSIDAR TAKEN FOR MALARIA PREVENTION.	CODE 'A' CIRCLED ☐ CODE 'A' NOT CIRCLED ☐ (SKIP TO 430)		
427	How many times did you take (SP/Fansidar) during this pregnancy?	TIMES ..... ☐☐		
428	CHECK 409: ANTENATAL CARE FROM HEALTH PERSONNEL DURING THIS PREGNANCY	CODE 'A', 'B' OR 'C' CIRCLED ☐ OTHER ☐ (SKIP TO 430)		
429	Did you get the (SP/Fansidar) during any antenatal care visit, during another visit to a health facility or from another source?	ANTENATAL VISIT ... 1 ANOTHER FACILITY VISIT .... 2 OTHER SOURCE 6		
430	When (NAME) was born, was he/she very big, bigger than average, average, smaller than average, or very small?	VERY BIG ...... 1 BIGGER THAN AVERAGE ...... 2 AVERAGE .... 3 SMALLER THAN AVERAGE ...... 4 VERY SMALL ...... 5 DON'T KNOW 8	VERY BIG ...... 1 BIGGER THAN AVERAGE ...... 2 AVERAGE .... 3 SMALLER THAN AVERAGE ...... 4 VERY SMALL ...... 5 DON'T KNOW 8	VERY BIG ...... 1 BIGGER THAN AVERAGE ...... 2 AVERAGE .... 3 SMALLER THAN AVERAGE ...... 4 VERY SMALL ...... 5 DON'T KNOW 8
431	Was (NAME) weighed at birth?	YES .... 1 NO .... 2 (SKIP TO 433) DON'T KNOW 8	YES .... 1 NO .... 2 (SKIP TO 433) DON'T KNOW 8	YES .... 1 NO .... 2 (SKIP TO 433) DON'T KNOW 8
432	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	KG FROM CARD 1 ☐.☐☐☐ KG FROM RECALL 2 ☐.☐☐☐ DON'T KNOW 99998

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME ______	NEXT-TO-LAST BIRTH NAME ______	SECOND-FROM-LAST BIRTH NAME ______
433	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 NURSE .... C OTHER PERSON TRADITIONAL BIRTH ATTENDANT D VILLAGE HEALTH WORKER .... E OTHER PERSON RELATIVE/FRIEND F OTHER ______ X (SPECIFY) NO ONE ASSISTED Y	HEALTH PERSONNEL DOCTOR .... A NURSE MIDWIFE B NURSE C OTHER PERSON TRADITIONAL BIRTH ATTENDANT D VILLAGE HEALTH WORKER .... E OTHER PERSON RELATIVE/FRIEND F OTHER ______ X (SPECIFY) NO ONE ASSISTED Y	HEALTH PERSONNEL DOCTOR .... A NURSE MIDWIFE B NURSE C OTHER PERSON TRADITIONAL BIRTH ATTENDANT D VILLAGE HEALTH WORKER .... E OTHER PERSON RELATIVE/FRIEND F OTHER ______ X (SPECIFY) NO ONE ASSISTED Y
434	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 YOUR HOME .... 11 (SKIP TO 438) OTHER HOME .... 12 PUBLIC SECTOR CENTRAL HSP 21 PROVINCIAL HOSPITAL .... 22 DISTRICT HSP 23 RURAL HSP .... 24 URBAN MUNCPL CLINIC ...... 25 RURAL HEALTH CENTRE ...... 26 OTHER PUBLIC SECTOR ______ 27 (SPECIFY) MISSION HSP/CLIN 31 PRIVATE MED. SECTOR PVT. HOSPITAL/ CLINIC .... 41 OTHER PRIVATE MED. SECTOR 46 ______ (SPECIFY) OTHER ______ 96 (SKIP TO 438)	HOME YOUR HOME .... 11 (SKIP TO 448) OTHER HOME .... 12 PUBLIC SECTOR CENTRAL HSP 21 PROVINCIAL HOSPITAL .... 22 DISTRICT HSP 23 RURAL HSP .... 24 URBAN MUNCPL CLINIC ...... 25 RURAL HEALTH CENTRE ...... 26 OTHER PUBLIC SECTOR ______ 27 (SPECIFY) MISSION HSP/CLIN 31 PRIVATE MED. SECTOR PVT. HOSPITAL/ CLINIC .... 41 OTHER PRIVATE MED. SECTOR 46 ______ (SPECIFY) OTHER ______ 96 (SPECIFY) (SKIP TO 448)	HOME YOUR HOME .... 11 (SKIP TO 448) OTHER HOME .... 12 PUBLIC SECTOR CENTRAL HSP 21 PROVINCIAL HOSPITAL .... 22 DISTRICT HSP 23 RURAL HSP .... 24 URBAN MUNCPL CLINIC ...... 25 RURAL HEALTH CENTRE ...... 26 OTHER PUBLIC SECTOR ______ 27 (SPECIFY) MISSION HSP/CLIN 31 PRIVATE MED. SECTOR PVT. HOSPITAL/ CLINIC .... 41 OTHER PRIVATE MED. SECTOR 46 ______ (SPECIFY) OTHER ______ 96 (SPECIFY) (SKIP TO 448)
435	Was (NAME) delivered by caesarean, that is, did they cut your belly open to take the baby out?	YES .... 1 NO 2	YES .... 1 NO 2	YES .... 1 NO 2
436	After you gave birth to (NAME), did anyone check on your health while you were still in the facility?	YES .... 1 (SKIP TO 439) NO 2		

NO.	QUESTIONS AND FILTERS	LAST BIRTH NAME _____	NEXT-TO-LAST BIRTH NAME _____	SECOND-FROM-LAST BIRTH NAME _____
437	Did anyone check on your health after you left the facility?	YES . . . . . 1 (SKIP TO 439) NO . . . . . 2 (SKIP TO 446)		
438	After you gave birth to (NAME), did anyone check on your health?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 442)		
439	Who checked on your health at that time? PROBE FOR MOST QUALIFIED PERSON.	HEALTH PERSONNEL DOCTOR . . . . . 11 NURSE MIDWIFE 12 NURSE . . . . . 13 OTHER PERSON TRADITIONAL BIRTH ATTENDANT 21 VILLAGE HEALTH WORKER . . . 22 OTHER _____ 96 (SPECIFY)		
440	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		
441	CHECK 437.	YES ☐ NOT ASKED ☐ (SKIP TO 446)		
442	In the two months after (NAME) was born, did any health care provider or a traditional birth attendant check on his/her health?	YES . . . . . 1 NO . . . . . 2 (SKIP TO 446) DON'T KNOW 8		
443	How many hours, days or weeks after the birth of (NAME) did the first check take place? IF LESS THAN ONE DAY, RECORD HOURS. IF LESS THAN ONE WEEK, RECORD DAYS.	HRS AFTER BIRTH . . 1 DAYS AFTER BIRTH . . 2 WKS AFTER BIRTH . . 3 DON'T KNOW . . . 998		