Health Economics Division

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Full Dissertation:

Assessing Socio-economic inequalities in the use of Antenatal care in Southern African Development Community

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Date: February 2019

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ACKNOWLEDGEMENTS

Truly grateful to God for having afforded me an opportunity to be a student in one of the prestigious universities in Africa, where I got supervision and mentorship from one of the greatest minds in the school of health economics.

A special thanks to my supervisor, A/Prof Ataguba for his guidance through the completion of this dissertation.

Last but not least, I want to thank my family and friends for all the support they have granted me throughout my tertiary education journey.

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Introduction

Beyond ensuring economic stability, advancements in technology, and education, the wealth of nations is also hinged on the health status of its inhabitants and how the government can provide for quality and accessible health care (Larson & Mercer, 2004). Amongst the many classifications and indicators of a country's health status, such as nutrition (Larson & Mercer, 2004), provision of health security (WHO, 2015), or service coverage, health services received by pregnant women also reflects the commitments countries make in ensuring a healthy population (Larson & Mercer, 2004).

Antenatal care (ANC), which is mainly preventive care received by pregnant women (Lincetto et al., 2006), dates back to the 18th century when childbirth was not as medicalized (Wald, 1985). In this time, potential parents had little confidence that their child could be born safely and thrive. As a result, a quarter of all marriages were childless either because of the untimely death of the neonate or infertility (Margolis & Kotch, 1931). A decline in this trend was due to advancements in medical care which saw a rise in medical technology such as fertility treatments, medical interventions during pregnancy and appointment of a more professional class of midwives to attend to childbirths (WHO, 2002).

In Africa, ANC coverage is described as successful, with 69% of pregnant women attaining at least one antenatal care contact before childbirth (Lincetto, 2006). However, to achieve the full life-saving potential that ANC promises for women and babies, a package often called the "focused antenatal care" is required (Kerber et al., 2007). Essential interventions, amongst other things, include surveillance of the pregnant woman and her unborn baby, management of pregnancy-related complications, treatment of concurrent ailments, and screening for infectious diseases that can potentially be transmitted to the baby. Many of these essential services remain scanty in sub-Saharan Africa due to many reasons leading to inequalities in access and use of these maternal services (Lincetto et al., 2006). Inequalities in health care generally refer to any measurable differences in the use of health care attributable to individuals or socially relevant groupings (Arcaya, Arcaya, & Subramanian, 2015).

Although ANC remains a routine or a recommended service in many African countries, access to ANC services is not universal (Kerber et al., 2007). In middle-income countries such as South Africa, inequality in access to maternal health care can go as far as being wealth-based and/or geographic, where the rich and those living in urban areas have better coverage than the poor and those who live in rural areas (Silal et al., 2012). These trends also exist in low-income countries such as Zimbabwe, where those with secondary education and living in relatively urban areas show a greater utilization of maternal health care during pregnancy (Muchabaiwa et al., 2012).

Health care inequalities, in particular, have become an area of focus, not only because of the pressures that have been placed on policymakers who are fraught with difficult questions, such as, decisions to improve the health of the worst-off groups (Kerber et al., 2007), but it is also an area widely explored because of its associations with socioeconomic and geographic background of the users (Zafer, Kılıc, Ozturk, & Emre, 2015).

Problem Statement

Good health care during pregnancy is not only imperative for the mother, but it is equally important for the development of the unborn baby. It is during this time that health-promoting behaviours and fitting parenting skills can be fostered, pre-existing conditions such as malnutrition, malaria, HIV/AIDS and anaemia that worsen during pregnancy can be monitored (Channon, Neal, Osrin, Madise, & Stones, 2010), and women who have been subject to genital mutilation, gender-based violence, and potential home and workplace hazards can be identified (WHO, 2006). Thus, satisfactory ANC not only binds the woman with the health system but also her family, and enhances the chance of being attended to by a health professional during birth (Kerber et al., 2007). Ultimately, this contributes to the critical continuum of care, even once the baby is born (Lincetto et al., 2006).

On the other hand, poor compliance with prenatal care has negative effects on both women and their babies (Brown, 1996). The negative effects for the mother include, but are not limited to,

development of conditions such as hypertension (pre-eclampsia or eclampsia) and antepartum haemorrhage, which are directly related to inadequate care during pregnancy. Although easily preventable, these conditions continue to contribute to the rise in maternal mortality in developing countries, mainly due to lack of access (Lincetto et al., 2006). A report by UNICEF (2013) states that "1 in 3300 in high-income countries compared to 1 in 41 in low-income countries have a lifetime risk of maternal death due to these preventable conditions". Also, sub-Saharan Africa has an estimated infant mortality rate of 52 per 1000 live births compared to 8 per 1000 live births in European regions due to congenital infections or fetal alcohol syndrome, equated to poor or no ANC (Lincetto et al., 2006). The differences in maternal and child mortality and morbidity mirror the huge discrepancies between rich and poor people both within and between countries (Borghi et al., 2006)

Consequently, until recently, four ANC visits have been recommended because of their potential to improve survival and health of both mothers and their babies, and to ascertain that key services are provided during the pregnancy period such as preventing the development of complications, monitoring pre-existing health conditions and ensuring teachings surrounding the effects of unhealthy lifestyles (Lincetto et al., 2006). Worldwide, socioeconomic inequalities are one of the leading factors that contribute to lack of use of ANC, along with remotely placed health facilities, inadequate human resource or inefficient medical technology (Zafer et al., 2015). Amongst the many equity stratifiers that potentially explain these trends, such as attaining a low level of education, living in a rural area and access to poorly resourced hospitals, user fees, in countries where they are levied, can also deter women from seeking medical attention during pregnancy (Muchabaiwa et al., 2012).

Many women across Africa still don't have access to these services and the current coverage and trends in the Southern African Development Community (SADC) countries are still to be explored (United Nations, 2015). In the period between 1990 and 2015, the World Health Organization reported advancements in maternal mortality rates; however, these trends remained unacceptably high in sub-Saharan Africa. The unprecedented efforts of improving the lives of Africans conducted by the United Nations were partially successful, and the achievement of

Millennial Developmental Goals (MDGs) was equally hindered by gaps in coverage, equity, and provision of quality services (Wilunda et al., 2015). The set target for the 5th MDG was to reduce Maternal Mortality Ratio (MMR) by three quarters (United Nations, 2015). Sub-Saharan Africa only achieved a 49% drop in maternal mortality between 1990 and 2015, for which 56% of the births were attended to by skilled health personnel compared to 87% in developed countries (United Nations, 2015). Also, only half of the pregnant women in developing countries were reported to receive the recommended minimum of four ANC visits (United Nations, 2015).

The SADC, comprising 15-member countries in southern Africa had an average MMR estimated at 460 per 100,000 live births in 2008 (WHO, UNICEF, UNFPA, & Bank, 2011). After 15 years of the MDG initiative in 2015, SADC countries were reported to have made little progress in achieving their MDG-5 (United Nations, 2015). This was combined with an alarming increase in MMR in two of the SADC countries, namely Zimbabwe and Zambia, at 550 per 100,000 live births (United Nations, 2015). ANC is one of the pillars of Safe Motherhood Initiatives (Muchabaiwa et al., 2012) and in-depth analysis and interpretation of its usage will help accelerate progress towards combating maternal mortality and forming policies that promote equal access. To my knowledge, apart from a few individual country studies (Muchabaiwa et al., 2012; Wabiri et al., 2016; Zere et al., 2010), there is a dearth of studies that analyse inequality in the use of ANC services in SADC countries as a collective.

Research Aim

Assessing inequalities in maternal health indicators in the SADC region.

Research Objective

Assessing inequalities in ANC coverage among women aged 15-49 with a live birth in the last 5 years preceding the survey in selected SADC countries.

Literature review

A. Theoretical Review

Inequalities in access to health care are responsible for a plethora of policy reforms in both the developing and developed countries (Culyer & Wagstaff, 1992). Of recent, reform proposals are founded on the distributional equity grounds giving rise to the prominent issue of continual debate on health care delivery and financing (Wagstaff & van Doorslaer, 1992), along with a thorough understanding of the terminology of equality and equity in health care (Arcaya, Arcaya, & Subramanian, 2015).

The distinction between health equality and health equity

Kawachi, Subramanian, & Almeida-Filho (2002) define inequality and equality as pure dimensional concepts about measurable quantities, whereas inequity and equity as concepts expressing a moral commitment to social justice. Arcaya et al., (2015) support this notion by stating that since equality is a descriptive term, we can decide from observing a distribution if that given distribution is equal or unequal. Equity, on the other hand, is defined as a normative term and cannot be referenced to solely by considering distribution, but it must be coupled with value judgement (Le Grand, 1987). Thus numerous policymakers concur that equity should feature prominently in health policy decisions (Gilson, 1988).

B. Methodological Review

Measurement of inequality in health care utilization

Irrespective of the growing evidence of socio-economic differences in the use of healthcare since the mid-19th century (Arcaya et al., 2015), concerns regarding the measurement of health inequalities from an economics perspective were only acknowledged following Wagstaff's publication on "the Measurement Inequalities in Health" in 1991 (Regidor, 2004a). In this time,

Wagstaff (1991) cautioned that conclusions reached by different authors regarding trends in health inequality vary depending on the type of measure employed. Mackenbach & Kunst (1997), in their review of measures used to assess the magnitude of socio-economic inequalities in health, concluded that the measure imposed mainly depends on the objective pursued.

Below is a brief review of six measures of inequalities that have been used in the literature and their respective limitations. The six measures include i) the range ii) the Lorenz curve and the Gini coefficient iii) the Pseudo-Lorenz curve iv) the index of dissimilarity v) the slope and relative indices of inequality and vi) the concentration curve and its associated concentrated index.

The range

The range involves comparing percentage point differences of one extreme value to another, in this case, the inequalities in health between the top and bottom socio-economic groups (Wagstaff et al., 1991a). Two major shortcomings of the range include 1) its failure to capture inequalities in the intermediate groups and 2) it takes no account of the size of groups (weightings) being compared which could lead to misleading results when comparisons are made over time or across countries (Wagstaff et al., 1991a).

The Lorenz curve and the Gini coefficient

The Lorenz curve focuses on the distribution of health among individuals of a given population (Wagstaff et al., 1991a). It plots the cumulative proportions of the population ranked from the least healthy person to the most healthy person against the cumulative percentage of overall health (Wagstaff et al., 1991a). The measure of inequality is expressed as a proportion of the area between the Lorenz curve and the diagonal (X) and the area below the diagonal (Y) (Regidor, 2004a). See **Figure 1** below. This measure is denoted by the letter G and is known as the Gini coefficient and ranges from 0 to 1 (Regidor, 2004a). When there is complete equality, G=0 and the Lorenz curve is diagonal (Regidor, 2004a). However, when there is complete inequality, the Lorenz curve moves rightwards along the horizontal axis and G=1 (Regidor, 2004a). Although the Lorenz curve reflects the experiences of people of all social classes better than the range, it fails to stratify the populations by social class (Wagstaff et al., 1991a). The absence of stratifying means that the question of relating inequalities in health to socioeconomic status is not being addressed (Wagstaff et al., 1991a).

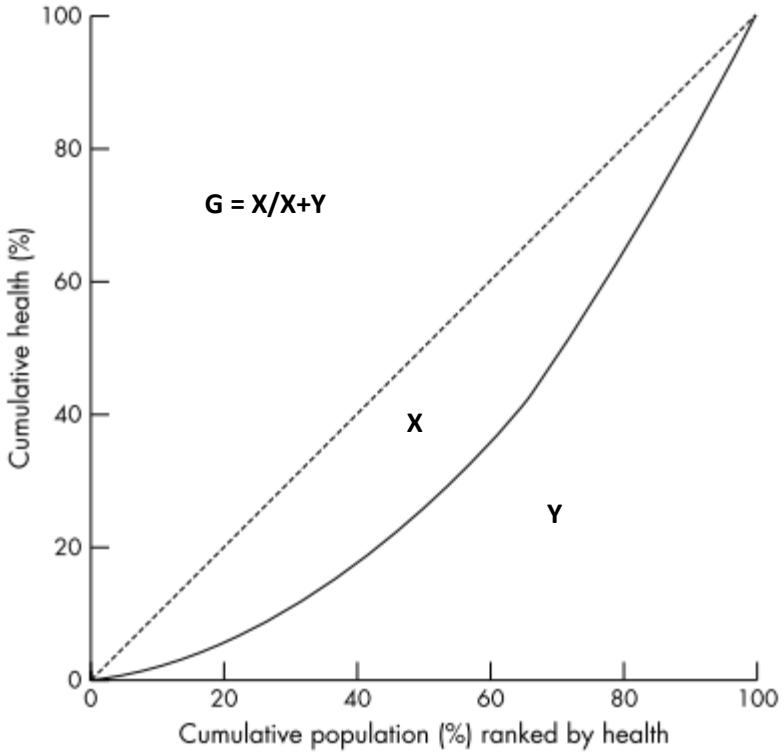


Figure 1. Lorenz Health Curve (Regidor, 2004a)

Pseudo Lorenz Curves

The pseudo-Lorenz curve is a derivative of the Lorenz curve that employs group data rather than individual data (Wagstaff et al., 1991a). The groups are occupational classes that are then ranked by their mortality, starting with the class with the lowest mortality (Wagstaff et al., 1991a). The associated pseudo-Gini coefficient is 0 when there are no morbidity differences between the groups, and the pseudo-Gini coefficient is 1 if all ill-health rests in the hands of one person (Mackenbach & Kunst, 1997). However, because the population is allocated into groups according to social class and rather than health status, this means that the curve is not a Lorenz curve at all (Wagstaff et al., 1991a). Over and above this, the pseudo-Lorenz curve, just like the true Lorenz curve, also does not reflect the socio-economic dimensions to inequalities in health.

The Index of dissimilarity

This index reflects the percentage of total health that would need to be redistributed from individuals who's health is above average to those whose health is below average, to achieve health equality for all socio-economic groups (Regidor, 2004a). This index is usually large if the

groups with the highest or lowest health states have large representations, and only relatively few people occupy intermediate positions (Mackenbach & Kunst, 1997). However, the index of dissimilarity suffers from the insensitivity to the socio-economic dimensions to inequalities in health (Wagstaff et al., 1991a). It is centred on how each socio-economic group's share of the population's health compares with its population share without accounting for how disparity compares with the socio-economic group's socioeconomic status (Wagstaff et al., 1991a)

The slope and relative indices of inequality

The slope index of inequality (SII) and the relative index of inequality (RII) show the relation between socio-economic dimensions and inequalities in health. Thus, it shows the frequency of a health problem in each socio-economic category alongside the hierarchical ranking of the socio-economic category on the social scale (Regidor, 2004b). The SII is then defined as the slope of the regression line showing the relationship between a class's health status and its relative rank in the socio-economic distribution (Wagstaff et al., 1991a). It can be interpreted as the absolute change in health level or the frequency of a health problem when moving from the lowest socio-economic group through to the highest (Wagstaff et al., 1991a). Although sensitive to changes in the distribution of the population among different socio-economic categories and reflect the experience of all individuals, its disadvantage is that it can only be applied to ordinal socio-economic variables (Regidor, 2004b). Also, the regression estimate should not reflect any deviations from linearity. Otherwise, the magnitude of the index will be biased (Regidor, 2004b).

Also, because of its sensitivity to changes in the mean level of population health, if this measure increases proportionally in all socio-economic categories, the SII will increase whereas the relative differences remain constant (Wagstaff et al., 1991a). This limits the comparison of trends in socioeconomic inequality in health across different populations, given that the frequency of the problem has reduced more in some populations than in others (Wagstaff et al., 1991a). The proposed alternative is the RII which can be estimated in one of two ways: 1) divide the SII by the mean level of population health or by the frequency of the health problem in the population. 2) divide the predicted value of the regression at the highest point (1) by the predicted value of the regression at the lowest point (0).

Concentration indices and concentration curves

Concentration curves can be used to assess whether socioeconomic inequality in a given health sector such as ANC exists and whether it is more pronounced in one country or another or one point in time or another (Wagstaff, Paci, & Van Doorslaer, 1991b). One of the limitations of a concentration curve is that does not give a measure of the magnitude of inequality that can be conveniently compared across given regions within a country or between countries (Makdissi & Yazbeck, 2014). This limitation is overcome by the use of the concentration index, which allows for the quantification of the degree of socioeconomic-related inequality in the use of health care (Wagstaff et al., 1991b). Substantive literature shows its use in measuring the degree of socioeconomic-related inequality in child malnutrition (Wagstaff, Van Doorslaer, & Watanabe, 2003), child mortality (Wagstaff et al., 2003) and adult health (van Doorslaer et al., 1997). In the present study, it will be used to measure and compare the degree of socioeconomic-related inequality in health care utilization (ANC) among pregnant women in SADC countries.

C. Empirical Review

In high-income countries, gestation is often associated with a positive and fulfilling experience, but for many women in low-resource countries, this period is associated with suffering, morbidity and in many cases maternal death (Ononokpono & Odimegwu, 2014). This persists despite the many attempts in reducing maternal mortality rates (Magadi, Zulu, & Brockerhoff, 2003). In sub-Saharan African countries, there is an estimated maternal mortality ratio of 500 per 100,000 live births, and besides, it contributes 56% of all maternal deaths globally (Ononokpono & Odimegwu, 2014). This brief empirical review focuses on how individuals' given 'socioeconomic status' affects these trends observed in accessing ANC and is defined as a construct that considers the overall household wealth, education and employment status of the expecting mothers.

Socioeconomic factors including the husband's occupation, wealth status, and financial difficulty have been found to influence the utilization of maternity services (Alam et al., 2015; Rai et al., 2012). Similarly, the women's educational attainment and occupation are markers of economic resources which empower them to take control of their own health and facilitate easy access to quality maternal health care (Ononokpono & Odimegwu, 2014).

In a study conducted in a Nigerian population, 70% of women with secondary education and formal employment delivered in a health facility while only 11% without education and unemployed did so (Ononokpono & Odimegwu, 2014). An overall of 85% per cent of women in the richest quartile delivered in a health facility as opposed to 8.4% in the lowest quartile (Ononokpono & Odimegwu, 2014). This is also true for Zimbabwe where the odds of utilising maternal care are higher for women with higher education and coming from richest households compared to the less educated and coming from poorer households (Muchabaiwa et al., 2012). Sepehri et al. (2008) report that 88.4% of women who had given birth in a health facility were more likely to have attained 3-6 ANC visits as opposed to 45.0% with no visit at all. These findings also concur with a study conducted by Rai et al. (2012) where there is a positive correlation between delivery at a health facility and attaining more than four ANC visits. The urban poor in sub-Saharan Africa is, on average, 1.4 times more likely to initiate antenatal care late in pregnancy or to make an inadequate number of antenatal visits (three or fewer) during pregnancy than the urban non-poor (Magadi et al., 2003).

Whilst it is evident that wealth quartile remains strongly associated with educational attainment and employment, several authors (Zere et al., 2010; Ononokpono & Odimegwu, 2014; Sepehri et al., 2008; Celik & Hotchkiss, 2000) further extrapolate this relationship to having a health insurance and ease of access to ANC. In a study conducted in a Turkish population having health insurance was found to have an important influence in increasing the probability of both prenatal care use and birth delivery assistance (Celik & Hotchkiss, 2000). Similarly, in a study conducted by Zere et al., (2010) assessing inequalities in utilization of maternal health interventions in Namibia, analysis conducted with concentration curves showed a pro-poor use of public facilities for place of delivery and place of antenatal care as opposed to a pro-rich use of private facilities for place of delivery and place of antenatal care.

Another derivative of access to ANC is place of residence and in a study conducted in South Africa employing the slope and relative indices of inequality and concentration index, pregnant women

in the wealthiest two quartiles were more concentrated in urban cities of Gauteng and Western Cape provinces and attended four or more ANC visits compared to three quarters of the poorest quartile and residing in relatively rural parts of South Africa such as KwaZulu Natal, Limpopo and Eastern Cape provinces (Wabiri et al., 2016b). This is consistent with the study conducted by Pathak et al. (2010) in India and selected states where economic inequalities in the use of prenatal care measured by concentration indices and concentration curves, according to place of residence, showed substantially large, consistent and pro-rich inequalities between 1992-2006 (CI: 0.39, 0.42, 0.35 during 1992–1993, 1998-1999 and 2005-2006 respectively).

Methods

A. Data source

The Demographic and Health Surveys (DHS) from eleven of the fifteen SADC countries for which data are available will be used. DHS are nationally representative surveys that make use of standardized questions to collect data from women of reproductive age ranging from 15 to 49 years in developing countries (DHS, 2013). The DHS obtains information on women's sociodemographic characteristics, along with maternal health care utilization (DHS, 2013).

B. Study population

SADC countries were chosen because of their rich historical and cultural affinities that exist amongst their people (SADC, 2005). Beyond this, SADC countries have a common shared vision that pursues economic well-being, improved standards and quality life, peace and social justice for the people of Southern Africa (SADC, 2005). A study of this nature conducted on a body of countries whose vision align with each other can deepen integration within its boards and harmonize political and social-economic policies and plans of member states.

Four countries are not in the analysis for one of two reasons, either 1) No data are available as in the case of Botswana, Mauritius, and Seychelles or 2) Data are outdated as in the case of South Africa.

Table 1 List of SADC counties and years for which DHS data is available*

#	Country	Years (most recent data)
1	Angola	2015-2016
2	Democratic Republic of Congo	2013-2014
3	Lesotho	2014
4	Madagascar	2016
5	Malawi	2015-2016
6	Mozambique	2011
7	Namibia	2013
8	Swaziland	2006-2007
9	Tanzania	2015-2016
10	Zambia	2013-2014
11	Zimbabwe	2015

*This represents the availability of data at the time of writing (2018).

C. Study variables

Equality in access to ANC will be measured in association with four variables. In the analyses, these variables will be divided into three mutually exclusive categories namely: (a) no ANC visit, (b) less than four ANC visits and, (c) equal to or more than four ANC visits. A fourth category will be created to assess socioeconomic inequality in access to ANC using the number of ANC visits that pregnant women had received (Intensity).

The DHS does not directly report information on household expenditure or income but employs asset or wealth index as a substitute for consumption expenditure or socioeconomic status (DHS, 2013). Data on ownership of the household asset are relatively easy to collect in routine

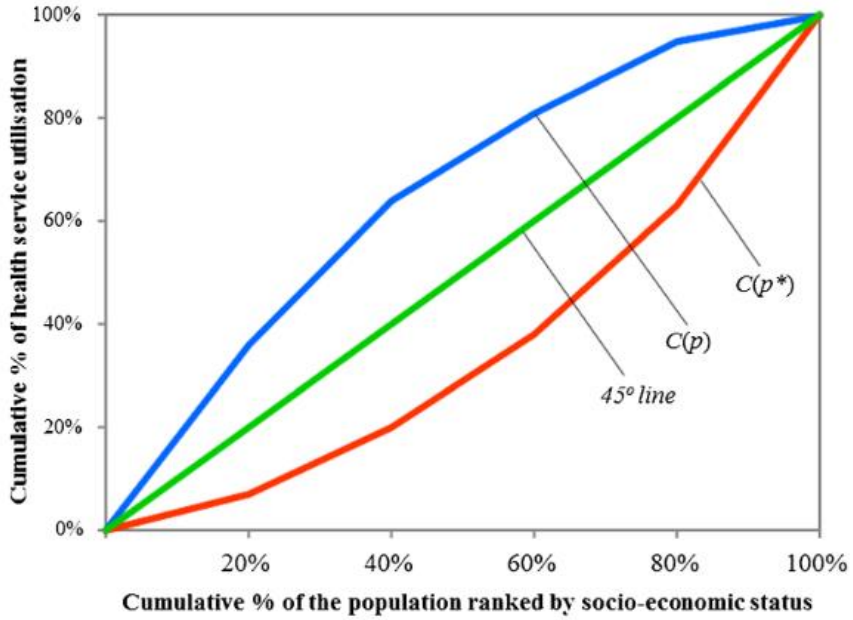
household surveys (van de Walle, 1998), making an asset index a relatively useful measure of socioeconomic status in developing countries. Another benefit of asset index as a measure of socioeconomic status is that it is less prone to under-reporting as in the case of income where individuals fear being marginalized for higher taxes, for instance (Phiri & Ataguba, 2014).

D. Analytic methods

In the first instance, this study will conduct basic descriptive analysis, including descriptive statistics across equity stratifiers such as the women's employment status or occupation, education and household wealth.

Analytically, this study will use concentration curves and indices to quantify and graphically examine socioeconomic inequality in ANC services in the SADC region. The vertical axis of the concentration curve (Figure 1) shows the cumulative share of the health variable, which in this case will be ANC utilization. The horizontal axis shows the cumulative proportion of the population ranked by socioeconomic status (SES) (Wagstaff A, Paci P, 1991).

Figure 2 below shows a concentration curve with a hypothetical example of health care utilization. If the concentration curve C(p) lies above the line of equality (i.e. the 45˚line), then health utilization is concentrated amongst the poor. If the concentration curve C(p*) lies below the line of equality, then health utilization is concentrated amongst the rich (Phiri & Ataguba, 2014).



Source:(Phiri & Ataguba, 2014)

Figure 2: Concentration curve for health care utilisation illustrated

To analyse the overall extent of inequality in access to ANC by socioeconomic status, this study computes concentration indices derived from the concentration curves (Umuhoza & Ataguba, 2018). The concentration index corresponds to twice the area between the concentration curve and the line of equality (Umuhoza & Ataguba, 2018). The concentration index ranges from -1 (when health care utilization is concentrated among the poor) to +1 (when health care utilization is concentrated among the rich) (Phiri & Ataguba, 2014). Thus a negative index is indicative of a higher distribution of utilization among the poor and a positive index signifies a higher distribution of utilization among the rich (Phiri & Ataguba, 2014).

These methods, as outlined above, will be applied to the four variables that will be constructed.

E. Data Analysis

Stata (StataCorp, Texas, United States) will be used for data management, data exploration, and analysis.

F. Research Ethics

This study uses existing datasets, i.e. the DHS datasets. This use of secondary data is, therefore, not expected to raise any ethical matters. As per procedure, ethics approval will be sought from the Human Research and Ethics Committee (HREC) of the University of Cape Town.

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SECTION 2: Literature Review

Assessing inequalities in the use of maternal health services in the Southern African Development Community Countries

Introduction

The World Health Organization's (WHO) recommendation of four antenatal care (ANC) visits during pregnancy, in addition to their key interventions and activities, significantly reduce maternal mortality due to pregnancy complications in well-resourced health facilities (Lincetto, Mothebesoane-anoh, Gomez, & Munjanja, 2006). Other than routine mandatory health check-ups done on neonates until just about the end of childhood, in some cases, pregnancy is the first time that otherwise healthy women come in contact with the formal health sector (hIarlaithe et al., 2014). Depending on their experiences, be pleasant or not, this can deter women from further use, or encourage continued use to postpartum care (Alcock et al., 2015). Other than the quality of service given, there are numerous reasons that can influence women's decision to use these facilities such as place of residence, maternal age, marital status, level of education, wealth and cultural beliefs (Rai et al., 2012; Magadi et al., 2003; Celik & Hotchkiss, 2000). This literature review will focus on socioeconomic status (SES) as one of these factors, taking into account household (HH) wealth, women's education, employment status and spouse education, where applicable.

According to UNICEF June 2018 data, the global coverage of access to ANC with skilled health personnel is 86%, and only 62% receive at least four ANC visits. In regions with the highest rates of maternal mortality, such as South Asia and sub-Saharan Africa, even fewer women receive at least four ANC visits (46% and 52%, respectively (UNICEF, 2018)). While there may have been assumptions that the Millennium Development Goals (MDGs) will eradicate poverty and increase access to maternal health care, progress has been uneven across regions and countries, leaving significant gaps particularly in developing countries (WHO, 2015). The global figures presented above point to an urgent need to address the barriers which are preventing women from accessing ANC services.

Aim

This literature review aims to explore different socioeconomic factors that contribute to inequality in the use of ANC services worldwide.

Objectives

Objectives of the empirical review are to highlight previous and current debates around socioeconomic inequalities in access and use of maternal health care and explore the assumptions authors have made to arrive at their conclusions. This review will also help in identifying gaps and/or limitations in the existing literature and further validate the need for the current research. Studies from different regions were included to reflect different contexts and settings.

Methods

Search and selection strategy

Peer-reviewed literature that assessed inequality in access to ANC in pregnant women using quantitative and qualitative study designs was reviewed. A three-step method was followed to identify the articles that were reviewed. The titles, abstracts and full texts were independently examined by the primary author as outlined in **Box 1**. Articles were excluded at each step if they were unrelated to the topic or met the exclusion criteria.

Box 1. A summary of the exclusion criteria applied by the primary author to identify relevant articles
1. Non-peer reviewed articles 2. Studies centered on equity 3. Studies are addressing maternal health care (MHC) with no focus on ANC. E.g. only addressing skilled birth attendance or only addressing postnatal care. 4. Studies focused on migrant women

The reference lists of the remaining publications were searched for potential relevance and eligibility. If the abstracts of the studies met the screening eligibility criteria, full-text articles were read and examined if they met the inclusion criteria outlined in Box 2.

Box 2. The inclusion criteria used to select articles to be included in the literature review
1. The article must include original data 2. All women of reproductive ages 3. Articles that are written in English 4. Articles from high-income countries, low-to-middle-income countries and low-income countries were included.

The PubMed electronic database was searched for studies using Title and Abstract to identify at least one term from each of the following categories (last search: July 2018):

- "Socioeconomic status" [Title/Abstract] OR "SES"[Title/Abstract] OR "Economic"[Title/Abstract] OR "Income Inequalities"[Title/Abstract] OR "Income Differences"[Title/Abstract] OR "Wealth Disparities"[Title/Abstract]
- AND Access*[Title/Abstract] OR Afford*[Title/Abstract]

- AND “Maternal Health Care”[Title/Abstract] OR “MHC”[Title/Abstract] OR “Antenatal Care”[Title/Abstract] OR “ANC”[Title/Abstract]

The Scopus electronic database was searched for studies using similar Title and Abstract to identify the search terms as outlined above (last search: September 2018)

Data Extraction

The primary author completed data extraction. Relevant articles meeting the inclusion criteria as per **Box 2** were reviewed with all relevant information, such as the objective of the study, the measure of SES, variables of interest, along with study findings and conclusions.

Box 3. Inequality and Maternal health care terminology

1. H***ealth Inequality***: Health inequality is the generic term used to designate variations and disparities in the health attainment of individuals and social groups (Kawachi & Subramanian, 2002).
2. ***Socioeconomic Status (SES)***: Socioeconomic factors comprise demographic, social, structural, and attitudinal influences which increase the likelihood of a person to seek ANC services when pregnant (Andersen 1995). Among the examples of socioeconomic variables that influence the use of ANC are age, level of education, employment status, household size, geographic distance, and physical accessibility. These factors can influence ANC use among pregnant women either positively or negatively (Akowuah, Agyei-baffour, & Awunyo-vitor, 2018).
3. ***Antenatal Care (ANC)***: Antenatal healthcare is defined by the World Health Organization (2000) as the "care a pregnant mother receives before birth" and involves among other services, education, screening, counselling, treatment of the minor ailment, and immunisation (Akowuah et al., 2018).
4. ***Prenatal Care***: Synonymous with ANC
5. ***Skilled Birth Attendance (SBA)***: Defined as the delivery experience with a health professional such as a doctor, nurse, midwife or auxiliary midwife. Traditional birth attendants and community health workers were not considered as health professionals (Do, Thi, Tran, Phonvisay, & Oh, 2018). Also referred to as Institutional delivery.
6. ***Postnatal Care (PNC)***: This is an important component of maternal health care as there is a high chance of developing grave and life-threatening maternal health complications after delivery. A postnatal care visit is an ideal time to educate a new mother on how to care for herself and her new-born. It is recommended that women receive at least three postnatal check-ups, the first within two days of delivery, the second on the third day after delivery and the third on the seventh day after delivery (Charlotte Warren, Pat Daly, Lalla Toure, n.d.).
7. ***Household (HH) size***: Household size is another important predisposing factor believed to influence the utilisation of antenatal care. Household size is measured as the number

of persons in a particular household that live in the same house and share resources (Akowuah et al., 2018).

Level of evidence and certainty

The level of evidence was determined for each article reviewed following the inclusion and exclusion criteria. A study was deemed of lower quality if the only measure of inequality was subjective in the form of participants' interviews.

Results

Figure 1: Description of the search results selection process for the literature review

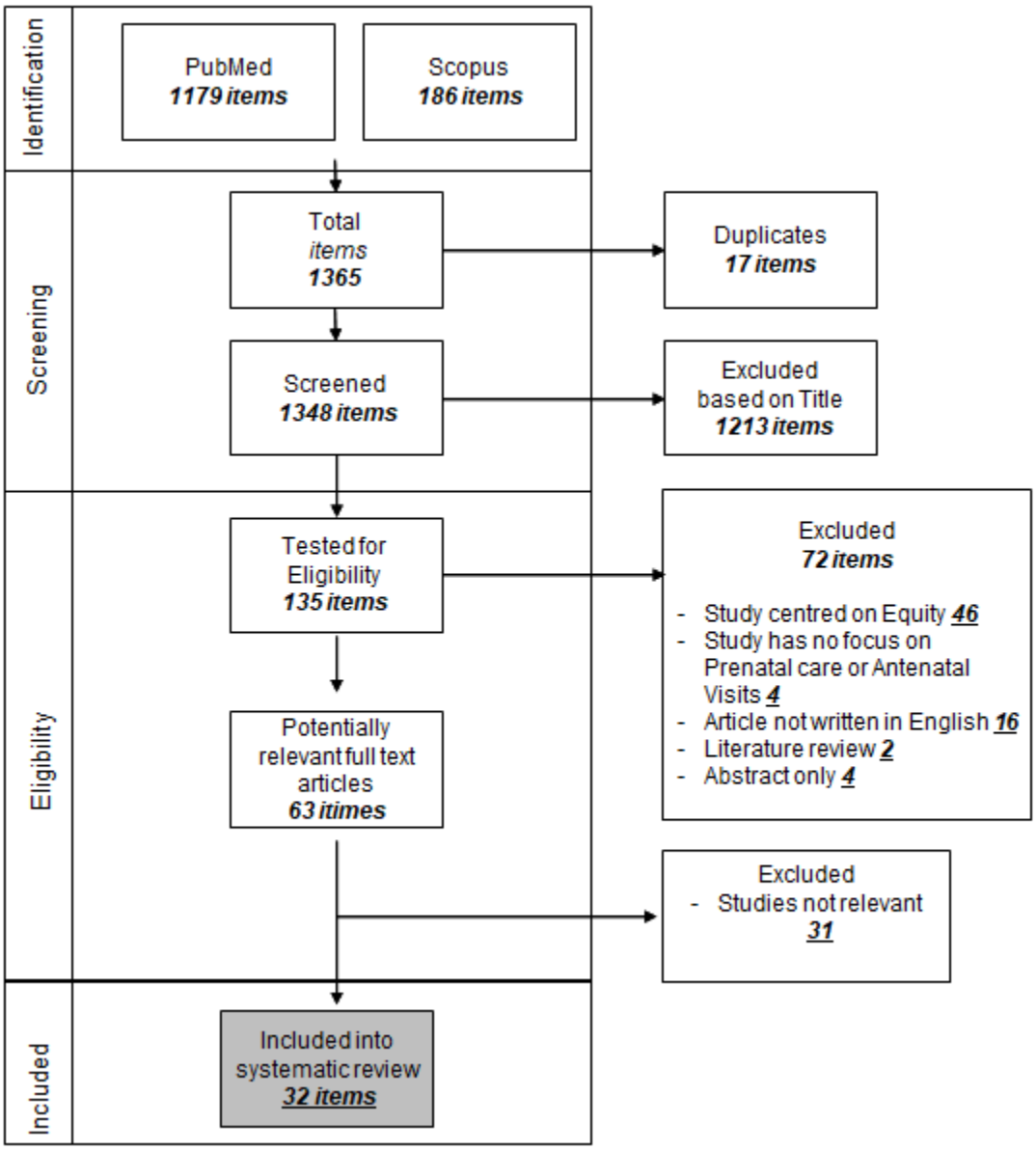

Figure 1 illustrates a search through Scopus and PubMed that yielded a total of 1365 articles, seventeen of which were duplicates. About 1348 articles were screened, and only 135 articles were tested for eligibility based on the inclusion and exclusion criteria. Thus a total of 32 items were included in this review

Table 1: *Empirical studies of socioeconomic inequalities in the use of maternal health care in 'high-income countries*

Author: Chiavarini, Lanari, Minelli, & Salmasi, 2014					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Italy-Umbria; 2005 - 2010	• A study conducted on 37 000 women between ages 20 – 39 years • Nationality of mother considered ○ Italian ○ European Union ○ Rest of the world	Provide accurate knowledge about the inadequate use of prenatal health care	Socio-demographic indicators: • Employment Status • Education	• Standard and multilevel regression models	• Number of prenatal visits • The timing of the first visit

Findings:

- Women making a lower number of visits tend to be less educated with respect to making a recommended number of prenatal visits.
- A higher percentage of employed mothers follow recommendations and have four or more ANC examinations

Education vs four or more ANC visits

- Higher education = 95.29%
- Lower education = 86.85%

Employment vs four or more ANC visits

- White-collar = 94.88%
- Unemployed = 87.60%

Conclusions:

- Inadequate prenatal care in those with low education.
- Having a job improved the use of services (workspaces allow transmission of information about negative consequences of delayed prenatal visits).

Limitations:

- Content and quality of care received by women not documented

Author: Park, Vincent, & Hastings-Tolsma, 2007

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
A retrospective, descriptive design; USA; 1996 - 1997	American College of Obstetricians and Gynaecologists (ACOG) traditionally recommends about 14 prenatal visits to low-risk pregnant women. A study conducted in a large, urban university midwifery faculty practice setting	The disparity in prenatal care among women of colour in the timing of initiation of prenatal care and the total number of prenatal visits	• Education • Method of payment.	Nurse-Midwifery Clinical Data Set (NMCDS) • Pearson correlation and Chi-square were used to determine whether a relationship between the two variables existed.	• Timing of initiation of prenatal care • Total number of prenatal visits

Findings:

- The mean number of prenatal visits was 10.3 visits, and the range was 1–26 visits.
- Women who were high school or college graduates visited prenatal clinics more often than women with less than a high school education ($p = 0.001$)
- Women with private insurance or Medicaid were more likely to visit prenatal clinics than women who had other forms of public insurance ($p < 0.001$)

Conclusion:

- The non-Hispanic white women at the university hospital clinic, with high school or college degrees and insurance or Medicaid, were more likely to visit prenatal clinics.
- Examination of the association between the timing of initiation of prenatal care and demographic variables showed significant differences in race and education.

Limitations:

This study has a comparatively small sample (439 participants), and most of the participants were women of colour in low socio-economic conditions.

Table 2: *Empirical studies of socioeconomic inequalities in the use of maternal health care in 'low-to-middle-income countries'*

Author: Tsawe & Susuman, 2014

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Mixed Methods (Quantitative and Qualitative); South Africa (Eastern Cape); Year of analysis missing	• Lower levels of education • Long queues at the hospital and longer distances to the Centre • Health care resources often unequally distributed between rural and urban areas • Health professionals mistreat women with a positive HIV status during consultations	Examine whether women in Mdantsane are accessing and using MHC. Examine what factors are associated with access and use of MHC services.	• Education • Occupation • Access to medical aid	Bivariate and multivariate regression models	Dependent variables: • Access to MHC • ANC during pregnancy Independent variables: • Maternal education • Occupation • Medical aid

Findings:

- Only 35.2% of women surveyed (267) were accessing MHC
- Occupation ($p<0.05$) and medical aid ($p<0.001$) were significantly associated with MHC access.
- Women with secondary education had a higher proportion of MHC use compared to women with primary education

Use of ANC:

- More than half (58.4%) of women went for at least four ANC visits.
- About 41.6% went for five or more ANC visits
- Self-employed women (74.4%) went for the recommended 4 visits
- Women with secondary education were 2.9 times as likely to use ANC compared to those with no education

Limitations:

- Only 267 participants were interviewed, therefore study no representative of the South African population

Author: Arokiasamy & Pradhan, 2013					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; India and 19 major states; Analysis periods include: 1992-1993, 1998 – 1999, 2005 - 2006	• Highly pronounced variations exist in MHC coverage in India across its states • There are striking inequalities by SES • Provision of MHC was minimal in some states with increased maternal and childhood mortality and morbidity • Working women have lower MHC use because of opportunity and monetary costs forgone. • Religion – caste/tribe hinders the use of MHC. Women who practice these customs are discriminated against.	Assess the degree to which the observed MHC use can be accounted for by social & economic determinants	• HH economic status index is broken into three categories as low, medium and high • women's education • women's working status • Husband's education	Multi-level logistic regression models	Dependent variables • Attendance of four ANC visits. • Safe delivery coverage Other variables • Demographic factors • Socio-economic factors • Service availability

Author: Arokiasamy & Pradhan, 2013, *continued*

Findings:

- In the state of Bihar, fully recommended MHC coverage was merely 5% for illiterate women, which rose to about 45% for women who completed high school.
- State of Nadu Tamil more than 75% of illiterate women received full ANC, with a lower proportion of illiterate women.
- Low fertility was linked with high SES and in turn, higher MHC use.
- Women with higher parities may not feel the need to receive care during pregnancy from their experience. Women with higher parities were also most likely bound by cultural and economic constraints.

Conclusions:

- The study found an overall higher level of MHC utilization for the following reasons:
    - Educated women can easily break away from tradition
    - Can take advantage of facilities available
    - Can make independent decisions.

Limitations:

- None mentioned

Author: Silal, Penn-Kekana, Harris, Birch, & McIntyre, 2012					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Mixed methods (Quantitative-Qualitative study design; South Africa; 2008/2009	• Analysis was done on women from two rural and two urban health sub-districts. • Mainly black Africans in the study (both in rural and urban areas – recruitment from public hospitals) • About 56% of participants were aged between 21 and 29 years. • Those in rural areas were more likely to be married • It is routine to have an HIV test done when pregnant (although not mandatory) • Health and health service delivery has been affected by relics of South African past, including racial and gender discrimination, violence and severe income inequalities.	Explores barriers to access obstetric care from the perspective of women needing care	Household wealth index using multiple correspondence analysis conducted on several HH level variables: • Type of house • Material of walls • Type of toilet • The primary source of energy for cooking • Ownership of assets such as a vehicle, fridge, and livestock etc.	One thousand two hundred and thirty (1231) quantitative exit interviews and sixteen qualitative in-depth interviews (over 18 years) Regression analysis: • Logistic regression • Multiple linear regression	Demographic and socioeconomic predictor variables: • Proxies for affordability include the amount of money spent on the day of delivery or skilled birth attendance

Author: Silal, Penn-Kekana, Harris, Birch, & McIntyre, 2012, *continued*

Findings:

- Patients from wealthier HHs spent significantly less money as a percentage of HH expenditure compared to patients from poorest HHs holding other variables constant.
- Neither employment nor education yielded significant associations with costs as a percentage of HH expenditure
- Over 90% of South Africans use ANC and Skilled Birth Attendance (SBA).

Conclusions:

- Inequalities are found in favour of wealthier women and urban dwellers.
- Rural women had difficulty in accessing emergency obstetric care in district hospitals, owing to barriers like distance, cost of transport, shortage of medication and problems with staff attitude towards the poor.

Limitations:

- The study is facility-based. Thus, researchers only interviewed women who had used services and overcame barriers to accessing these services.
- Amount of money spent on the day of birth as a measure of affordability was used as a sole variable for affordability

Author: Viegas Andrade, Noronha, Singh, Rodrigues, & Padmadas, 2012					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Ecological study; Brazil and India; 2005 - 2006	• ANC coverage is almost universal in Brazil • 90% of women in Brazil receive four or more visits. • In India, only ¾ of women receive any form of care, and less than 2/5 have the recommended four or more visits. • Quality of service provision is also another factor that discourages service use in both countries. • Brazil is one of the most unequal economies in the world. • 87% of Brazilian live in urban areas as opposed to 28% in Indians in India. • Health care expenditure mainly incurred in private sector through health insurance in Brazil and via out of pocket expenditure in India.	A systematic comparison of Brazil and India to better the understanding of different policy approaches and their influence on the extent of antenatal behaviour among different socioeconomic groups.	Wealth index based on the ownership of HH assets.	Demographic and Health Survey (DHS) – Brazil National Family Health Survey – India • Concentration indices and concentration curves • Binary logistic regression models were used to examine the socioeconomic inequalities determining ANC behaviour, adjusting for relevant controls	Predictor variables • Socioeconomic Status Outcome variables • Number of ANC visits considering diagnoses and medical procedures followed during each visit • In India, these were categorized into less than four or more than four • In Brazil, these were categorized into less than six or more than six.

Author: Viegas Andrade, Noronha, Singh, Rodrigues, & Padmadas, 2012, *continued*

Findings:

- On average, a woman in Brazil spent 7.8 years in the school whereas her Indian counterpart spent only 4.4 years.
- In India, the poorest-poor had only one year of schooling experience compared to ten years among the richest-rich. Corresponding figures for Brazil were 5.4 and 9.8 years, respectively.
- In Brazil, less than 4% of the poorest-poor women had health insurance when compared to about 48% among those in the richest-rich category.
- In India, the overall household income coverage was very low, less than 1% among the poorest-poor and about 12% amongst the richest-rich group.
- A little more than 50% of the Brazilian women in the poorest-poor group had $\geq$ 6 visits, and this was less than 5% among their counterparts in India.
- About 80% of the poorest-poor in India had not received even the standard minimum of four visits.
- Brazilian women with private household income.
    - Rural areas: 8.3%
    - Urban areas: 25.6%
- Indian women with private HI
    - Rural areas: 1.6%
    - Urban areas: 7.3%

Conclusion:

- The frequency of ANC visits was higher among wealthier groups in both Brazil and India. However, the average difference in ANC visits between the richest and the poorest was relatively higher in India than Brazil.
- The difference in ANC use between urban and rural areas was negligible despite the differences in SES. However, in India, there were huge differences.
- Inequalities in access to four or more ANC visits are significantly pronounced in India, and in Brazil, the differences are significant only for those who had six or more visits.

Limitations:

- Data in the DHS are self-reported and might suffer from possible reporting bias

Author: Rashid, Antai, & Antai, 2014					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Namibia; 2006 - 2007	Study conducted on 9,804 females aged 15 – 49 years from both rural and urban areas.	Estimate the role of socioeconomic position as a determinant of the utilisation of MHC in Namibia	Wealth index	Demographic and Health Survey • Multivariate logistic regression	Exposure variables: • Education • Occupation • Wealth index • Place of residence • Marital status • Age Outcome variables • Access to prenatal care • Access to institutional delivery • Access to postnatal care

Author: Rashid, Antai, & Antai, 2014, *continued*

Findings:

- Women without education and partners without education reported fewer ANC visits compared to those with secondary and higher education.
- Both women and their partners who were agricultural self-employed reported less care compared to professional, technical and management workers.
- Women with no education (odds ratio: 0.15) and women in poor HH (odds ratio: 0.4) were less likely to use prenatal care by professional health care workers compared to women who had secondary or higher education and women in rich households, respectively.

Conclusion:

- Effective interventions need to factor in the less educated and poor women in rural areas to achieve increased maternal health service utilisation.
- Education exerts effects on health-seeking behaviour through several ways:
  - Greater knowledge and information in accessing MHC and its preventive ill-health advantage.
  - Therefore increase the probability that a woman would make critical choices regarding the availability and quality of services by health institutions

Author: Pathak, Singh, & Subramanian, 2010

Type of study; Country; Year of analysis	Background Context of the Country	Study Objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Longitudinal Study; India in three contrasting states, namely, Uttar Pradesh, Maharashtra and Tamil Nadu; 1992 - 200	Analysis conducted on three culturally, demographic, geographic and socioeconomically contrasting states. • Uttar Pradesh is the most populous state of India situated in the central part of the country with a large proportion of the state's population suffering from poverty, low female literacy and low women autonomy. • Maharashtra situated in the western part of India is the second most populous states with relatively higher socioeconomic development. • Tamil Nadu is among the most advanced Indian states in terms of socioeconomic and demographic parameters.	Analyse the trends and patterns in utilisation of prenatal care in the first trimester with four or more ANC visits and SBA	Composite wealth index derived from a similar set of durable asset ownership, access to utilities, infrastructure, and housing characteristics for all three rounds of NFHS.	Three rounds of National Family Health Survey (NFHS) • Bivariate analyses • Concentration curve and concentration index • Logistic regression and multinomial logistic regression models	• Likelihood of using prenatal care; • Likelihood of using skilled birth attendance

Author: Pathak, Singh, & Subramanian, 2010, *continued*

Findings:

- Across all the study states, the use of PNC remained substantially lower among poor mothers than their non-poor counterparts.
- Economic inequalities in the use of PNC remained precipitously high among rural mothers (concentration indices: 0.35, 0.39 & 0.37) compared to their urban counterparts (concentration indices: 0.25, 0.23 & 0.18) in India during these respective periods, 1992–1993; 1998-1999; 2005-2006.
- Maternal and paternal education, urban residence, mass-media exposure and any form of pregnancy complications were significantly associated with the use of PNC in India

Conclusions:

- Among the study states, the economic inequality in the use of PNC remained high in rural mothers compared to their urban counterparts during the 1992–2006 period.
- The findings from the study revealed a sluggish increment in PNC in India during 1992–2006. However, the increments were mainly noted among the non-poor mothers, and the poor mothers benefitted least from the government-sponsored maternal health care services over the past 15 years.
- The largest improvement in the use of maternal care services w recorded in Tamil Nadu, followed by Maharashtra, while the least change was observed in Uttar Pradesh.

Limitations:

- None listed.

Author: Alcock et al., 2015					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study, Quantitative and qualitative methods; Mumbai, India; September 2011 to March 2013	• Data for the study were provided by 3848 women who had delivered a baby in the preceding two years. • Just over half had some secondary education. Most (74 %) were in the age group 20–29 years and 56 % had one or two children. • Most were Muslim (83 %). Muslim women were more likely to seek prenatal and delivery care at private hospitals, reflecting a strong preference for female physicians	To quantify the pattern, determinants, and choice of maternity care provider at the health facility level in public and private sectors in Mumbai's informal urban settlements, and to explore the reason underlying these choices.	• Assets and amenities • Housing fabric • Maternal schooling	Primary quantitative and qualitative data were collected in a baseline census over 18 months • The univariable logistic regression model	Prenatal care as attendance of at least three check-ups (the locally recommended minimum).

Author: Alcock et al., 2015, *continued*

Findings:

- Overall, institutional maternity care-seeking was high: 94 % made three or more prenatal visits, and 85 % had a facility delivery.
- Uptake of prenatal care and institutional delivery care was lower for women who never went to school, were poorer, and who had recently arrived in Mumbai.
- The odds of prenatal care increased with education, economic status in terms of household asset quintile, and duration of stay in Mumbai, and decreased with parity.
- Even in the most disadvantaged groups, women choose among health providers in both the private and public sectors.
- Some women who had particularly poor perceptions or experiences of public sector care had either sought financial support from within the family or had taken a loan to avoid seeking care at a public hospital.

Conclusion:

- Institutional delivery is the norm in Mumbai's informal settlements. However, poorer and less educated women and recent migrants were less likely to receive professional prenatal and delivery care.

Limitations:

- A qualitative limitation arose from the use of quantitative and qualitative methods in grounded theory: Authors found it difficult to reconcile analytical concepts derived from deductive (quantitative) and inductive (qualitative) methods.

Author: Singh et al., 2012

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; India; 2007–08.	Data collected on 601 districts from 34 states and union territories of India.	Compare inequalities in the use of PNC between facility births and home births and to determine inequalities in the use of PNC.	A wealth index is computed based on the ownership of household assets and consumer durables	The third round of the District Level Household Survey (DLHS-3) • Binary logistic regression models	Outcome variable: type and timing of postnatal care. Main explanatory variable of interest was a proxy measure of household economic status

Findings:

- Only about 42% received the recommended four or more visits. Only 46% of women received advice on institutional care for childbirth
- Only 44% of the mothers interviewed in the survey received any PNC check-up within 48 hours of giving birth
- The rich-poor ratio varied from as low as 1.7 in case of receipt of any form of ANC to as high as 3.4 in regard to the compliance with 4 or more ANC visits.

Conclusion:

- There are significant socio-economic inequalities in access to PNC even for those accessing facility-based care. The coverage of essential PNC is inadequate, especially for mothers from economically disadvantaged households.
- The present findings are indicative of the fact that part of the non-use and inequalities in maternal health care can be explained by the inherent drawbacks in health systems which are inclined to treat clients based on their socio-economic position.

Limitations:

- This research could not externally validate the survey responses, although the trends were seen in various rounds of DLHS ensure consistency across time.

Author: Asamoah, Agardh, Pettersson, & Östergren, 2014					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross Sectional Study; Ghana; 1988, 1993, 1998, 2003, and 2008.	The majority of participants were within 25–34 years, had basic education, resided in rural areas and were married. For one-fifth of the respondents, it was their first birth experience while the majority had more than one birth experience (para 1 to 3: 44–50% and para 4 +: 28–36% between 1988 and 2008).	Investigate the magnitude and trends in income-, education-, residence-, and parity-related inequalities in access to antenatal care and skilled attendance at birth	• Educational level • Income level	Ghana Demographic and Health Surveys (DHS). • Logistic regression model • Regression-based Total Attributable Fraction (TAF)	• Antenatal care visits. ANC accessed using two variables: a) no ANC visit or at least one visit, and b) less than four ANC visits or at least four visits • Skilled attendance at birth. Responses were dichotomised as a) women who had skilled attendance at birth from a doctor, nurse, or midwife), and b) those who had no skilled attendance at birth.

Author: Asamoah, Agardh, Pettersson, & Östergren, 2014, *continued*

Findings:

- The rural-urban gap and education-related inequalities in the utilisation of antenatal care and skilled birth attendants seem to be closing over time, while income- and parity-related inequalities in the use of antenatal care are on a sharp rise.
- Within the income levels, increased utilisation of ANC was mostly attributed to high-income women. Two decades ago, income-related inequalities in ANC and SBA utilisation in Ghana were minimal
- From 1993 to 2008, the proportion of women with at least one ANC visit increased from 87.1% to 96.1%, those with at least four visits increased from 60.1% to 78.7%.
- The utilisation of SBA increased mainly in women with urban residence, high education, high income, and low parity

Conclusion:

- Intensifying community-based health education through media and door-to-door campaigns could further reduce the mentioned education- and parity-related inequalities.

Limitations:

- Self-reporting bias
- There was no data on the composition and quality of antenatal care received which could have given a more informed idea on the adequacy of care
- The declining trend in the rural/urban gap in the use of maternal health services may partly be attributed to changes in infrastructure and improved access to maternal health care services.

Author: Adeyanju, Tubeuf, & Ensor, 2017					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Nigeria; 1990 and 2008	The population remains religious and can be seen to be quite evenly split between Christian (42% in 1990) and Muslim (53%) at both times points although there it seems that the latter is larger overall this may be as a result of the increasing birth rates in the Muslim groups. The population is still largely rural (75% in 1990 and 64% in 2008), but an increase in the population urbanisation is seen. In Nigeria, maternal health care remains highly underfunded with only 7% of Nigeria's annual budget has gone to the health sector since the early 1990s	Analyse the trends in socioeconomic inequalities in the access t o maternal and child health care over time in Nigeria between 1990 and 2008	Household wealth index constructed with economic proxies, such as • housing quality, • household amenities, • consumer durables and • size of landholding	Nigerian Demographic and Health Survey • Concentration curves and indices	• Skilled antenatal care from a health professional or otherwise • Skilled birth attendance from a health professional or otherwise Control variables: • Education • Wealth Index

Author: Adeyanju, Tubeuf, & Ensor, 2017, *continued*

Findings:

- Inequalities in access to skilled antenatal care were concentrated among the wealthier group with both years' curves lying below the line of equality and inequalities increased over time with a CCI of 0.24 (95% CI 0.235-0.251) in 1990 and 0.26 (95% CI 0.256-0.272).
- Inequalities in skilled birth attendance increased between 1990 and 2008.
- Literacy-related inequality in skilled birth attendance increased while education-related inequality declined over-time.

Conclusion:

- Observed an increase in inequalities in access to care for the two maternal health variables
- The socioeconomic inequalities in access to maternal health care have increased with access to care favouring women in richer households.
- While some socio-economic groups have benefited from faster economic growth and improvements in living standards, much of the population continues to lack access to maternal services

Limitations:

- The analysis is not causal but rather presents associations between several characteristics and the care outcomes.

Author: Makate & Makate, 2017

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Zimbabwe; 1994, 1999, 2005/2006, and 2010/2011.	• Policies implemented to improve access to MHC including the Primary Health Care (PHC) of the mid-1980s and the Maternal and Neonatal Health (MNH) roadmap 2007–2015 launched in 2009 among others • Had one of the worst economic crisis in its history that saw the deterioration in the major sectors of the economy. • The degradation in the quality of health because of the exodus of qualified health professionals to neighbouring countries and abroad has contributed to inequalities in health. The increase in user fees in health in 1993–94 is plausibly responsible for the widening gap between the poor and rich in the country.	Measure and explain wealth-related inequalities in prenatal care use, and professional delivery assistance	• Asset-based household wealth index	Demographic and Health Survey for Zimbabwe (ZDHS) • Erreygers corrected concentration index	Receipt of four or more antenatal care visits as our measure for prenatal care use. Explanatory variables: • The age of the woman at the time of birth • Education level • Contraceptive usage • Marital status • Employment status • Religious beliefs • Access to information • Previously terminated pregnancy

Author: Makate & Makate, 2017, *continued*

Findings:

- The prevalence of MHC utilisation for women in the bottom three wealth quintiles (poorest, poorer, and average) appear somewhat lower than those in the top two wealth quintiles (richer and richest).
- Women from wealthier families (richer and richest) appear to have had high utilisation rates over time (1994 – 2011).
- The overall trends in disparities in prenatal care use show a pro-rich distribution in 1994, 2005/06 and 2010/11 with a pro-poor distribution observed in 1999.
- Inequalities in professional delivery support have also been pro-rich over the period under study.
- The pattern of inequalities over time also reveals a widening gap between the rural wealth-poor and the rural wealth-rich individuals.
- The decomposition analysis of the wealth-related inequalities in maternal health care use demonstrated that household wealth was amongst the most important factors explaining the observed differences in maternal health care in Zimbabwe. This result makes intuitive sense given the documented rise in poverty levels in the country since the mid-1990s
- while schooling appears to explain a fair share of the observed inequalities in maternal health care use, its contribution has declined over time.

Conclusion:

- The observed pro-rich distribution in disparities in maternal health care was mostly explained by household wealth, education, religion, health insurance coverage, and access to information.

Limitations:

- Factors identified to influence maternal health care outcomes do not necessarily have a causal interpretation
  Some of the data recorded by the ZDHS on maternal health care use are based on self-reports of the interviewed women, which can result in recall bias.

Author: Akowuah, Agyei-baffour, & Awunyo-vitor, 2018

Type of study; Country; Year of analysis	Background Context of the Country	Study Objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Ghana; year of analysis missing	The Ghana Ministry of Health introduced the free maternal healthcare delivery nationwide in April 2005, of which antenatal care was a major component. The policy was expected to reduce the cost of maternal services, which serves as a burden to pregnant mothers and reduces the maternal mortality rate.	Socioeconomic determinants of antenatal care utilisation in peri-urban Ghana using pregnant women who are in their third trimester	• Occupation status of the women	A well-structured questionnaire conducted on 200 women. Binary logit regression model	• Accessibility of ANC. • Level of education • Occupation

Findings:

- The results of the study reveal that socioeconomic factors like occupational status, secondary/higher education significantly influence the use of ANC in peri-urban Ghana.
- Wealth and education still influence ANC use in Ghana even after the introduction of the free maternal health policy.

Conclusion:

- Socioeconomic and health system factors are important determinants of antenatal care utilisation. Stepping up of interventions aimed at improving the socioeconomic status and addressing health system and proximity challenges could help improve antenatal care utilisation by pregnant women in Ghana.

Limitations:

- The selection was based on the level of antenatal care attendance at the health facility, missing out on the women who did not make it to the facility.

Table 3: *Empirical studies of socioeconomic inequalities in the use of maternal health care in 'Low-income countries'*

Author: Wang & Hong, 2015					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Cambodia; 2010	• The analysis was done on women aged 20-34, already had 1 or more children and had some form of education • The majority lived in rural areas, 80% reported access to various types of media • 30% of the population lives below the poverty line (6 472 women analysed).	Examine the level of service use along the continuum of care	Asset index	Demographic Health Survey: • Three sequential regression models	Continuum of care: ANC visits, SBA and Postnatal care (PNC), 48 hours post-delivery.

Author: Wang & Hong, 2015, *continued*

Findings:

- 3/5 Cambodian women received all three types of MHC services for their most recent birth
- Regional variations in use range from 14% to 96% in capital cities.
- Quality of ANC is connected to women's use of SBA and PNC.

Overall use in Cambodia:

- 60% attended all recommended four visits
- 90% had at least 1 visit
- 74% of women had skilled birth attendance
- Women from wealthier HHs are more likely to receive postnatal care than women from poorer HHs, although the effect of wealth on PNC does not appear to be as strong as its effect on ANC and PNC.
- After receiving ANC many women dropped out from the pathway of continued care.

Conclusions

- The use of services (continuum of care) substantially vary by wealth status, education, and Health Insurance coverage.
- 89% from the richest HHs compared to 39% of those form the poorest HHs, receive the full range of services.
- Odds of using ANC are five times higher for women with secondary education than for women without education
- A woman with health insurance has a 30% greater odds of having ANC.

Limitations:

- The analysis used secondary data thus cannot account for maternal complications that can potentially drive women to health facilities for more MHC.

Author: Joshi, Torvaldsen, Hodgson, & Hayen, 2014					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
South Asia, Nepal; 2011	• Nepal follows the World Health Organization's recommendation of initiation of ANC within the first four months of pregnancy and at least four ANC visits during an uncomplicated pregnancy • Younger women, living in urban areas, having primary education or higher, with lower parity, from non-farming occupations, in higher wealth quintiles, who did not smoke and whose husbands also had primary education or higher, were more likely to attend four or more ANC visits and receive higher quality ANC	Investigate factors associated with: (1) Four or more ANC visits and (2) Receipt of good quality ANC, among Nepalese women who had given birth in the previous five years.	• DHS wealth quintile divided into categories: poorest, poorer, middle, richer and richest; and were derived using the principal components analysis based on information from housing characteristics and ownership of durable household goods) • Women's education • Women's work status in the past 12 months	Demographic and Health Survey • Logistic regression models	Outcome Variable: • Attendance at four or more ANC visits • Quality ANC as that which included all seven recommended items of ANC in Nepal

Author: Joshi, Torvaldsen, Hodgson, & Hayen, 2014, *continued*

Findings:

- Half the women (n = 2078, 50.0%, 95% CI = 46.1 to 53.8%) had four or more ANC visits, whereas the other half had fewer than 4 ANC visits, including 15% of women who had no ANC at all
- A larger proportion of women attending four or more ANC visits received good quality ANC, compared to those who attended fewer than four ANC visits (84% vs 16%).
- With increasing education levels of women, their odds of receiving four or more ANC visits also increased, which was as high as seven times for women with tertiary education compared to those with no education (OR = 7.11; 95% CI: 3.28 to 15.44).
- Women in the richest quintile had three times the odds of receiving four or more ANC visits than women in the poorest quintile (OR = 3.00; 95% CI: 1.95 to 4.60).
- The levels of husbands' education increased the odds of women getting four or more ANC visits.

Conclusion:

- We found that receipt of four or more ANC visits and the quality of ANC were associated with several factors ranging from socio-economic
- Women's education was strongly associated with greater use of maternal health care [38]. Female education improves wealth reduces gender disparity and empowers women

Limitations:

- The data were self-reported, and it was a retrospective study making the information thus collected subject to recall bias.

Author: Sharma, Sawangdee, & Sirirassamee, 2007					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Nepal; 1996 and 2001.	• The country has employed the use of outreach service workers who make home visits to increase access to MHC and information regarding health during pregnancy. • Mass media is also one of the mechanisms the country has put in place to further use of MHC	To understand how far programme interventions issues have been successful in Nepal to increase MHC usage with a special focus on the relationship between SES score and educational attainment as one of the determinants.	SES was measured by adding yes/no responses for possession of eight household durable goods or services: radio, television, car, electricity, bicycle, tap water, modern toilet, modern floor material.	1996 Nepal Family Health Survey and 2001 Nepal Demographic and Health Survey • Multiple and Simple logistic regression models	• Dependent variables: antenatal care, delivery care and postnatal care, during the last pregnancy and birth. • Explanatory variables include: Women's highest qualification and employment status

Author: Sharma et al., 2007, *continued*

Findings:

- Among women's status variables, education showed a strong association with the use of all maternal health services. Women with primary and higher education were more likely to use these services than uneducated women.
- All working women, irrespective of the type of employment, were less likely to use delivery and postnatal care.
- Women working in the service sector, however, were more likely (not significant) to use prenatal care services compared with women who did not work.

Conclusion:

- Education was positively associated with all three maternal health service utilisation. Potentially because of educated women's greater decision-making power on health-related issues.
- Employed women, irrespective of their type of employment, were less likely to utilise maternal health services.
- The likelihood of utilising maternal health services increased with an increased household economic status score. The likelihood of utilising maternal health services increased with an increased household economic status score.

Limitations:

- None mentioned

Author: Nigatu, 2011

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Ethiopia;	• Even though ANC and PNC services are made accessible to nearly all villages (in most instances at lower or no cost), the decisions that lead women to use the services seem to occur within the context of their marriage, household and family setting. • A large number of women in polygamous relationships • The total population of Sidama was 2,954,136, of which only 5.51% reside in urban areas.	This study, therefore, aims to examine both the utilisation of ANC and PNC services in Southern Ethiopia, Sidama. Tests three major hypotheses: (1) Educated women are more likely to use ANC and PNC service than their counterpart uneducated ones (2) older women are more prone to using ANC and PNC compared to the younger ones. (3) Higher parity mothers are more likely to use ANC and PNC.	• Educational status of women • Occupation of women • Land size owned by the household	Interviews conducted on 1094 households • Logistic regression analysis • To indicate increased or decreased chance of ANC/ PNC given a set of the level of an independent variable, odds ratios were determined from the logistic regression coefficients	Main response variables: • ANC, a dichotomous variable was asking created whether a woman had visited a skilled health care provider at least once during the last pregnancy • PNC was measured by the level of immunization of the last child

Author: Nigatu, 2011, *continued*

Findings:

- Women who are working in formal employment (such as in civil services) were 1.96 times more likely to use the ANC services.
- Illiterate women were 27.9% and 24.7% less likely to use the ANC and PNC services respectively compared to their counterpart literate women.

Conclusion:

- The study has revealed that the level of ANC service utilisation is relatively higher in Sidama (about 77.4%) compared to other populations in southern Ethiopia. However, most women might have visited the service to get treatment for their health problem instead of deliberately seeking ANC services.
- It is also likely that literate women seek out higher quality services and have a greater ability to use health care inputs that offer better care

Limitations:

- The study collected information on service utilisation in relation to the most recent birth during the 24 months preceding the survey, and hence, it is difficult to look into consistency in the use of these services between successive births.

Author: Memirie, Verguet, Norheim, Levin, & Johansson, 2016					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Ethiopia; 2005 and 2011.	The national health policy of Ethiopia gives strong emphasis on fulfilling the needs of the rural residents, which constitute 84 % of the Ethiopian population. Ensuring universal access to health care is one of the main targets of the national Health Sector Development Program (HSDP) IV (2011–2015) in Ethiopia.	1)To measure changes in the degree of inequality in the utilisation of selected MCH interventions and child morbidities over time 2)To determine factors associated with inequality and inequity in access to care	Household asset index using principal components analysis. Wealth quintiles were used as a living standard measure in the subsequent modelling.	Data from DHS conducted in Ethiopia • Concentration and horizontal inequity indices	Utilization of MCH services was selected for analysis. These were binary variables, where a value of 1 was assigned if care was accessed or a value of 0 if care was not accessed.

Author: Memirie, Verguet, Norheim, Levin, & Johansson, 2016, *continued*

Findings:

- Decomposition of the concentration index shows that 47% and 76% of wealth-related inequality in access to SBA and modern contraceptive use is explained by the direct effect of household economic status and by educational attainment of parents.
- Public hospitals and private facilities played a major role as delivery care services outlet, more so for the wealthiest quintile and urban residents (pro-rich).

Conclusion:

- Despite improvements in coverage of MCH services, the inequality by wealth quintile has remained persistently high in both the 2005 and 2011 surveys.
- Socioeconomic status, measured by a wealth index and parental educational attainment, were the main predictors of differences in utilization of MCH services
- The low utilisation of these services among the poor and rural residents might be related to out-of-pocket spending by families, either for services or because families need to travel to a health facility.

Limitations:

- Recall bias is one possible problem in surveys as they are based on maternal recall.
- The computation of concentration indices for binary outcomes, we used a linear regression model that may lead to inaccuracies.

Author: Wilunda et al., 2015

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; three districts in South West Shoa Zone (Wolisso, Wonchi and Goro), Ethiopia; February 2013	Most of the participants were from Wolisso District (55.6 %); rural dwellers (86.3 %); of Oromo ethnicity (86.6 %); uneducated (52.3 %); Orthodox Christians (51.8 %); with a partner with at least primary education (77 %); and married (96.4 %). Less than a half (48.8 %) knew the minimum recommended number of ANC visits and 23.3 % could mention at least three danger signs of pregnancy.	Determine the coverage of at least four ANC visits and delivery by an SBA and to identify determinants of utilisation of these services	• Housing material • Asset ownership • access to water • sanitation facilities	UNICEF's Multiple Cluster Indicator Survey questionnaires and JHPIEGO's tools for monitoring birth preparedness and complication readiness (492 women interviewed) Logistic regression models were used to obtain unadjusted and adjusted odds ratios with 95 % CIs for the associations between various factors and each of the outcome variables. • Variables with $p < 0.1$ in the unadjusted analysis were included in multivariate analysis.	• Attendance of at least four ANC visits provided by a health professional or a health extension worker • Delivery care by an SBA, i.e. a doctor, nurse, midwife, or a health officer.

Author: Wilunda et al., 2015, *continued*

Findings:

- Coverage of at least four ANC visits and SBA at delivery were 45.5 and 28.6 %, respectively.
- Women in the highest wealth quintile had a three-and-a-half-fold increase in the odds of attending ANC compared to those in the lowest wealth quintile (OR 3.53, 95 % CI 1.69-7.39)
- The wealth index was positively associated with delivery by an SBA with women in the highest wealth quintile having a 9-fold increase in the odds of delivery by an SBA compared to those in the lowest wealth quintile (OR 8.94, 95 % CI 2.45–32.61)
- 15% of women with secondary or higher education, as opposed to 43.8% of those with no education, attended all four ANC visits.

Conclusion:

- Attendance of at least four ANC visits was positively associated with wealth status, knowledge of the recommended number of ANC visits, and attitude towards maternal health care, but was negatively associated with woman's age.
- This study suggests that education is not a strong determinant of the utilisation of maternal health services in this context where more than half of the women are uneducated.

Limitations:

- Transportation and direct or indirect costs were also not evaluated in this survey.
- Inadequate staffing potentially leading to long waiting time in receiving care at health facilities was also not studied here.

Author: (Tsegay et al., 2013)

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Ethiopia, Tigray; August to September 2009	Eighty per cent of the population are estimated to live in rural areas, and most of the inhabitants are Christian. The region is divided into seven zones and 47 districts, of which 35 are rural, and 12 are urban. There is one specialised referral hospital as well as five zonal hospitals, seven district hospitals and 208 health centres.	Determine the prevalence of maternal health care utilisation and explore its determinants among rural women aged 15–49 years in Tigray	• Respondents'(women) education • Husbands´ occupation	A structured questionnaire based on an existing tool (women from 1,115 households were interviewed) Univariable logistic regression	• ANC use was defined as whether the mother paid at least one visit to the health post during her pregnancy. • Place of delivery was classified as home delivery or institutional delivery

Findings:

- Mothers with 5–12 years of education (OR=3.18, 95% CI: 1.85-5.47) were more likely to attend ANC than non-educated and grade 1–4 mothers.
- Having husbands with a non-farming occupation (OR=2.26, 95% CI: 1.43-3.58) were also associated with greater use of ANC.

Conclusion:

- Women's education improves the status of women, enabling them to decide to seek health care and to identify danger signs during pregnancy. Furthermore, it increases women's knowledge of where and how the best health care can be accessed and enhances women's capability of making autonomous decisions
- It becomes clear from this study that the key factor for improving maternal health care and access is women's education.

Limitations:

- The data were collected by health extension workers who were familiar with the community, which could result in social desirability bias.

Author: Mezmur, Navaneetham, Letamo, & Bariagaber, 2017

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Ethiopia; 2000, 2005 and 2011.	Ethiopia is the second-most populous country in the African region. It has made remarkable progress in reducing poverty over the past decade. Despite the progress in reducing poverty over the past decade, the country's per capita national health expenditure of 20.77 US$ in the year 2011 remains the lowest compared to the Sub-Saharan Africa average of US$ 93.65 and that of WHO's recommended US$ 30–40 per person needed to cover essential healthcare Out-of-pocket healthcare payment is catastrophic and comprises 80% of the healthcare expenditure, which is much higher compared to 62% in sub-Saharan Africa.	Examine socioeconomic inequalities in the uptake of maternal health services and to identify factors that contribute to such inequalities	• Wealth index, constructed using information collected on durable asset ownership, access to utilities and infrastructure	Ethiopian Demographic and Health Surveys (EDHS) • Concentration curves and the related concentration index (CI) • Decomposition analysis	• Minimum of one ANC, four or more ANC • Initiated the first ANC in the first trimester of pregnancy, Exposure Variables: • Maternal Education • Maternal Occupation

Author: Mezmur, Navaneetham, Letamo, & Bariagaber, 2017, *continued*

Findings:

- The uptake of a minimum of one ANC and adequate ANC (3+ ANC) were more frequent among the richest segment of society.
- Across the survey years, the average increase in the uptake of these services is greater among women in the richest wealth quintile.
- Initiation of the first ANC in the first trimester of pregnancy amongst the poorest wealth quintile increased marginally, whereas the increase for women in the richest wealth quintile was greater.
- The positive CI values of 0.308, 0.323 and 0.310 for the uptake of a minimum of one ANC in the year 2000, 2005 and 2011 respectively indicate skewness towards the non-poor population.
- Inequality in the uptake of four or more ANC declined from 0.409 in the year 2000 to 0.353 in 2011.

Conclusion:

- There is 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 while giving birth than in other maternal healthcare indicators.
- The observed widening inequalities in the uptake of delivery care favouring the rich over the study period; however, mean the implemented health programs have not adequately addressed the issue of equity.

Limitations:

- The cross-sectional nature of the data does not allow drawing causal inferences.
- DHS data are associated with recall bias given that data were collected retrospectively on events that took place 5 years before the survey

Author: Mehata et al., 2017					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Nepal; 1994 to 2011.	Nepal has made significant progress in meeting maternal and child health-related Millennium Development Goals and has achieved remarkable reductions in maternal, newborn, infant, and under-five mortality over the past two decades. However, stark disparities in utilisation of services and health outcomes persist along geographic, economic, and sociocultural lines.	Assess the social determinants of inequalities in the use of maternal health services in Nepal by drawing on national household surveys.	Wealth index	cross-sectional surveys conducted in Nepal in 1996 (Nepal Family Health Survey, NFHS), 2001, 2006, and 2011 (Nepal Demographic and Health Surveys (NDHS)): • Bivariate and multivariate logistic regression • Rate difference and rate ratios were calculated to measure income inequalities • concentration index and 95% confidence interval (95% CI) were also used to assess income inequality over time.	Dependent variable: • Antenatal care • Institutional delivery • Delivery by cesarean section Independent Variable: • Mothers' education • Caste and ethnicity • Wealth quintile • Rural/urban residence • Ecological zone

Author: Mehata et al., 2017, *continued*

Findings:

- The percentage of mothers with four antenatal care (ANC) visits increased from 9% to 54%, and the institutional delivery rate increased from 6% to 47% between 1994 and 2011.
- The institutional delivery rate increased both in public and private sector facilities between 1994–1996 and 2009–2011. While public health facilities continue to have a larger number of deliveries in comparison to private, the rate of increase in institutional delivery was higher among for-profit private facilities compared to public facilities.
- Mothers from the richest wealth quintile were more than five times more likely to have four ANC consultations (AOR: 5.08, 95% CI: 3.82–6.76), nine times more likely to give birth at health institutions (AOR: 9.00; 95%CI: 6.55–12.37), and nearly 10 times more likely to give birth by C-section (AOR: 9.37; 95% CI: 4.22–20.83).
- The rich: the poor ratio was reduced from 11.36 in 1994–1996 to 2.92 in 2009–2011 and the concentration index dropped from 0.60 (95%CI: 0.56–0.64) to 0.31 (95% CI: 0.29–0.33) for four ANC consultations.
- Mothers with higher education were about ten times more likely (odds ratio: 10.38; 95% CI: 6.81–15.81) to use four ANC compared to women with no education.

Conclusion:

- study indicate that inequality in the utilization of maternal health services in Nepal persists, although it is in a declining trend from 1994 to 2011.
- To turn the goals of universal health coverage into reality, special attention needs to be paid to poorer women, those with less education, and those living in remote areas.

Limitations:

- The design of the four NDHS surveys may not have been strictly comparable although we tried to adjust some differences such as duration of recall period while assessing the determinants of inequalities.
- The findings are prone to recall bias.
- The perspectives of women who gave birth and died before an interview could take place were missing.

Author: Rurangirwa, Mogren, Nyirazinyoye, Ntaganira, & Krantz, 2017

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; Rwanda - Kigali City; July and August of 2014	With approximately 11 million inhabitants, 64% of women and 66% of men in Rwanda have a primary school education. However, 12% of women and nine per cent of men have no formal education. The majority of the low educated or illiterate women live in rural areas where more than 93% of the women are involved in small-scale agricultural activities, and the fertility rate is higher than the country average of 4.6 children.	Investigate the number and timing of ANC visits that were performed and socio-demographic and psycho-social risk factors for low or no attendance.	• Total household monthly income • Household assets	Interviewer-administered questionnaire • Bi-and multivariable logistic regression • Odds ratios were presented with their 95% confidence intervals.	Dependent variables: • Number of antenatal care visits • The timing of antenatal care visits

Findings:

- No schooling and being poor, with no assets in the household, was not associated with poor ANC attendance with p-values of 0.24, 0.62 and 0.24, respectively.

Conclusion:

- The study found that a majority of women still do not complete the recommended number of four visits to ANC during pregnancy.

Limitations:

- The cross-sectional nature of our study limits the ability to draw any causal inferences, and residual confounding resulting from other socio-demographic and psychosocial related determinants cannot be ruled out.

Author: Amin, Shah, & Becker, 2010

Type of study; Country; Year of analysis	Background Context of the Country	Study Objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; 3 rural areas from Bangladesh - Chittagong, Dhaka and Rajshahi; June 2003 to September 2006	A wide range of therapeutic choices in modern health care through public health facilities is available in rural Bangladesh. These include primary health care organised around the Health Complex located at the Upazila (sub-district) headquarters with in-patient and basic laboratory facilities. These facilities provide a free essential services package (ESP) in health care, which consists of maternal health, family planning, communicable disease control, child health, and basic curative care.	Socioeconomic differentials in maternal and child health-seeking behaviour in selected rural areas.	• Mother's level of schooling • Father's occupation and level of education • Membership in a microcredit group • Ownership of assets.	Household survey • calculated odds ratios with each covariate • conducted multivariate logistic regression analyses	• Trained antenatal care (ANC) provider vs. untrained provider or no ANC • Tetanus toxoid (TT) given vs. not given to the woman during the last live birth pregnancy • Child delivery by trained providers vs. untrained providers

Author: Amin, Shah, & Becker, 2010, *continued*

Findings:

- Greater use of antenatal care (ANC) from a trained provider was significantly associated with years of schooling of the mothers and the fathers, with 76.4% of mothers with more than primary school vs. 33.7% of mothers with no education seeking ANC from a trained provider ($p < 0.01$).
- Women whose husbands had schooling above primary level 74.5% sought ANC from a trained provider compared with 35.9% of women whose husbands had no formal education ($p < 0.01$).
- Mothers in families whose husbands were in agricultural or skilled labour occupations and whose households were in higher wealth quintiles were more likely to use modern providers for antenatal and postnatal care.
- Compared to the mothers in the lowest wealth quintile, mothers from the highest quintile had greater odds of seeking ANC from a trained provider (OR = 7.6, 95% CI: 2.2-26.2, $p < 0.01$) and nearly 11 times higher odds to have a trained provider present at childbirth (95% CI: 2.-45.2, $p < 0.01$).

Conclusion:

- Both formal education and relative wealth were positively associated with the utilisation of maternal and child health services. Consequently, both the economic and educational improvement of the poor mothers would have a reinforcing effect on improved service utilisation, so they both need to be strengthened.

Limitations:

- Data were from a purposive sample of villages in relatively remote rural areas. Therefore, the findings pertain to the population of households of the 128 sampled villages at the time of the interview

Author: Collin, Anwar, & Ronsmans, 2007

Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Bangladesh; 1993–1994, 1996–1997, 1999–2000, and 2004.	Bangladesh has seen a gradual decline in its maternal mortality ratio (deaths per 100,000 live births) over the past decade, from 500 in 1990 to 400 in 2001, but the ratio remains unacceptably high, representing 12,000 maternal deaths per year. The official MDG-5 target of 143 deaths/100,000 live births by 2015 can only be achieved by overcoming gender and socioeconomic inequalities, and cultural barriers, which prohibit access to skilled and emergency obstetric care for the vast majority of Bangladeshi women	Examine trends in the proportions of live births preceded by antenatal consultation, attended by a health professional, and delivered by caesarean section, according to key socio-demographic characteristics.	• Asset quintiles were computed using the principal components analysis method of Filmer and Pritchett	Four Bangladesh Demographic and Health Surveys • Logistic regressions were used to calculate crude and adjusted odds ratios	• Receiving one or more antenatal consultations from a health professional • Health professional present at delivery, • The birth occurred at home or in a health facility. Other variables: • Mother's age at delivery • Parity • Mother's highest level of education • Father's highest level of education, • Residence

Author: Collin, Anwar, & Ronsmans, 2007, *continued*

Findings:

- Utilization of antenatal care increased substantially, from 24% in 1991 to 60% in 2004.
- Despite a relatively greater increase in rural than urban areas, utilization remained much lower among the poorest rural women without formal education (18%) compared with the richest urban women with secondary or higher education (99%).
- Within these trends there were huge inequalities; a health professional attended 86% of live births among the richest urban women with secondary or higher education, and 35% were delivered by caesarean section, compared with 2% and 0.1% respectively of live births among the poorest rural women without formal education.

Conclusion:

Despite commendable progress in improving uptake of antenatal care, and in equipping health facilities to provide emergency obstetric care, the very low utilization of these facilities, especially by poor women, is a major impediment to meeting MDG-5 in Bangladesh.

Limitations:

- Data on the area of residence in the three DHS surveys were not strictly comparable because, unlike the 1999–2000 survey, the 1993–1994 and 1996–1997 surveys categorized "other urban" areas as "rural".
- The recall periods were different; 3 years for the first survey, 5 years for the other surveys.

Author: Do, Thi, Tran, Phonvisay, & Oh, 2018					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Lao People's Democratic Republic; 2000 – 2012	Lao People's Democratic Republic (Lao PDR) is one of the ten "fast-track" countries who are doing better than comparable countries in reducing maternal mortality. Maternal mortality ratio has decreased substantially in the last decade, from 1100 (in 1990) to 220 (in 2012) per 100,000 live births. The government has put maternal health care services as the entry point to strengthen the healthcare system in the Health Sector Reform Agenda.	Examine the differences in using maternal health care services across different socioeconomic subgroups in Lao PDR.	• HH wealth index quintile	Multiple Indicator Cluster Survey • Logistic regression	Dependent variable • Antenatal care • Delivery services with skilled birth attendants Independent variable • Education • Wealth • Ethnicity • Residential areas

Author: Do, Thi, Tran, Phonvisay, & Oh, 2018, *continued*

Findings:

- There were no educational disparity changes from 2000 to 2012, and there were aggravations in the disparities between ethnic groups as well as worsening disparities between the rich and poor.
- Compared to the mothers who had never attended school, the mothers who had attended primary school were more likely to use ANC [OR = 2.32; 95% CI: 1.97–2.74] and more likely delivery with an SBA [OR = 1.40; 95% CI: 1.12–1.70].
- Women with secondary or higher education were more likely to use ANC [OR = 4.58; 95% CI: 3.70–5.68] and more likely to use an SBA [OR = 3.71; 95% CI: 2.96–4.65].
- The richest quintile women were more likely to use antenatal services [OR = 3.41; 95% CI: 2.53–4.59] and more likely to deliver with an SBA [OR = 8.21; 95% CI: 5.99–11.27] compared to the poorest quintile women.

Conclusion:

- Efforts to increase maternal health service utilisation in poor and minority ethnic groups should be emphasised to reduce social inequalities, thus encompassing multiple-sector interventions rather than focusing only on health sector-related interventions.

Limitations:

- The data collected are from respondents' recall information, which was not validated with other objective data sources such as health facilities' ANC and SBA registration data.

Table 1: *Empirical studies of socioeconomic inequalities in the use of maternal health care in 'multi-country studies'*

Author: McTavish, Moore, Harper, & Lynch, 2010					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional Study; sub-Saharan Africa (SSA); 2002 – 2003 <u>Countries included:</u> Burkina Faso, Chad, Congo, Côte d'Ivoire, Ghana, Kenya, Malawi, Mali, Namibia, Senegal, South Africa, Swaziland, Zambia, and Zimbabwe.	• Countries with low compared to high female literacy in SSA are characterized by greater gender-based inequality. • Female literacy at the national level may be associated with MHC use due to a) Greater maturity of the system b) increased resources c) Autonomy to all women. • Countries where women's economic status is higher and where resources are more available for women to become educated may also place greater legal protections and more progressive policies that enable women to access and use HH resources.	Importance of national female literacy on women's MHC use in continental SSA	Permanent income was estimated at the HH level for each respondent using asset-based approach and categorized into quintiles	World Health Survey • Multilevel logistic regression	Individual Variables: • Permanent HH income • Years of schooling Country-level variable: • National female literacy = proxy for women's status and resources available to women in a country

Author: McTavish, Moore, Harper, & Lynch, 2010, *continued*

Findings:

- SSA mean female literacy of 55%
- Among 11 661 respondents, 16.2% reported not using MHC during their last pregnancy.
- Within countries, for each increase in a mothers' HH income (Odds Ratio: 0.87; 95% Confidence Interval: 0.80, 0.96) and for each extra year of schooling (OR: 0.95; 95% CI: 0.93, 0.96) the lower the probability of lacking MHC

Between Countries:

- The magnitude of the association of income with lack of MHC varied across the 14 SSA countries.
- Mothers residing in higher female literacy level countries had a lower level probability of lack of MHC (OR: 0.97; 95% CI: 0.95, 0.99) and mothers residing in countries with higher levels of Gross Domestic Product per capita had a higher probability of lack of MHC (OR: 1.59; 95% CI: 1.07, 2.36)
- Malawi and Zambia showed the opposite: The study found an increase in reported use of MHC irrespective of a lower GDP/c
- In countries with high female literacy such as Namibia and South Africa, there are no differences between income quintiles and the probability of lack of MHC care

Conclusions:

- Within countries, education and HH income were associated with the use of MHC.
- National female literacy modified the association between income and non-use of MHC facilities. i.e. the strength of the association between income and lack of maternal health care was weaker in countries with higher female literacy.
- In countries with higher female literacy, such as Zimbabwe and South Africa, where reported female literacy was over 80%, inequalities in HH income between the poorest and richest quintiles were negligible.

Limitations:

- Study restricted to SSA countries that participated in the World Health Survey.
- No study to compare findings to as analysis was done both within and across countries.

Author: Tsala Dimbuene et al., 2017					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; the Democratic Republic of the Congo (2013–14), Egypt (2014), Ghana (2014), Kenya (2014), Nigeria (2013) and Zimbabwe (2015	In the period between 1980 and 2008, Zimbabwe has seen, on average, an increase of 5.5% in maternal mortality per year probably due to the high proportion of adults affected by AIDS In the same period more than 50% of all maternal deaths during the period occurred in six countries in 2008, including Nigeria and the Democratic Republic of the Congo	Addressed the associations between women's education and maternal health service utilisation through a lens of inequities at the individual level in different social and cultural contexts.	Household Wealth Index Three SES strata were defined as follows: Poor (40%), Middle (40%) and Rich (20%).	Demographic and Health Surveys • Logistic regression models	Dependent variables • the antenatal care provider, • the timing of first antenatal care visit, • the frequency of antenatal care visits, • place of delivery • presence of a birth attendant. Independent variable: • Maternal education • Employment status • Marital status • Health insurance

Author: Tsala Dimbuene et al., 2017

Findings:

- findings revealed country-specific variations in maternal health service utilization, and for most indicators, there was a clear gradient among socioeconomic strata
- Women living in better-off households exhibited greater access to, and utilization of, maternal health services
- In the six countries, the associations between women's education and frequency of antenatal care visits (i.e. at least four visits) were positive
- women's education was positively and significantly associated with the likelihood of health facility delivery across different SES groups.
- In Egypt, Nigeria and, to some extent in Zimbabwe, women's education was significantly ($p<0.01$) associated with the likelihood of having a doctor as a skilled birth attendant.

Conclusions:

- Multivariate analyses revealed that women's education had a positive association with the type of antenatal care provider, timing and frequency of antenatal care visits, place of delivery and presence of a skilled birth attendant at delivery.
- The findings also showed that many other factors (results not shown) are at play and need to be taken into account for a thorough understanding of the relationship between women's education and maternal health service utilization outcomes, and for the development of sustainable social and health policies aimed at improving maternal and child health while promoting an equity approach.

Limitations:

- The cross-sectional nature of the data limited the possibility of drawing any conclusion from the analyses about causation.

Author: Goli & Singh, 2017					
Type of study; Country; Year of analysis	Background context of the country	Study objectives	Measure of SES	Analytic methods for SES inequality assessment	Variables of interest
Cross-sectional study; Bangladesh, Ethiopia, Nepal and Zimbabwe; 2010 to 2011	South Asia (Nepal and Bangladesh) and sub-Saharan Africa (Zimbabwe and Ethiopia) contribute 29% and 56% respectively to the global burden of maternal deaths, together accounting for 245,000 maternal deaths. Within these regions, the countries are in the top fifty in terms of levels of maternal mortality, and in the bottom fifth in rankings of recent progress in maternal mortality decline, based on the World Health Organization 2015 report	The study quantified the contributions of the socioeconomic determinants of inequality to the utilisation of maternal health care services in four countries in diverse geographical and cultural settings:	Household wealth quintile contrasted using household assets.	Demographic and Health Surveys • Decomposition model • Concentration index (CI) • Concentration curves	Dependent variables • Less than three ANC visits • No Institutional delivery • No Postnatal care Independent variables • place of residence • mother's literacy level • Mother's Level of education • Husband's education level • Child's birth order • Women's work status • Women's risky age

Author: Goli & Singh, 2017, *continued*

Findings:

- Although maternal health care was poorer among lower socioeconomic status 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.
- Analyses found that for all four countries the plotted CI curves diverged from the line of equity for all three maternal health indicators, indicating that the under-utilisation or non-utilization of maternal health care was heavily concentrated among relatively poor women.
- In terms of specific outcomes with regard to inequality in ANC visits, the distance from the line of equity to the line of concentration curve was greatest in Nepal (CI=−0.2859) relative to Bangladesh (CI=−0.1147), Ethiopia (CI=−0.1146) and Zimbabwe (CI=−0.0632).
- In the case of institutional delivery, inequality was highest in Zimbabwe with a CI value of −0.2527, followed by Nepal (CI=−0.1959), Bangladesh (CI=−0.1337) and Ethiopia (CI=−0.03702).
- Nepal also had the greatest inequalities in postnatal care visits within 2 days of delivery (CI=−0.1816), followed by Bangladesh (CI=−0.1153), Zimbabwe (CI=−0.0577) and Ethiopia (CI=−0.0370).
- Ethiopia had the least inequality with regard to postnatal care within 2 days of delivery.
- The variables mother's illiteracy, partner's illiteracy, poor economic status and birth order 3+ were found to be positively associated with <3 ANC visits in all four countries.

Conclusion:

- Key contributing factors for socioeconomic inequalities in maternal health care varied across the selected countries.
- Policy initiatives must consider factors such as economic status, education level and regional disadvantages to reduce the burden of maternal mortality in low- and middle-income countries.

Limitations:

- Recall bias

Discussions

Commitments from MDGs to SDGs have enhanced emphasis on maternal health care service strengthening, especially in low-to-middle-income countries and low-income countries. There is an evident transition in the promotion of the use of all three components of MHC (i.e. ANC, SBA and PNC) where there previously was a single approach and effort to each of these services (Wang & Hong). While these services are believed to better the health outcomes of pregnant women, and their babies and numerous studies have repeatedly demonstrated the importance of these services, their use has not been universal and varied by countries.

The focus of this literature review is narrowed mainly on the relationship between SES and the use of ANC. Following data extraction, countries were categorized into one of three divisions namely, 1) High-income countries (***Table 1***), 2) Low-to-middle-income countries (***Table 2***), 3) Low-income countries (***Table 3***) as classified according to the 2014 World Development Indicators (World Bank, 2014). For the sake of this review, a fourth category was formed, classified as multi-country studies (***Table 4***).

High-income countries

Study design

The two studies conducted in high-income countries used different study designs. The study conducted in Italy employed a cross-sectional design conducted on 37 000 women (Chiavarini et al., 2014) whereas the study conducted in the USA used a retrospective descriptive design on 439 women (Park et al., 2007).

Measure of SES

Employment and level of education were often used as a measure of SES in high-income countries as opposed to asset index in the majority of studies conducted in low-income countries and low-to-middle-income countries (Park et al., 2007; Chiavarini et al., 2014). Another method Park et al., (2007) used not seen in any of the studies included in this literature review was the method of payment as a measure of SES, alluding to having medical insurance or not.

Analytic methods for SES inequality assessment

The study conducted in Italy employed standard and multilevel regression models as a means of assessing SES inequalities in the use of ANC (Chiavarini et al., 2014). On the other hand, Park et al., (2007) conducted a Pearson correlation and Chi-square methods to determine the correlation between the total number of prenatal visits and SES from the Nurse-Midwifery Clinical Data Set.

Findings of the review

From the search results, studies that were based in high-income countries were focused rather on the quality of care women received as opposed to the number of ANC visits attained in relation to SES. This is because coverage of ANC in high-income countries was almost always universal

and disparities did not follow SES differences but rather demographic patterns such as race and age, which were beyond the scope of this review.

Nonetheless, the recommended minimum number of ANC visits in high-income countries varied considerably ranging from four to fourteen visits. For instance, Chiavarini et al., (2014) and Park et al. (2007) show varying contexts in terms of the number of recommended prenatal visits. The minimum number of recommended prenatal visits in the USA was 14 for low-risk pregnant women as per the American College of Obstetrics and Gynaecology (ACOG) guidelines (Park et al., 2007). On the other hand, in Italy, the recommended number of prenatal visits was the same as that recommended by the WHO, which is a minimum of four visits for pregnancy with no complications (Chiavarini et al., 2014).

Unlike in low-income countries and low-to-middle-income countries, attaining the recommended number of visits in high-income countries mirrored the differences in the type of insurance women in question had access to (Chiavarini et al., 2014; Park et al., 2007). In the USA, having private insurance significantly increased the likelihood of having more prenatal care visits compared to women with other forms of public insurance (Park et al., 2007).

On the other hand, employment and level of education in high-income countries was consistent with the existing body of knowledge, where higher education and employment of the mother has been shown to enhance the use of ANC (Chiavarini et al., 2014; Park et al., 2007). In Italy in particular, the strength of determination of the use of ANC by these predictor variables was the same, i.e. education did not surpass employment in increasing use of ANC and *vice versa* (Chiavarini et al., 2014).

Although Italy and USA are high-income countries, the policy implications of their findings concurred with those in low-to-middle-income countries, where the focus is centred on empowering women that are unemployed and poorly educated.

Low-to-middle-income countries

Study design

Majority of the studies employed a cross-sectional study design unless the authors took an interest in qualitative data as well, for which a mixed-method (quantitative and qualitative) approach was used. Use of mixed methods is seen in studies conducted in South Africa (Tsala Dimbuene et al., 2017; Silal et al., 2012) and Mumbai - India (Alcock et al., 2015). Only a study conducted in Ghana solely used a qualitative method in the form of a questionnaire, carried out in only 200 women, qualifying it as a study with the least number of participants in all developing countries (Akowuah et al., 2018). On the other hand, all the multi-country studies also used the cross-sectional study design and the Demographic and Health Survey as a primary source of data, except for the study that was conducted in sub-Saharan Africa that used the World Health Survey (McTavish et al., 2010).Measures of SES

The asset-based household wealth index was a significant measure of SES. Some of the unique factors included the type of house the mother lived in, the source of energy and ownership of land and livestock (Alcock et al., 2015; Silal et al., 2012; Adeyanju et al., 2017). Authors used a combination of these measures to determine the household economic status index, taking into account the occupation of the mother and their spouse, with an except for Akowuah et al., (2018) that only looked at the occupation status of the mother as the sole measure of SES.

Similarly, all other multi-country studies used the household wealth quintile constructed from the household assets as a measure of SES and McTavish et al., (2010) estimated a permanent

income at the household level from each respondent by using an asset-based approach in sub-Saharan African countries.

Analytic methods for SES inequality assessment

Logistic regression was used in assessing the relationship between MHC and SES across most of the studies. In addition to this, a few authors (Viegas Andrade et al., 2012; Pathak et al., 2010; Adeyanju et al., 2017) used concentration indices and concentration curves to quantify the extent of inequality. Makate & Makate, (2017) deviated from using standard concentration indices and made use of G-Erreygers corrected concentration indices as an analytic method for SES inequality assessment. Goli & Singh, (2017) who did a multi-country analysis, used the concentration curve, concentration indices and decomposition models as analytic methods.

Findings of the review

Factors that influence and promote the use of ANC in low-to-middle-income countries vary. These include SES, age group, religion, parity and marital status. In the studies retrieved from the literature search, low-to-middle-income countries followed the WHO recommended guidelines of a minimum of four ANC visits for an uncomplicated pregnancy, except for Brazil with a minimum of six ANC visits for an uncomplicated pregnancy (Viegas Andrade et al., 2012). However, it is worth noting that although Brazil is classified as a low-to-middle-income country (World Bank, 2014), it has one of the most unequal economies and these guidelines were potentially reserved for richer communities (Viegas Andrade et al., 2012). Another exception to the rules was a region in India called Mumbai, where at least three prenatal care checkups were recommended locally for an uncomplicated pregnancy (Alcock et al., 2015).

From the search results as conducted in this literature review, there was an overrepresentation of studies conducted in India as one of the low-to-middle-income countries with a high rate of

maternal mortality (Viegas Andrade et al., 2012). These studies focused on analysing the trends of ANC utilisation, and although authors concurred on economic factors that influenced the uptake of MHC or the lack thereof, they often had different contextual reasons on arriving at their respective conclusions (Alcock et al., 2015; Arokiasamy & Pradhan, 2013). There were striking SES inequalities in the use of ANC in different states across India with unemployed and least educated women attaining a lower number of ANC visits and surprisingly, with religion varying as an additional factor that perpetuated this evidence. For instance, while Alcock et al., (2015) showed that Muslim women were more likely to seek prenatal care and made up the majority of the educated population, Arokiasamy & Pradhan (2013) argued that religion or caste hindered the use of MHC, employability and economic empowerment of women.

In contrast to the many studies that showed that education of the mother further enhanced the use of MHC (Pathak et al., 2010; Asamoah et al., 2014; Rashid et al., 2014; Tsawe & Susuman, 2014) there were authors that showed that in economically advanced states even illiterate women received the full ANC coverage (Viegas Andrade et al., 2012; Silal et al., 2012). Makate & Makate (2017) further added that while school appears to explain a fair share of the observed inequalities in ANC use, its contribution has significantly declined over time according to a study that was conducted in Zimbabwe looking at the period from 1994 to 2011. In a study conducted in Nigeria, Adeyanju et al., (2017) consider education and literacy as two separate entities, with education signifying the level of education a woman has attained and literacy signifying basic ability to read and write. In their study, Adeyanju et al., (2017) noted an increase in literacy-related inequality in MHC use and a decline in education-related inequality in MHC between 1990 and 2008 which agrees with a study conducted in Ghana by Asamoah et al., (2014) and Arokiasamy & Pradhan (2013) in the State of Bihar in India. With regards to findings from the multi-country studies (McTavish et al., 2010; Goli & Singh, 2017; Tsala Dimbuene et al., 2017), education showed to be a prominent socioeconomic determinant of MHC utilization in the three studies conducted in diverse geographical and cultural settings (Tsala Dimbuene et al., 2017; Goli & Singh, 2017; McTavish et al., 2010). McTavish et al. conducted a study in 14 sub-Saharan African countries analysing the importance of national female literacy and MHC use. In this study,

the authors conclude that for each extra year of schooling a mother attains, there is an increased probability of MHC use (McTavish et al., 2010). This is in agreement with the notion that women's education will improve the status of the women's ability to acquire wealth independently and enhance the women's autonomy in making decisions to seek health care and identify danger signs during pregnancy (McTavish et al., 2010; Joshi et al., 2014; Tsala Dimbuene et al., 2017; Tsegay et al., 2013).

With regards to household wealth, there were inconsistencies seen where in some instances the difference in the frequency of ANC use was negligible between rural and urban areas despite the huge differences in SES (Viegas Andrade et al., 2012; Arokiasamy & Pradhan, 2013; Asamoah et al., 2014), as opposed to states in India where economic inequalities in the use of ANC was significantly higher in rural mothers when compared to their urban counterparts (Pathak et al., 2010).

Furthermore, although a close association is often seen between wealth and place of residence, household income was viewed in isolation to the number of ANC visits. Household income proved to be a significant determinant of ANC use (Akowuah et al., 2018; Makate & Makate, 2017) even in countries where free maternal health policies were in places such as Ghana (Akowuah et al., 2018) and South Africa (Silal et al., 2012), suggesting that implementation of interventions that seek to improve citizens' SES are just as imperative in improving ANC utilization. All low-to-middle-income countries included in this systematic review showed that inequalities in use of ANC favoured wealthier women over their poorer counterparts (Adeyanju et al., 2017; Asamoah et al., 2014; Rashid et al., 2014; Makate & Makate, 2017; Alcock et al., 2015), and a few authors noted a sharp rise in this inequality in studies that considered change over prolonged periods of time (Adeyanju et al., 2017; Asamoah et al., 2014; Makate & Makate, 2017). It is worth noting that in some instances, poor women received some form of prenatal care even if it was not institutionalised or provided by a registered health professional (Rashid et al., 2014).

Whilst an assumption can be made following this finding that the employment of the mother would have a similar effect in increasing the use of ANC, this was not always the case as seen in a study conducted by Arokiasamy & Pradhan (2013) where working women had lower use of ANC because of "opportunity and monetary costs forgone" (Arokiasamy & Pradhan, 2013). Similarly, the employment of the mother alone was not a sufficient determinant of use of ANC but also the type of occupation. For instance, in a study conducted in South Africa, more self-employed than private employees and even far more than government employees attained the recommended four ANC visits (Tsawe & Susuman, 2014).

Another SES factor influencing the frequency of ANC visits was having access to health insurance for the use of private care with the hope of avoiding poor service in public facilities. Poorer women were not only disadvantaged in terms of less use of MHC facilities during pregnancy, but when they did, they also spent a higher percentage of their household expenditure in maternal care compared to women from wealthier households due to lack of medical insurance coverage (Silal et al., 2012). In Mumbai, poorer women incurred catastrophic health spending by borrowing money, trying to avoid poor public services and lack of choice for opting for a female clinician (Alcock et al., 2015). Their use of private care also fed into their preference for a female physician during consultations (Alcock et al., 2015).

Majority of these low-to-middle-income countries reported enforcement of interventions that were put in place to improve the overall care of women during pregnancy (Adeyanju et al., 2017; Tsawe & Susuman, 2014; Akowuah et al., 2018), however, only a few and already advantaged socio-economic groups seemed to benefit from fast-growing economies and much of the poorer populations continue to lack access to basic maternal care (Adeyanju et al., 2017).

Low-income Countries

Study Design

All studies conducted in low-income countries included in this literature review followed the cross-sectional study design. Majority of the authors opted for the use of the Demographic and Health Survey as a primary source of their data, except for two authors that used varying methods in studies conducted in Ethiopia. The one author used the UNICEF's Multiple Cluster Indicator Survey Questionnaires on 492 women making this the smallest sample for low-income countries (Wilunda et al., 2015), and the other author used a structured questionnaire based on an unnamed existing tool with 1115 participants (Tsegay et al., 2013).

Measure of SES

For all studies in the review, wealth quintiles were used as a measure of a living standard, constructed from information collected on access to utilities, sanitation facilities, durable asset ownership and infrastructure. Two authors (Tsegay et al., 2013; Amin et al., 2010) extended this measure of SES to the husband's education and occupation.

Analytic Methods for SES inequality assessment

The use of regression models was standard in almost all the studies and odds ratios with each covariate and odds ratios determined from logistic regression coefficients were often deployed (Amin et al., 2010; Rurangirwa et al., 2017; Wilunda et al., 2015; Nigatu, 2011; Collin et al., 2007). Memirie et al., (2016) and Mehata et al. (2017) used concentration curves and related concentration indices as analytic methods for SES inequality assessment. In addition to this, Mezmur et al., (2017) in a study conducted in Ethiopia, was the only author that used the decomposition analysis to assess SES inequalities in the use of ANC.

Findings of the Review

Of the low-income countries included in the review, there was commendable progress in improving uptake of antenatal care, with numerous authors reporting a significant decline in maternal mortality, especially in Asian countries (Do et al., 2018; Collin et al., 2007; Mehata et al., 2017). In pursuit of MDGs, these countries employed the outreach service workers' system and the media as a mechanism to improve ANC use (Sharma et al., 2007). However, in Bangladesh and Ethiopia, despite the unprecedented efforts to equip health facilities in providing MHC, the low utilization specifically by poor women continued to be an impediment to reaching the MDG-5 (Collin et al., 2007; Mezmur et al., 2017) as seen in Nigeria, classified as one of the low-to-middle-income countries (Adeyanju et al., 2017). In Ethiopia, the low utilization among the poor was related to out-of-pocket spending either for services or for travelling to a health facility by families (Memirie et al., 2016). Out-of-pocket spending comprised 80% of the health expenditure in Ethiopia (Mezmur et al., 2017).

Within these low-income countries, there were no variations in terms of the number of visits women were supposed to make because they all followed the WHO's recommendation of at least four ANC visits during an uncomplicated pregnancy. Under-utilization of ANC was heavily concentrated among poor women and the inequalities in use of overall MHC was far more significant compared to low-to-middle-income countries (Goli & Singh, 2017; Wang & Hong, 2015; Joshi et al., 2014; Mehata et al., 2017; Amin et al., 2010; Do et al., 2018; Wilunda et al., 2015; Mezmur et al., 2017). In Ethiopia, this pro-rich use of ANC services was evident even in public facilities (Memirie et al., 2016).

Women's education was also significantly and positively associated with the likelihood of ANC use (Tsala Dimbuene et al., 2017; McTavish et al., 2010; Wang & Hong, 2015; Joshi et al., 2014; Mehata et al., 2017; Do et al., 2018; Memirie et al., 2016; Tsegay et al., 2013; Nigatu, 2011), thus women with higher education were more likely to use adequate ANC. However, contrary to this, and given that educated women were more likely to be employed and use adequate ANC (Joshi

et al., 2014; Nigatu, 2011), Sharma et al., (2007) in a study conducted in Nepal reported that employed women irrespective of their type of employment were less likely to utilize maternal health services. This is in conformity with the findings by Wilunda et al., (2015) where only a smaller proportion (15%) of women with secondary or higher education as opposed to more (43.8%) without education, attended all four ANC visits. Also, as seen with some of the low-to-middle-income countries such as Zimbabwe (Makate & Makate, 2017), educational disparities in use of ANC showed no changes between 2000 and 2012 in Lao People's Democratic Republic (Do) and no associations were reported in Rwanda (Rurangirwa et al., 2017). These authors conclude that in their respective contexts, education is not a strong determinant of MHC use (Wilunda et al., 2015; Do et al., 2018; Rurangirwa et al., 2017).

Having a health insurance, a spouse, their level of education and the type of occupation they possessed showed more significant as a determinant of ANC use in low-income countries compared to in high-income countries and low-to-middle-income countries (Joshi et al., 2014; Amin et al., 2010; Tsegay et al., 2013). Having a husband with a non-farming occupation was associated with enhanced use of ANC (Tsegay et al., 2013). As with high-income and low-to-middle income countries, the use of ANC services was influenced by health insurance coverage although this finding was only reported by one author (Wang & Hong, 2015) amongst all low-income countries included in the review.

Recommendations given from these low-income countries mirrored that of the entire world, where an emphasis is placed on poorer women, with less education and living in more remote areas. There was a consensus within the authors that both economic and educational empowerment of the disadvantaged mothers would have a positive effect on improved service utilisation.

Conclusion

Majority of the studies included in this review used secondary data from the DHS where the survey is based on maternal recall and are thus subject to recall bias. No study took account of maternal complications as a reason to why some women would attend all recommended four visits or more as per country guideline requirements.

Reported widening inequalities in the use of ANC over the years across countries point to the fact that health programmes that are supposed to ensure universal access to all women have not adequately addressed the issue faced particularly in low-to-middle-income countries and low-income countries.

To my knowledge and apart from a few individual country studies seen in literature (Muchabaiwa et al., 2012; Wabiri et al., 2016; Zere et al., 2010), there is a dearth of studies that analyse inequality in the use of ANC services in SADC countries as a collective, also evidenced by this review. Although there was representation of multi-country studies as per the literature review search conducted in this study, these studies only focused on women's education and MHC services with little to no focus on other socioeconomic determinants of inequalities in MHC use, and employed logistic regressions to arrive at their conclusions (McTavish et al., 2010; Tsala Dimbuene et al., 2017). Goli & Singh (2017) looked at SES determinants of MHC utilisation but only focused on four countries including Bangladesh, Ethiopia, Nepal and Zimbabwe. Thus a gap exists for this comprehensive analysis, employing the same methods and databases for all SADC countries.

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Section 3: Manuscript

Assessing Socio-economic inequalities in the use of Antenatal care in the Southern African Development Community

Abstract

Introduction

Despite the unprecedented efforts of national governments along with various NGOs to achieve the third SDG, which is to reduce global maternal mortality to less than 70 per 100 000 live births by 2030, developing countries seem to be lagging far behind in reaching this goal (UNDP, 2016). This paper focuses on socioeconomic inequalities in the use of ANC services as an important aspect of MHC in SADC countries.

Methods

The data used in this study are obtained from the Demographic and Health Survey (DHS). Three mutually exclusive variables were created to assess ANC inequality, namely, 1) No ANC visits 2) Less than four ANC visits and 3) At least four ANC visits. A fourth variable that assesses the actual number of ANC visits that a pregnant woman had received was created and called 'Intensity'. ANC and SES using the wealth index were used to construct the concentration curves and indices to determine whether health care utilization is concentrated among the poor or the rich.

Results

Over 70% of all who lived in rural areas had '0 ANC', with Namibia and Tanzania as the only exception to this finding. In four of the eleven countries, over 58.36% of women were married and were likely to make an adequate number of ANC visits. Namibia and Lesotho are two of the eleven countries that had a great majority of women educated up to the secondary level, 65.61%

and 49.90% of which attained at least 4 ANC visits, respectively. Women who worked in agricultural settings had the least likelihood of attaining any ANC visits.

Discussions and conclusion

ANC use was consistently lower in women with no education, doing agricultural work and those residing in rural areas in the SADC region. Overall, marriage is inconclusive in determining ANC use. Inequality in wealth makes ANC utilization more predominant among the rich. Saving mothers and babies is ultimately saving the population and knowledge of the patterns of maternal health usage is imperative to draw relevant policies that are evidence-based.

Introduction

The burden of maternal mortality continues to plague sub-Saharan Africa (SSA) despite the interventions to achieve the fifth Millennium Development Goal (MDG), which was to reduce maternal mortality ratio by three quarters between 1990 and 2015 (1). Post-MDGs, the Sustainable Development Goals (SDGs) set similar targets to address maternal health challenges and to fill the remaining gaps (2). Despite the unprecedented efforts of national governments along with the help from various non-governmental organizations (NGOs) to achieve the third SDG, which is to reduce global maternal mortality to less than 70 per 100 000 live births by 2030, developing countries seem to be lagging far behind in reaching this goal (UNDP, 2016). Recognisably, the factors that affect maternal mortality are broader than access to maternal health services. However, the continuum of care inclusive of the use of antenatal care (ANC) services, skilled birth attendance (SBA) and postnatal care (PNC) services remain beneficial in reducing maternal mortality and improving the health outcomes of newborns. In many developing countries, access and provision of these services are still not universal (3).

The World Health Organization (WHO) reports that approximately 830 women die daily from preventable causes related to pregnancy and childbirth (4). Even though most of the interventions and funds have been directed towards low-middle income countries (5,6,7), about 99% of these maternal deaths occur in developing countries (4). Women from more deprived communities, those with limited education, those with informal employment and those living in rural areas bear the most burden (8,9). Also, women from poorer households access far less

maternal care compared to women from richer households (13,14,15). The positive correlation between women's capacity to earn money and their ability to use maternal health care (MHC) services (12) remains a major challenge in many developing countries. Employed women not only have greater autonomy over their health but also have exposure to relevant information and knowledge on maternal and child health (13). These patterns are most apparent in developing countries compared to developed countries, where even the most disadvantaged women can use adequate maternal health services (15,16).

This paper focuses on the use of ANC services as an important aspect of MHC services. ANC is usually the point of entry into the health system by pregnant women. In many cases, this is a likely predictor of the use of SBA and the frequency of PNC visits (14,17,18). While studies that explore the influence of Socioeconomic Status (SES) on the use of ANC have been carried out in numerous SSA countries, a multi-country assessment of these patterns in Southern African Development Community (SADC) countries, using the same method and a uniform source of data has not been realised. This is particularly of concern because the deficit in knowledge of these trends in this regard means there is no real form of evidence for which policies can be drawn and informed, and the current study seeks to close this gap. Therefore, this study aims to make a comprehensive assessment of the SES inequalities in the use of ANC in SADC countries.

Methods

Study population and a brief overview of health financing profile and MHC patterns in SADC countries

The SADC is a body of countries with rich historical and cultural affinities. They share a subset of goals, one of which is to improve the health of its people (18). The SADC region's population is over 340 million, and life expectancy remains within the range of 51 to 75 years (19). Indisputably, the Demographic and Health Survey (DHS) were conducted in SADC countries with varying national population sizes (see Table 1). The most populous country within this region is the Democratic Republic of Congo with 81 million people, and the least populous country is Mauritius with 1.2 million people (20) although not included in this study because of data unavailability. The other countries excluded from this study because of lack of DHS data include Botswana, South Africa and Seychelles.

Table 1.1: Sample size per country

#	Country	Abbreviation	Survey year	Population size(2017)	*Sample size
1	Angola	ANG	2015 - 2016	29,78 million	8 839
2	The Democratic Republic of Congo	DRC	2013 - 2014	81,34 million	11 214
3	Lesotho	LST	2014	2,233 million	949
4	Madagascar	MDG	2008 - 2009	25,57 million	8 470
5	Malawi	MLW	2015 - 2016	18,62 million	13 389
6	Mozambique	MZB	2011	29,67 million	7 485
7	Namibia	NAM	2013	2,534 million	3 119
8	Swaziland	SWZ	2006 - 2007	1,367 million	2 069
9	Tanzania	TAN	2015 - 2016	57,31 million	7 019
10	Zambia	ZWB	2013 - 2014	17,09 million	9 217
11	Zimbabwe	ZIM	2015	16,53 million	4 805

*Sample size = number of women aged 15-49 years

Despite the shared goals towards a common future between the SADC countries, they have varying health financing profiles, which in turn have a direct influence on the use of ANC. For instance, while out of pocket (OOP) payment is prominent for basic health needs in some countries such as Zambia, Tanzania and Zimbabwe (23,24,25), it is relatively low and has gradually decreased in other countries such as Malawi, Angola, Botswana, Mozambique and Namibia (26,27,28,29,30). Malawi was previously noted to be one of the countries with the highest maternal mortality rates in the world (29), but as a result of a decrease in OOP payments, there has since been a decline in maternal deaths for which some of it is accredited to the removal of user fees (29). Intuitively, countries with a low OOP payments have more funds or a greater portion of government health expenditure as a percentage of total health expenditure, hence less dependence on citizens to pay for their own basic health care.

Data source

The data used in this study are obtained from the Demographic and Health Survey (DHS) from eleven of the fifteen SADC countries (see Table 1). This is primarily based on the availability of the DHS data in these countries. In all the countries, the DHS is a cross-sectional survey with nationally representative data using standardised questions to collect information mainly from women of reproductive age (i.e. aged between 15 and 49 years) (30). Among other variables, the DHS contains data on women's sociodemographic and socioeconomic characteristics along with MHC utilisation (30).

Study variables

Three mutually exclusive variables were created. Namely, 1) No ANC visits (i.e. when a woman with a live birth in the specified period did not have any ANC visit; *0 ANC*) 2) Less than four ANC visits (i.e. having at least one ANC visit but less than 4 visits; *1-3 ANC*) and 3) At least four ANC visits (i.e. a woman with at least four ANC visit; $\geq$ *4 ANC*). A fourth encompassing category (ANC intensity) uses the actual number of ANC visits that a pregnant woman had received.

The DHS does not directly report information on household expenditure or income but contains information on household assets or a wealth index (30). In this paper, the wealth index is used as a proxy for socioeconomic status (SES) (30). This index was constructed from household asset data, which comprised access to sanitation facilities, type of flooring material and source of drinking water (30).

Analytic methods

Descriptive statistics

A comparative analysis of the utilisation of ANC in the eleven SADC countries in general and separately by wealth quintiles was conducted to give a descriptive assessment of inequalities in the use of antenatal care. This analysis uses equity stratifiers such as women's marital status, type of residence, highest education level, respondents' occupation and wealth index.

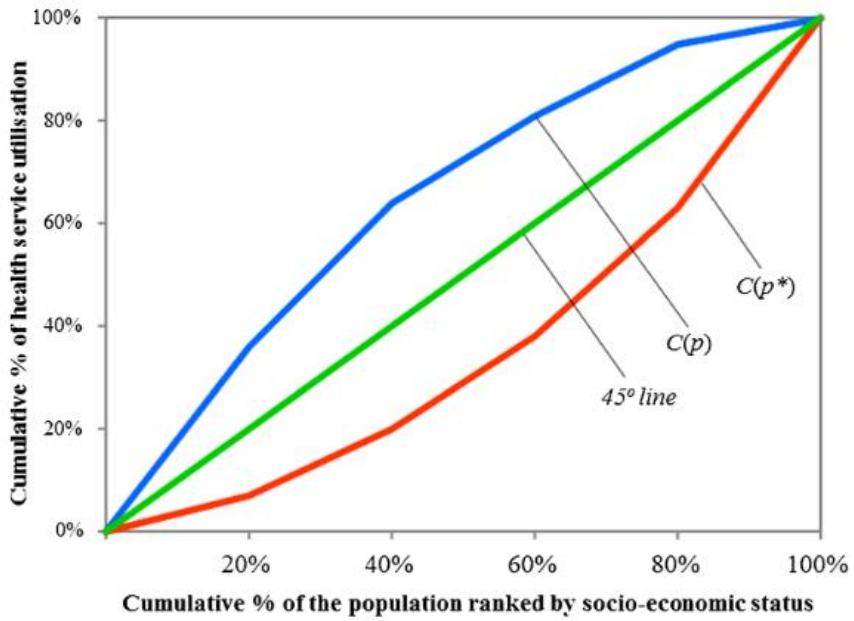
Assessing inequality in antenatal care utilization

Concentration indices and curves are used to examine whether the distribution of ANC utilisation favours the poor or not (31).

Concentration curves

In this study, the two key variables used to construct the concentration curve include ANC as a health variable of interest (i.e. *0 ANC*, *1-3 ANC*, $\geq$ *4 ANC* and ANC intensity) and SES using the wealth index. The concentration curve plots the cumulative percentage of ANC use (y-axis) against the cumulative percentage of the population of each country, ranked from poorest to richest on the x-axis (32).

Figure 1: Concentration curve with a hypothetical example of health care utilisation



Source: Phiri & Ataguba (33)

As shown in Figure 1, if everyone irrespective of their wealth quintile attains the same number of ANC visits (health utilisation), the concentration curve will be a *45-degree line*, also known as the line of equality. On the contrary, if the ANC variable takes a higher (lower) value among the richer people, the concentration curve will lie below (above) the line of equality (32).

Concentration Indices

The concentration index is defined as twice the area between the concentration curve and the line of equality (34). It was used to assess the overall extent of inequality in the use of ANC by SES. The index ranges from -1 to +1 (31). A negative index, corresponding to the concentration curve lying above the line of equality, indicates a higher distribution of utilisation among the poor and a positive index signifies a higher distribution of utilisation among the rich (33).

Results

Table 2.1: Descriptive statistics for '0 ANC' visits

	ANG	DRC	LST	MDG	MLW	MZB	NAM	SWZ	TAN	ZMB	ZIM
Residence Type (%)											
Urban	26.63	16.64	31.41	4.37	7.75	11.51	50.34	14.48	23.17	24.27	20.80
Rural	73.37	83.36	68.59	95.63	92.25	88.49	49.66	85.52	76.83	75.73	79.20
Marital status (%)											
Never married	17.09	4.51	21.33	5.81	11.77	3.70	41.14	44.45	10.47	5.35	3.68
Married	14.72	65.29	44.85	68.21	64.04	56.60	13.97	29.53	47.43	79.19	82.85
Living together	59.77	17.81	9.03	7.67	8.66	26.15	40.38	14.94	33.32	0.54	4.21
Education (%)											
No education	59.28	28.82	1.74	49.74	21.30	55.06	21.80	10.22	32.61	34.90	1.23
Primary	33.86	53.26	60.96	43.45	72.27	42.68	33.22	58.06	53.18	52.12	46.65
Secondary	6.41	17.84	35.15	6.81	6.42	2.26	41.80	26.56	12.26	12.99	51.79
Employment (%)											
Not working	18.87	15.58	0.00	6.00	44.57	49.79	63.71	60.36	18.94	26.84	43.97
Agriculture	59.88	61.86	13.06	84.21	34.32	43.96	3.04	5.24	54.36	51.98	17.41
Domestic services	16.95	20.42	62.69	3.49	2.79	5.55	22.03	26.12	11.57	19.25	35.13
Wealth (%)											
Poorest	48.13	40.15	14.98	49.56	35.81	40.56	26.71	31.33	33.03	42.02	30.89
Poorer	34.37	25.06	30.44	26.50	18.78	27.71	25.75	33.14	16.81	22.90	23.67
Middle	11.69	18.03	39.30	12.82	25.13	18.78	15.76	19.20	16.17	13.08	17.95
Richer	3.72	10.16	7.49	7.56	10.86	8.43	16.85	9.69	17.31	18.81	23.84
Richest	2.09	6.60	7.78	3.56	9.42	4.52	14.93	6.64	16.69	3.19	3.66

Table 2.2: Descriptive Statistics for '1-3 ANC' visits

	ANG	DRC	LST	MDG	MLW	MZB	NAM	SWZ	TAN	ZMB	ZIM
Residence Type (%)											
Urban	58.36	25.69	36.67	7.40	11.95	25.95	43.66	18.40	21.86	37.87	34.08
Rural	41.64	74.31	63.33	92.60	88.05	74.05	56.34	81.60	78.14	62.13	65.92
Marital status (%)											
Never married	17.22	5.44	13.19	3.42	4.68	4.83	47.87	50.08	6.45	10.24	7.95
Married	13.34	60.75	69.15	76.53	77.05	57.24	17.23	32.65	56.89	78.09	76.96
Living together	59.60	24.20	0.00	7.87	5.33	25.41	29.15	12.81	24.95	0.51	4.43
Education (%)											
No education	28.91	20.30	0.32	24.25	13.33	38.76	8.74	9.38	22.46	11.02	0.91
Primary	45.60	45.77	47.33	60.15	67.30	52.57	31.48	34.22	66.18	54.17	23.39
Secondary	24.65	33.40	48.24	15.21	18.55	8.48	57.03	54.08	11.16	32.15	66.80
Employment (%)											
Not working	26.88	18.59	0.00	6.40	30.92	53.72	62.97	59.59	13.76	42.86	50.28
Agriculture	35.56	56.37	16.27	78.87	44.63	33.94	0.94	3.69	61.98	31.36	12.19
Domestic services	32.96	21.72	46.60	6.90	6.08	11.21	27.68	25.07	7.12	21.40	30.65
Wealth (%)											
Poorest	21.38	22.54	14.84	26.04	24.61	25.05	26.76	23.36	26.39	23.61	23.77
Poorer	29.17	23.39	20.59	24.48	22.74	22.91	21.43	21.36	23.52	21.25	21.01
Middle	27.53	22.03	23.90	22.47	19.83	20.22	22.27	21.62	20.88	21.09	13.89
Richer	14.73	20.06	28.93	18.58	18.54	19.41	20.52	17.78	17.62	20.79	28.36
Richest	7.20	11.98	11.74	8.43	14.28	12.41	9.03	15.88	11.58	13.27	12.96

Table 2.3: Descriptive Statistics for '≥ 4 ANC' visits

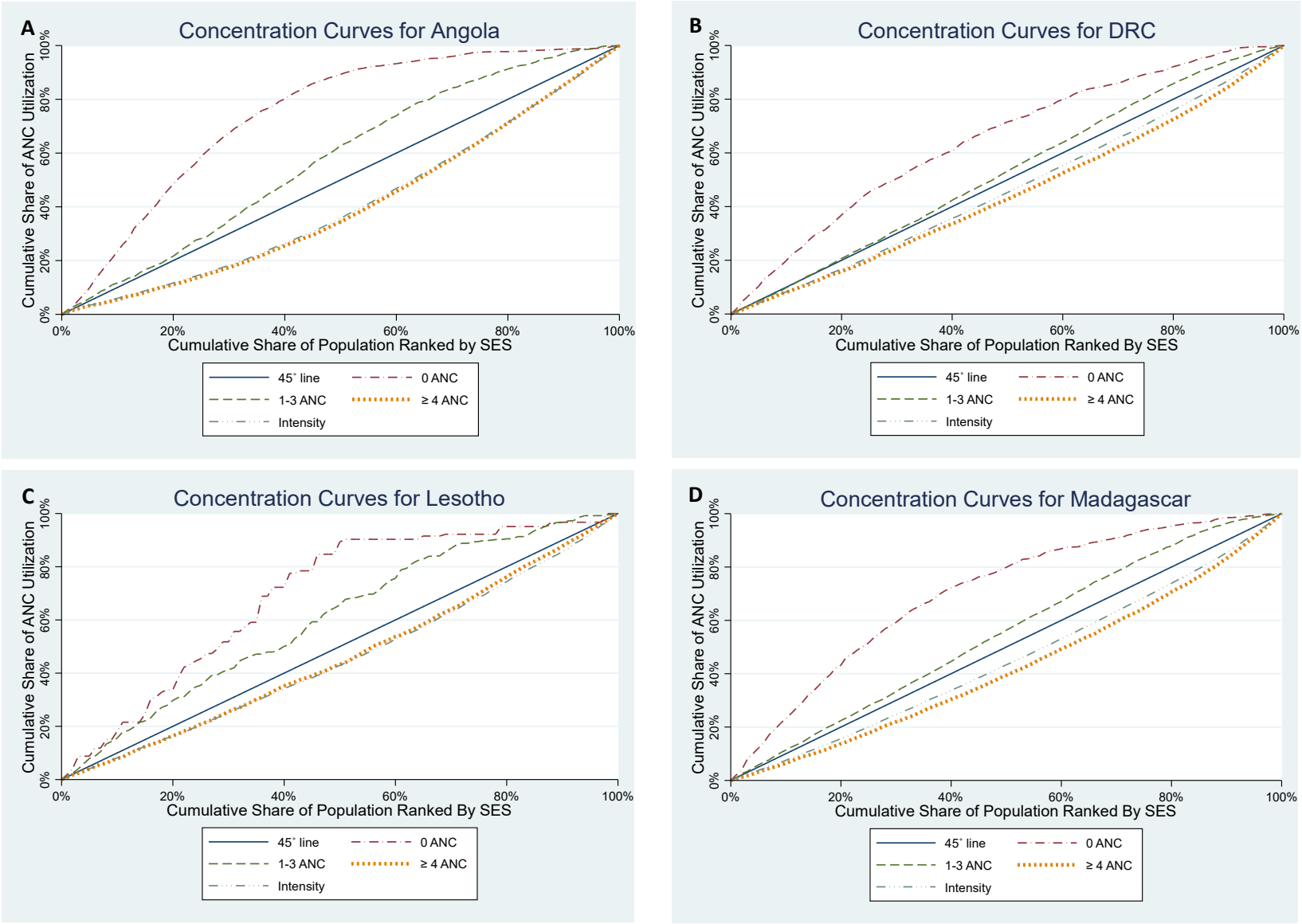
	ANG	DRC	LST	MDG	MLW	MZB	NAM	SWZ	TAN	ZMB	ZIM
Residence Type (%)											
Urban	77.00	40.05	45.90	17.71	16.71	34.63	52.43	24.70	37.65	38.08	33.48
Rural	23.00	59.95	54.10	82.29	83.29	65.37	47.57	75.30	62.35	61.92	66.52
Marital status (%)											
Never married	17.64	6.71	9.70	2.56	3.05	5.91	47.44	36.73	7.89	9.16	3.92
Married	13.96	61.03	76.89	79.60	78.54	54.77	22.90	43.31	58.36	79.54	81.62
Living together	59.32	23.04	1.39	7.05	4.90	27.38	24.32	14.15	20.55	0.93	3.60
Education (%)											
No education	16.56	13.72	0.83	17.39	11.43	29.97	4.19	7.96	15.38	9.08	1.15
Primary	36.75	37.14	34.58	52.48	63.80	50.98	19.21	33.05	63.75	53.26	29.69
Secondary	42.10	45.96	51.29	27.95	21.76	17.86	68.37	51.44	19.39	32.61	62.81
Employment (%)											
Not working	30.48	20.90	0.00	9.64	27.06	52.49	49.98	53.81	17.90	42.08	46.27
Agriculture	18.74	43.85	10.95	64.53	43.90	28.87	1.64	4.13	45.63	30.55	11.41
Domestic services	41.34	29.17	44.40	12.57	7.56	14.30	31.38	26.41	8.88	20.67	31.96
Wealth (%)											
Poorest	10.92	17.13	7.46	16.55	22.26	16.75	19.22	17.09	16.69	20.45	20.36
Poorer	16.06	19.43	13.52	18.10	20.82	17.87	19.09	19.43	17.10	20.81	18.37
Middle	22.32	19.59	18.99	19.43	18.53	19.14	19.94	19.46	17.50	20.42	18.03
Richer	26.67	18.98	24.18	20.67	17.75	23.13	22.67	21.39	22.24	18.21	22.61
Richest	24.04	24.88	35.85	25.25	20.63	23.12	19.08	22.62	26.46	20.10	20.63

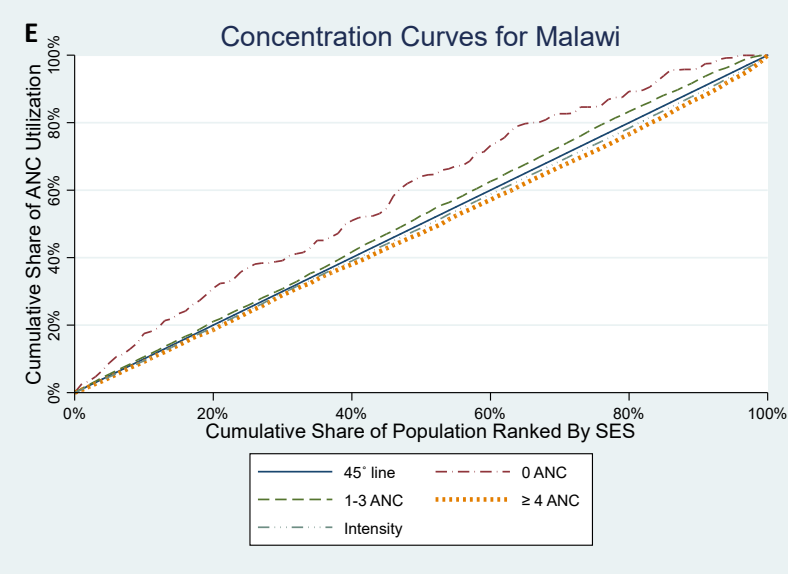
Table 3: Concentration Indices showing wealth-related inequalities in the use of antenatal care

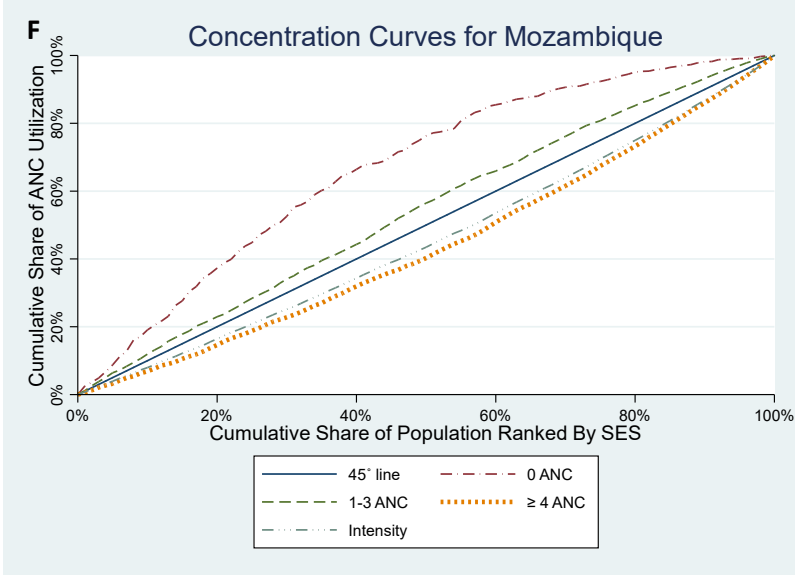
#	Country	0 ANC	1-3 ANC	≥ 4 ANC	ANC intensity
1.	Angola	-0.4915	-0.1530	0.1930	0.1814
		(0.0119)	(0.0123)	(0.0043)	(0.0035)
2.	DRC	-0.2977	-0.0529	0.1082	0.0701
		(0.1560)	(0.0064)	(0.0056)	(0.0032)
3.	Lesotho	-0.3855	-0.2094	0.0816	0.0968
		(0.0830)	(0.0364)	(0.0106)	(0.0095)
4.	Madagascar	-0.4029	-0.0981	0.1539	0.1001
		(0.0194)	(0.0074)	(0.0061)	(0.0032)
5.	Malawi	-0.1855	-0.0371	0.0413	0.0193
		(0.0366)	(0.0052)	(0.0049)	(0.0022)
6.	Mozambique	-0.3397	-0.0825	0.1249	0.0878
		(0.0205)	(0.0082)	(0.0063)	(0.0033)
7.	Namibia	-0.1203	-0.1397	0.0309	0.0671
		(0.0499)	(0.0250)	(0.0049)	(0.0059)
8.	Swaziland	-0.3315	-0.1014	0.0301	0.0495
		(0.0767)	(0.0294)	(0.0060)	(0.0053)
9.	Tanzania	-0.1099	-0.1259	0.1206	0.0586
		(0.0480)	(0.0072)	(0.0066)	(0.0027)
10.	Zambia	-0.2942	-0.0385	0.0365	0.0244
		(0.0508)	(0.0070)	(0.0053)	(0.0021)
11.	Zimbabwe	-0.2301	-0.0490	0.0311	0.0548
		(0.0314)	(0.0180)	(0.0047)	(0.0043)

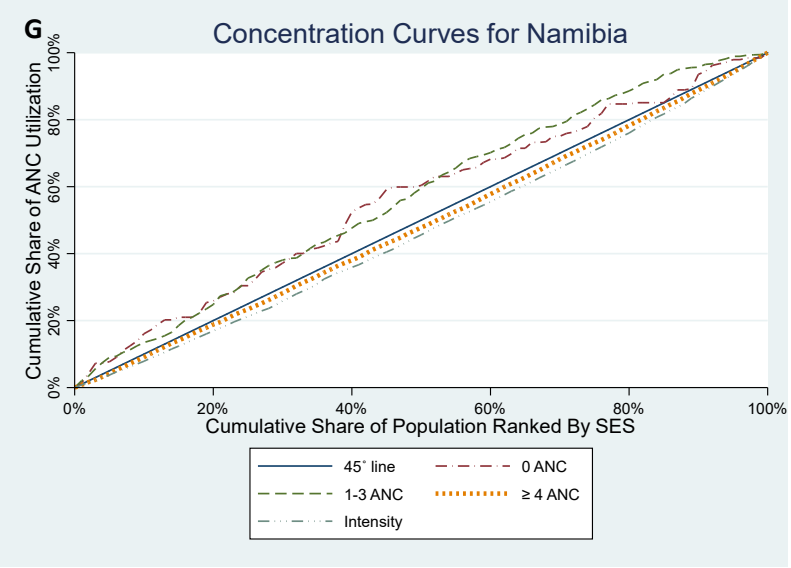
Standard errors in parenthesis
All Concentration Indices significant at the 1% level

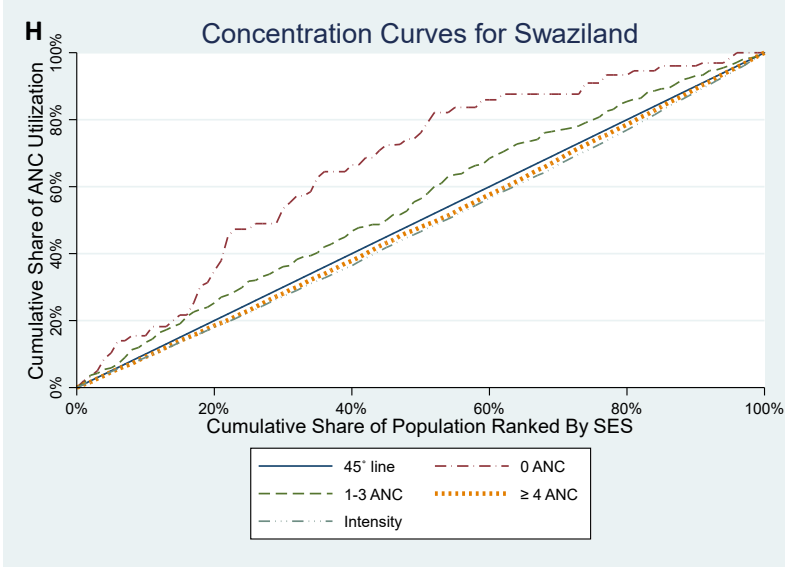
Figure 2: Concentration curves showing the cumulative share of ANC utilization in SADC countries.

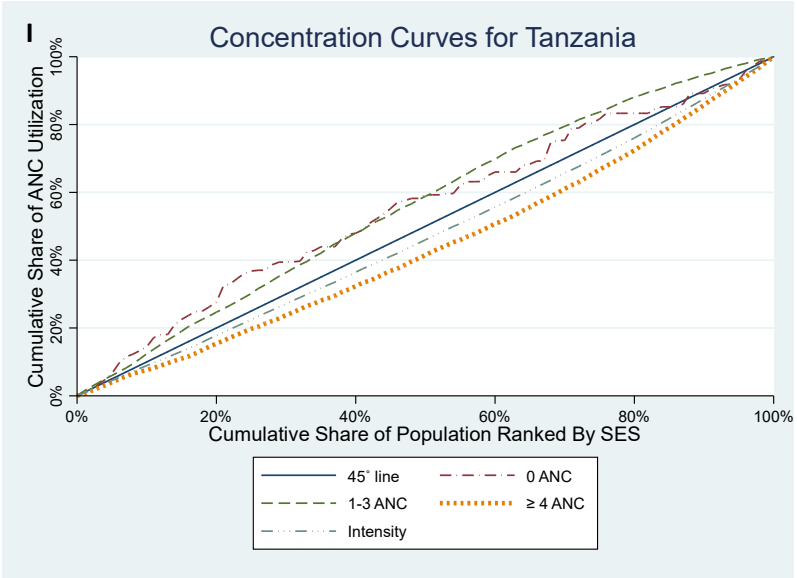


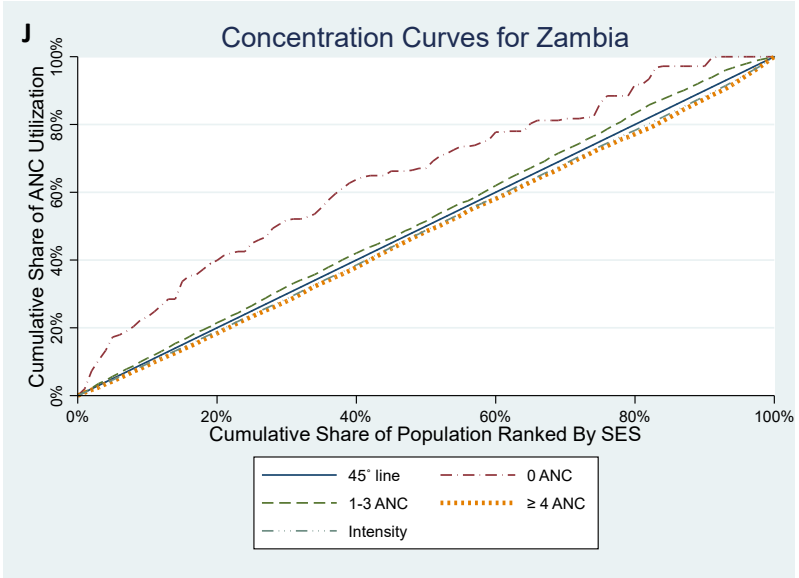

E
Concentration Curves for Malawi
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45° line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity

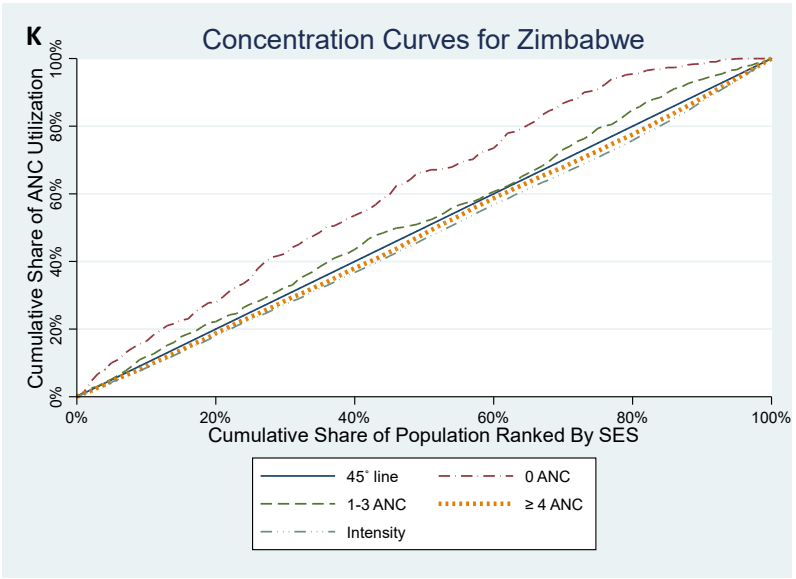

F
Concentration Curves for Mozambique
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45° line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity


G
Concentration Curves for Namibia
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45° line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity


H
Concentration Curves for Swaziland
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45° line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity


I
Concentration Curves for Tanzania
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45˚ line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity


J
Concentration Curves for Zambia
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45˚ line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity


K
Concentration Curves for Zimbabwe
Cumulative Share of ANC Utilization
0%
20%
40%
60%
80%
100%
Cumulative Share of Population Ranked By SES
45˚ line
0 ANC
1-3 ANC
≥ 4 ANC
Intensity

Descriptive statistics

Rural vs urban residence and ANC Utilization

In ten of the SADC countries included in this study, there was an overrepresentation of women who lived in rural areas, the majority of which were not attending any ANC visits as opposed to those living in urban areas making the recommended number of four ANC visits. Consequently, over 70% of all who lived in rural areas had '0 ANC', with Namibia and Tanzania as the only exception to this finding. Although not profoundly different from '0 ANC' use, attaining '1 – 3 ANC' for rural Namibian and Tanzanian women was more popular compared to all other countries included in the study. However, use of adequate or '≥ 4 ANC' was similar in all other countries specifically for urban women except for Zimbabwe where even the urban population (34.08%) were not making the recommended number of four visits (*see* Table 2.2).

Marital Status

Two (Angola and Namibia) out of eleven countries had the lowest proportion of married women with 13.97% and 21.71%, respectively. All other countries had well over 40% of the women included in the survey marked as 'Married'. Study data showed that in Angola majority of couples cohabitate, and their use of ANC is equally weighted across all mutually exclusive categories, i.e. neither '0 ANC', '1-3 ANC' nor '≥ 4 ANC' dominated in the outcome. Women living with their partners were therefore just as likely not to make any ANC visits as they were likely to make adequate ANC visits. This was not the case in Namibia, where a greater proportion (40.38%) of women 'cohabitating' did not make any ANC visits (*see* Table 2.1). Majority in Namibia (47.24%) and Swaziland (39.02%) as outlined in Table 2.2 were

'never married' and did not live with their partners, and these women were more likely to have some form of ANC even if they did not attain all four recommended visits.

On the other hand, in four of the eleven countries namely Lesotho, Madagascar, Malawi and Tanzania, well over 58.36% of women were married and were likely to make an adequate number of ANC visits (*see* Table 2.3).

In the DRC and Mozambique, the majority of the women surveyed were married, however, in contrast to Lesotho, Malawi, Madagascar and Tanzania these women were likely to make '0 ANC' visits (see Table 2.1) as opposed to '≥ 4 ANC' visits.

Zimbabwe and Zambia are the only two countries out of the eleven that did not show any discernible patterns to being married. Although the majority (78.92%) of the women in both countries were legally married, that did not increase or decrease their likelihood of making either '0 ANC', '1-3 ANC' or '≥ 4 ANC' visits.

Education

Namibia and Lesotho are two of the eleven countries that had a great majority of women educated up to the secondary level or higher, 65.61% and 49.90% of which attained at least 4 ANC visits, respectively (*see* Table 2.3). Swaziland and Zimbabwe alike also had most women with a secondary education level. However, they differed from Namibia and Lesotho because these women were more likely to make '1-3 ANC' visits at 68.80% for Zimbabwe and 54.80% for Swaziland as opposed to '≥ 4 ANC' visits (*see* Table 2.2). The second largest group for all four of these countries was women who studied or attained education up to the primary level, most of which had '0 ANC' visits.

On the other hand, over 42.36% of women in the DRC and 65.61% in Malawi had attained only primary education, making up most women surveyed in these countries. Fifty-three per cent in the DRC and 72.27% in Malawi of these women had '0 ANC' visits (*see* Table 2.1).

On the contrary, five countries namely Angola, Madagascar, Mozambique, Tanzania and Zambia also had majority of women surveyed with education attainment up to the primary level, except for these women were more likely to attain some form of ANC (1-3 ANC) even if they did not complete the full course of four ANC visits.

Employment Status

An analysis of women's employment status and use of ANC was heavily dependent on the type of work women had. Women who worked in agricultural settings had the least likelihood of attaining any ANC visits. These women made up the majority in Angola, DRC Madagascar and Tanzania and a range of about 54.36% to 84.21% had '0 ANC' (*see* Table 2.1) except in Malawi where 44.63% had '1-3 ANC' visits (*see* Table 2.2).

In the SADC countries analysed, unemployment was one other category that was common that followed agricultural work in popularity. In Mozambique, Zambia and Zimbabwe, the majority of the women were not working, and these women were more likely to make '1-3 ANC' visits as opposed to their working counterparts. The only three countries with the majority of women unemployed that deviated from this finding were Malawi, Namibia and Swaziland, where over 44%, 63% and 60% of women in this category, respectively, had '0 ANC' visits (*see* Table 2.1).

Lesotho is the only country where the majority of women did domestic services, and their use of '1-3 ANC' and '$\geq$ 4 ANC' was evenly distributed with '0 ANC' as the slightly dominant

category. Women with white-collar jobs were underrepresented and thus omitted from the analysis.

Analytic Assessment

In all eleven countries analysed in the present study, the use of '0 ANC' was pro-poor across the border. Similarly, analysis of descriptive statistics supported this finding where the poorer and the poorest populations showed greater proportions of '0 ANC' use (*see* Table 2.1). Angola, however, showed the greatest extent of pro-poorness use with a concentration index of -0.4915 (standard error = 0.0119) as presented in Table 3.

Furthermore, findings in the majority of the countries showed a consistent pro-poor inequality in having less than four ANC visits (1-3 ANC visits). This is particularly the case in Angola, Lesotho, Madagascar, Mozambique, Namibia, Swaziland and Tanzania where the concentration indices (CIs) range from -0.1014 (0.0294) to -0.2094 (0.0364) as outlined in Table 3. The DRC and Zimbabwe, on the other hand, showed a unique picture where the use of '1-3 ANC' visits appears equal for quintiles 1 to 3 but becomes markedly pro-poor for quintiles 4 and 5 (*see* Figure 2, concentration curves for DRC and Zimbabwe). Malawi and Zambia on the other hand bring out stark differences from other countries, showing a perfect picture of equality in the use of '1-3 ANC' visits across all wealth quintiles as seen in Figure 2 (concentration curves for Malawi and Zambia), with CIs estimated at -0.0371 (0.0052) and -0.0385 (0.0070), respectively (*see* Table 3).

The disparity between the rich and the poor was well defined in the use of more than four ANC visits ($\geq$ 4 ANC) in Angola, DRC, Lesotho, Madagascar, Mozambique and Tanzania. All

concentration curves (*see* Figure 2) for these countries lie below the line of equality, and the CIs are positive (*see* Table 3) which confirm that the use of ANC is pro-rich. As in the case of '0 ANC' visits, the inequality with regards to '≥ 4 ANC' visits was more pronounced in Angola with a CI of 0.1930 (0.0043) as seen in Table 3. On the other hand, Namibia and Swaziland showed similar patterns of equality in the use of '≥ 4 ANC' visits with positive CIs estimated at 0.0309 (0.0049) and 0.0301 (0.0060), respectively (*see* Table 3). Although Malawi, Zambia and Zimbabwe showed somewhat similar patterns, the slight skewness of their respective curves (Figure 2) leaned towards the non-poor population with CIs estimated at 0.0413 (0.0049), 0.0365 (0.0053) and 0.0311 (0.0047), respectively (*see* Table 3).

Assessment of the intensity of ANC service utilisation (ANC intensity) showed a picture that resembles equality in Malawi and Zambia (see Figure 2, concentration curves for Malawi and Zambia) for all wealth quintiles with CIs closest to zero at 0.0193 (0.0022) and 0.0244 (0.0021), respectively (*see* Table 3). Although similar, Zimbabwe, Namibia and Swaziland had slightly more pronounced pro-rich distributions. All other countries (Angola, DRC, Lesotho, Madagascar, Mozambique, and Tanzania) that showed a pro-rich use of '≥ 4 ANC' visits showed a pro-rich ANC intensity. Of these countries, the DRC, Lesotho and Tanzania were the closest to equality with CIs estimated at 0.0701 (0.0032), 0.0968 (0.0095) and 0.0586 (0.0027), respectively (*see* Table 3). Their concentration curves can be seen almost abreast to the line of equality (*see* Figure 2).

Discussion

This study aimed to make a comprehensive assessment of the SES inequalities in the use of ANC services in the SADC region. The study uses simple descriptive statistics and analytical methods using concentration indices and curves for analysis.

Descriptive Statistics

Rural vs urban residence and ANC utilization

In terms of place of residence and the variations in attaining ANC visits, living in an urban area was associated with the likelihood of attaining '≥ 4 ANC' than all other mutually exclusive categories. Similarly, living in a rural area was associated with the likelihood of attaining '0 ANC' use compared to all other mutually exclusive categories. This finding is supported by other studies in both developed and developing countries (35,36,37). Tanzania and Namibia's deviation from this finding can potentially be explained by their relatively smaller sample of women, with no 'over-representation' of rural women as seen in all other ten countries. Thus, Tanzania and Namibia were the only countries that did not show a higher proportion of '0 ANC' use among rural dwellers, suggesting that most women had some form of ANC visits even if they did not complete the full course of recommended four ANC visits. This is in agreement with a cohort study conducted in Vietnam, where almost all women reported some form of ANC use during pregnancy (38). Given that women in rural areas had fewer visits, the large disparity in ANC adequacy between the two settings suggests that special attention need to be given to rural areas, focusing on the importance of ANC and ways of luring pregnant women in.

Marital status

Whilst marriage can be considered as an institutional structure that promotes women's support from their spouse during pregnancy (39,40) as seen in Malawi, Madagascar, Lesotho, and Tanzania in the present study, in some African cultures, marriage can be seen as a custom that takes away from women's authority over their owns' lives decisions, some of which include health-related choices. Different patterns have emerged in many other countries with regards to attaining an adequate number of ANC visits and being married, and thus, no sole conclusion could be reached. A study conducted by Rai and colleagues (41) found that a high proportion of women in Nigeria were "married to much older men based on religion and cultural beliefs, practising cultural norms that restricted women from seeking health-related assistance during pregnancy". As in the present study, limited use of ANC among married women in Mozambique is also reported by Charfudin (42) who concluded that majority of births take place at home, pointing to a possible lack of urgency for women to consult health professionals during their pregnancy. Also, early marriages or child marriages are a popular trend in Mozambique, which is in line with findings by Rai and colleagues (41). Similarly, in the DRC, which also showed low use of ANC among married women, females are more likely to get married before the age of 18 compared to their male counterparts, which also possibly speaks to their waned down authority regarding their own productive health (43). On the other hand, although early marriages are quite common in Zambia (44), being married did not seem to predict women's likelihood of attaining adequate or inadequate use of ANC. Furthermore, in countries where marriage did not seem to influence the use of ANC as in the case of Zambia and Zimbabwe, a study conducted by Musandirire and colleagues (45) had contrasting findings wherein cultural practices,

power dynamics and gender roles were shown to have taken away the Zimbabwean married women's capacity to exercise their maternal health care rights during pregnancy, including their susceptibility to infectious diseases that contribute to some of the maternal mortalities. From these findings, a deduction can be made to promote community-based programmes or interventions that can help encourage spousal support during pregnancy, which will be paramount in bridging the gap between attaining '0 ANC' visit and reaching an adequate or more than four ANC visits. This is not to suggest that cultural practices should be ignored, but rather a mechanism that can help create awareness regarding cultural norms that are potentially health-damaging to both the mother and the unborn child during pregnancy.

Education

Findings in Namibia and Lesotho contrast those backed by literature (15,16) where countries with relatively more educated women, even the most illiterate women attain some form of ANC due to economic advancements. In these two countries this was not the case as, although the majority of women with a secondary education level made the recommended number of ANC visits, the remainder of women with no education or just primary level education had no form of ANC. Nonetheless, women's educational attainment has been shown to have an inordinate influence on authority; it affords them and their ability to make informed decisions over their own health (46).

In countries (Zambia, Tanzania, Mozambique, Madagascar and Angola) where most women had primary level education and had attained '1-3 ANC' visits, a deduction can be made that these women had some form of knowledge about the importance of ANC even if they did not complete the recommended course of four visits. Given that these women initiated the

visits but did not attend all four or more visits, the underlying reasons for the lack of compliance could include but are not limited to 1) Poor quality of service from health professionals (47), 2) discouragement to continue using ANC services due to lack of resources (47), 3) being a first time mother or not or (48) 4) the need to just have a pregnancy registered should complications arise or for administrative purposes such as issuing of birth certificates once the baby is born (49). This points to the fact that while knowledge or the lack thereof can sway women to use ANC or not, other factors can potentially confound this finding if not controlled for. For instance, Wang and Hong (16) in a study conducted in Cambodia, found that while education had a relatively stronger effect on predicting ANC use, the quality of care received in the first visit or two was likely to predict the continuation of care. In a qualitative study conducted in South Africa, some women reported poor quality of services and being reprimanded and scolded by health professionals as reasons why they had inadequate use of ANC or opted to book late for their pregnancy (50).

Employment

The lack of ANC use among women who did agriculture work in the present study is possibly due to the fear of loss of a day's wage should a visit be made to a health facility. In agreement with the present, a couple of authors have reported higher odds of fewer ANC visits among women who engaged in agriculture jobs when compared to women who do not work (47,48). Acharya and colleagues (53) further supported that mothers employed in the agricultural sector have no maternal autonomy and are the most at risk of complications that could arise during the gestation period. Thus, this potentially leads to missed opportunities for educating women about their health during pregnancy, such as the need

to do less strenuous work that could, in some instances, lead to miscarriages. Therefore, failure of women attending ANC services due to their respective occupations can result in dire consequences such as eluding correct diagnosis, treating and preventing pregnancy-related ailment, some of which are transferrable to the baby.

Contrary to studies that have found that employment of the women increases their authority over their health (7,50,51), in the present study four countries that showed the highest level of unemployment amongst the mothers had well over 50% of the women attaining either '1-3 ANC' visits or four or more ANC visits. Although this finding is quite unusual, especially in African countries, other studies have reported similar findings (10,52). However, it is intuitive that unemployed women have relatively more time to make all recommended visits as opposed to their working counterparts that have to face the opportunity costs of lost wages. Given that unemployed women are not economically independent, it is possible that financial spousal support and location of health centres within their vicinity contributed to their continued use of maternal health services during pregnancy. Authors that have looked extensively into barriers or enablers of ANC use point to a combination of these factors (spousal support and location of the facility) as key determinants of continued service use (53,54).

Analytic assessment

In the present study, concentration curves were complemented with concentration indices to allow for examination of the pattern of socioeconomic inequalities in the uptake of ANC

across the eleven SADC countries. The distribution of the share of adequate ANC services is unequal at the disadvantage of the poor. The CI of all the '0 ANC' and '1-3 ANC' visits were negative, revealing a higher pro-poor use of inadequate antenatal care by poorer women. This is consistent with other studies where inadequate or complete lack of ANC use is prevalent among the poor (59,60,61). The analysis further showed a pro-rich use of '$\geq$ 4 ANC' visits except for countries that showed some form of equality such as Malawi, Zambia and Zimbabwe, with CIs closest to zero. Interventions that had been put in place in these countries (Malawi, Zambia and Zimbabwe) to promote the use of maternal health services during pregnancy shows that some progress has been made in reducing inequalities in the use of adequate ANC. In Malawi where the majority of the women surveyed in the current study were married, the literature shows that an intervention promoting male involvement in maternal health care in both urban and rural areas of Malawi had a greater influence on this (62). On the other hand, in Zambia 'Safe Motherhood Action Groups' interventions were initiated to increase coverage of maternal services among the poorest and most remote populations in Zambia (63). In Zimbabwe, the 'Pillars of Safe Motherhood' were formed, one of which was focused on ANC services, including PMTCT, nutrition, and ensuring these were made available to all pregnant (64).

However, much public awareness in countries such as Angola and Madagascar that showed the highest level of inequality overall has to be considered for change. All the SADC countries included in this study signed to achieving the MDGs and subsequently the SDGs, which is a step in the positive direction, but it is evident the widened inequality in most of these countries have not been addressed.

Limitations

The cross-sectional nature of the DHS data does not allow for any causal inferences to be made. The study also did not take note of whether mothers were primigravidae or multigravidas, which could highly influence their continued use of ANC. Similarly, there is no mentioned of pregnancy complications that can potentially drive women to seek maternal care and attain four or more ANC visits. Nonetheless, the results of this study were unique in that four mutually exclusive categories regarding use of ANC was analysed in SADC countries, deriving its novelty from the fact that women who attained '0 ANC' visits were analysed as a separate entity.

Also, a fourth category which analysed the intensity of inequality of ANC service use was derived and assessed.

Conclusion

Use of antenatal care and associated maternal mortality are indices that measure how good a country is doing in terms of achieving its health goals. In this study, the ANC usage rates, although reasonable on an overall basis, were consistently lower for women with lower education, doing agricultural work and those residing in rural areas. On the other hand, marriage did not prove to be a significant determinant of ANC use with countries showing differences in the relationship between the use of ANC and marital status. The analytical analysis showed that inequality in wealth makes ANC utilisation more predominant among the rich. Saving mothers and babies is ultimately saving the population and knowledge of

the patterns of maternal health usage is imperative in this regard, to draw relevant policies that are evidence-based.

Acknowledgements

I would love to thank my parents for their undying support throughout my school and varsity years. Also, truly grateful for the patience, strength and perseverance I drew from my relationship with God throughout the years. A special thanks also to my supervisor, A/Prof John Ataguba, who guided me through my Master of Public Health journey, it's truly an honour to have been a recipient of his knowledge and wisdom.

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Section 4: Policy Brief

Assessing inequalities in the use of maternal health services in the Southern African Development Community Countries

What do we know about maternal health service coverage, and what should be done to improve service coverage in the SADC countries?

Introduction

Disparities in maternal health care are of concern to all developing countries and present one of the biggest possible challenges to governmental policies in many SADC countries. With the rates of maternal mortality stagnant in most countries varying interventions implemented to achieve the millennium development goals (MDGs) and now the sustainable development goals (SDGs), have not effectively closed the crude differences between the rich and the poor in the use of antenatal care (ANC) services.

Previous research conducted in different sub-Saharan countries shows that poorer women continue to have fewer ANC visits compared to their more affluent counterparts. Majority of these implicated women tend to be poorly educated and unemployed. The findings of the present study show that these disparities continue to persist. Furthermore, women who live in urban areas which are often richer and more educated are more likely to take advantage of ANC services offered, making them beneficiaries of health services most needed by the least advantaged.

Even though it is acknowledged that women from poorer backgrounds have a higher risk of maternal mortalities subject to low use of ANC, this comprehensive assessment of inequalities in maternal health care is limited in SADC countries.

Even in SADC countries where user fees are minimal or non-existent for maternal health services, women from poorer backgrounds often bear the greater financial burden such as transport costs to maternal facilities or losing a day's wage if working in agricultural settings.

To date, women's dependence on men for economic survival has been a principal barrier to women's control over their reproductive behaviour in majority of developing countries. This is often associated with poor attendance of maternal health care. In many developing countries, women bear a disproportionate burden of disease compared to men. Yet, achieving Universal Health Coverage (UHC) for pregnant women is still elusive. UHC is about giving access to quality care to all who need such services and offering financial protection.

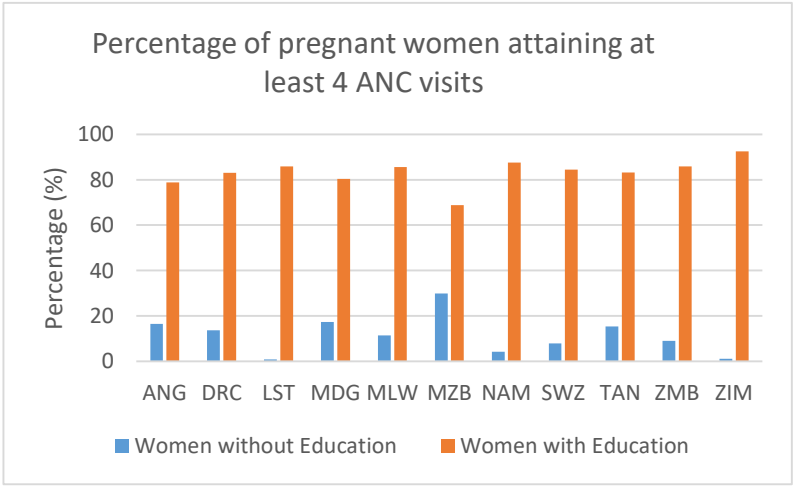
The World Health Organization (WHO) states that almost two-thirds of maternal deaths are a result of largely preventable causes, majority of which are subject to failing to attend the recommended four ANC visits.

Key Findings

- Disparities in ANC coverage, between the rich and the poor, is highest in Angola compared to the other 11 SADC countries
- Women from poorer backgrounds are more likely to report fewer ANC visits compared to their more affluent counterparts
- Women attaining at least secondary education are more empowered and report relatively more ANC use than women with primary or no formal education.
- Women who work in agricultural settings are less likely to make the recommended number of ANC visits, compared to the unemployed women.
- Women residing in rural areas remain disadvantaged as they use far less maternal health services compared to their urban counterparts.

Figure 1

Women doing agricultural work tend to have far less ANC visits compared to women with white-collar jobs or unemployed women.



Abbreviations

ANG: Angola
DRC: Democratic Republic of Congo
LST: Lesotho
MDG: Madagascar
MLW: Malawi
MZB: Mozambique
NAM: Namibia
SWZ: Swaziland
TAN: Tanzania
ZMB: Zambia
ZIM: Zimbabwe

Figure 2: Women without any formal education report fewer antenatal care visits compared to educated women.

Recommendations

- Empowering women with more economic participation, such as getting an education and employment and granting them control in their households and communities, is key to ensuring that women achieve control over their reproductive health. This includes teaching women to see beyond their pregnancy-related health, but also let them know of services that are available once that baby is born. These services include immunisation against infectious and the use of the continuum of care.
- Getting fathers to engage or encouraging spousal support can also promote the use of antenatal care. Men should be educated about the importance of maternal health care through, for example, the promotion of community-based programs or interventions that can help encourage spousal support during pregnancy
- Because poorer women have fewer ANC visits, they may be unable to afford transportation to facilities. Therefore, shortening the distance to clinical facilities is critical. This may be done through building facilities closer to people, the use of mobile clinics in rural communities with no maternal clinics at reach. Community-based health care workers can also be trained and deployed to make home visits to pregnant women.
- There should be collaborations enforced among the SADC countries to share knowledge and ideas on interventions that have worked well for countries with lower rates of maternal mortality and those with higher rates of ANC coverage.
- There should be social protection policies in place that protect women, especially the poor and those in rural communities, from wage loss when they attend antenatal care, irrespective of their occupation. This may also require laws that support maternity leave and time off for antenatal care.

Conclusion

Saving mothers and babies is ultimately saving the population and knowledge of the patterns of maternal health usage is imperative in this regard, to draw relevant policies that are evidence-based.

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Acknowledgements

Special thanks go to A/Prof John Ataguba for his incredible supervision and mentoring me through the completion of this study.

Disclaimer

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Section 5: Appendices

Appendix 1: Human Ethics Research Approval

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

Room ES3-46 Old Main Building
Groote Schuur Hospital
Observatory 7925
Telephone [021] 406 6492
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Website: www.health.uct.ac.za/fhs/research/humanethics/forms

28 September 2018

HREC REF: 530/2018

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

Dear A/Prof Ataguba

PROJECT TITLE: ASSESSING INEQUALITIES IN THE USE OF MATERNAL HEALTH SERVICES IN THE SOUTHERN AFRICAN DEVELOPMENT COMMUNITY COUNTRIES (MPH Candidate - Miss K. Selebano)

Thank you for your response letter dated 27 September 2018, addressing the issues raised by the Human Research Ethics Committee (HREC).

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

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

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

We acknowledge that the student: Ms Keolebogile Selebano will also be involved in this study.

Please quote the HREC REF in all your correspondence.

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

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

Yours sincerely

PROFESSOR M BLOCKMAN signature removed to avoid exposure online
CHAIRPERSON, FHS HUMAN RESEARCH ETHICS COMMITTEE

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

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

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-

Figures should be cited in ascending numeric order upon first appearance. Each figure caption should ~~then~~ be inserted immediately after the first paragraph in which it is cited in the article file.

Figures should not be included in the main manuscript file. Each figure must be prepared and submitted as an individual file. Find more information about preparing figures here.

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The title, authors, and affiliations should all be included on a title page as the first page of the manuscript file.

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- Discussion
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Back to top

2. Guidelines for Standard Sections

Title

Manuscripts must be submitted with both a full title and a short title, which will appear at the top of the PDF upon publication if accepted. Only the full title should be included in the manuscript file; the short title will be entered during the online submission process.

The full title must be 250 characters or fewer. It should be specific, descriptive, concise, and comprehensible to readers outside the subject field. Avoid abbreviations if possible. Where appropriate, authors should include the species or model system used (for biological papers) or type of study design (for clinical papers).

Examples:

- Impact of Cigarette Smoke Exposure on Innate Immunity: A *Caenorhabditis elegans* Model
- Solar Drinking Water Disinfection (SODIS) to Reduce Childhood Diarrhoea in Rural Bolivia: A Cluster-Randomized, Controlled Trial

The short title must be 50 characters or fewer and should state the topic of the paper.

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Authors and Affiliations

All author names should be listed in the following order:

- First names (or initials, if used),
  Middle names (or initials, if used), and
- Last names (surname, family name)

Each author should list an associated department, university, or organizational affiliation and its location, including city, state/province (if applicable), and country. If the article has been submitted on behalf of a consortium, all author names and affiliations should be listed at the end of the article.

This information cannot be changed after initial submission, so please ensure that it is correct.

To qualify for authorship, one should contribute to **all** of the following:

1. Conception and design of the work, acquisition of data, or analysis and interpretation of data
2. Drafting the article or revising it critically for important intellectual content
3. Final approval of the version to be published
4. Agreement to be accountable for all aspects of the work

All persons designated as authors should qualify for authorship, and all those who qualify should be listed. Each author must have participated sufficiently in the work to take public responsibility for appropriate portions of the content. Those who contributed to the work but do not qualify for authorship should be listed in the acknowledgments.

When a large group or center has conducted the work, the author list should include the individuals whose contributions meet the criteria defined above, as well as the group name.

All authors must approve the final manuscript before submission. PLOS ONE will contact all authors by email at submission to ensure that they are aware of the submission of the manuscript.

One author should be designated as the corresponding author, and his or her email address or other contact information should be included on the manuscript cover page. This information will be published with the article if accepted.

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Abstract

Describe the main objective(s) of the study

Explain how the study was done, including any model organisms used, without methodological detail

Summarize the most important results and their significance

Not exceed 300 words