BINDURA UNIVERSITY OF SCIENCE EDUCATION

TOPIC: IMPACT OF INDIVIDUAL HEALTH INSURANCE ON MATERNAL HEALTHCARE SEEKING BEHAVIOUR.

By LARRY NYONI
B200278A

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTERS IN HEALTH ECONOMICS OF BINDURA UNIVERSITY OF SCIENCE EDUCATION. FACULTY OF COMMERCE.

JUNE 2021

BINDURA UNIVERSITY OF SCIENCE EDUCATION

Approval form

TOPIC: **Impact of individual health insurance on maternal healthcare seeking behaviour**

The undersigned certify that they have read this dissertation and have approved its submission to the department for marking after confirming that it confirms with departmental requirements.

……	**……..**
(Student)	**(Date)**
……..	**……**
(Supervisor)	**(Date)**
……..	**……**
(Chairperson)	**(Date)**

Declaration form

I, Larry Nyoni declare that this is my work and has not been copied or lifted from any source without acknowledging the source.

Signed……

Date……

Dedication

This copy of my research is dedicated to my family.

ABSTRACT

This study investigates the impact of health insurance the uptake of maternal healthcare services in Zimbabwe, where despite being a signatory of Millennium Development Goals which aimed at improving maternal healthcare, however indicators of maternal healthcare continues to perform poorly. The need to understand the crucial factors in improving maternal healthcare motivated the current study, especially since there is dearth of literature in this study area in Zimbabwe. In so doing, a national representative data (Zimbabwe Demographic Health Survey – ZDHS 2015) was used. STATA version 13 was used for the estimations. The study used binary logit model to estimate the utilisation of maternal healthcare services (antenatal care). Age, middle wealth quantile, richest wealth quantile, region, insurance cover, marital status and number of living children were significant factors influencing antenatal care services. Basing on these findings, the study advises the Government of Zimbabwe to make more available vocational training centres and education institutions since education influences the uptake of maternal healthcare services. There is need to encourage family planning awareness so as to reduce the number of children which affects the uptake of maternal healthcare. For free maternal healthcare to be successful, the government is advised to ensure that all rural mothers access the healthcare centres by bringing them closer to people and increasing the number of village health workers.

Acknowledgements

The researcher would like to express his gratitude to the people who assisted him and gave him encouragement to make this study a success.

Supervisor D Kairiza for his patience, guidance and encouraging advice.

The following colleagues who assisted me in proof reading, typing and encouraging words, Mr David Mhlanga, Alex Marikiti and Kudzai Nyoni.

My Family played a very important role. I would like to thank them for tolerating all the inconveniences caused by this research

LIST OF TABLES

LIST OF FIGURES

Table of Contents

CHAPTER ONE

INTRODUCTION AND BACKGROUND

1.0 Introduction

The increasing attention given to maternal health globally has concentrated on the reduction of maternal mortality since good health plays a pivotal role in poverty alleviation and human development. This is out of the realisation that maternal mortality is a global concern, with a consensus having been reached that the uptake of maternal care as well as the health of mothers is an important indicator of national health and socio-economic development status of countries [United Nations (UN), 2016]. In the International statistical classification of diseases and related health problems, 10th revision (ICD-10) World Health Organization (WHO) defines maternal death as the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but not from accidental or incidental causes. (http:/www.who.int.org/).

The World Health Organization (WHO) estimates that 580,000 women of reproductive age die each year from complications arising from pregnancy, and a high proportion of these deaths occur in sub-Saharan Africa. Women play a principal role in the rearing of children and the management of family affairs, and their loss from maternity-related causes is a significant social and personal tragedy (Mekonnen & Mekonnen, 2002). Since a large proportion of maternal and neonatal deaths occur within the first few days after delivery, safe motherhood programs have recently increased their emphasis on the importance of postnatal care. A woman in Africa, south of the Sahara has a 1 in 39 chance of dying in pregnancy or childbirth, compared to a 1 in 3,800 risk in developed countries (Mungai, 2015).

Leading causes of maternal deaths are related to obstetric complications around the time of childbirth, and three quarters of those deaths and significant morbidity can be prevented by access to a full continuum of quality maternal health services. Nevertheless, access to and utilization of services such as family planning, antenatal care and skilled delivery at birth is still low (UNFPA, 2010)

Studies demonstrating the high levels of maternal mortality and morbidity in developing countries and research identifying causes of maternal deaths have repeatedly emphasized the need for antenatal care and availability of trained personnel to attend women during labour

and delivery (Fauveau*et al.,* 1988; Fortney et al., 1988). The importance of tetanus toxoid injections given prior to birth to reduce neonatal mortality has been documented as well (Bhatia, 1989). Since a large proportion of maternal and neonatal deaths occur within the first few days after delivery, safe motherhood programs have recently increased their emphasis on the importance of postnatal care. Therefore, there is need to get an insight of the factors influencing the uptake of maternal care to avert high maternal mortality rate.

1.1 Background of the study

Health is central to wellbeing of any nation as well as a perquisite for sustainable development. Health for all remains an elusive goal for most of the developing countries (Carr, 2004). Maternal mortality is a prevalent problem particularly in developing countries including Zimbabwe. This has given rise to the United Nations agency for health, World Health Organization (WHO) setting a Millennium Development goal and adopted reduction of maternal mortality in the global action plan. The two targets for assessing this Millennium Development Goal (MDG) 5 were reducing the maternal mortality ratio (MMR) by three quarters between 1990 and 2015 levels and achieving universal access to reproductive health by 2015 and Zimbabwe failed to achieve that goal. In the case of infectious diseases and maternal complications, developing countries face a serious problem than developed countries (WHO, 2011). It is infrequent for maternal mortality rate for developed countries to be more than 10 per 100 000 live births whilst it is normal for developing countries to have maternal mortality rate exceeding 500 per 100 000 live births which makes it a problem for developing countries (World Bank, 2001).

There is an increasingly visible gap between households that have access to healthcare and those who are excluded from such benefits (WHO, 2005). In 2004, maternal mortality rates for Sub Saharan countries stood at 900 deaths per 100 000 live births compared to 9 deaths per 100 000 live births for developed countries (WHO, 2004). In Zimbabwe, the under-five mortality rate for the richest fifth of the population was reported to be 62 deaths per 1000 live births compared to 100 deaths per 1000 live births for the poorest fifth who are constrained from accessing healthcare by their incomes (Gwatkin et al., 2003). In fact, researchers have found that a large proportion of mothers and children remain excluded from the health benefits that others in the same country enjoy. For example, Gwatkin et al. (2003) found that 94 percent of births by the richest fifth of Zimbabwean women are attended by medically trained personnel compared to only 57 percent of the poorest fifth. There is an increasingly

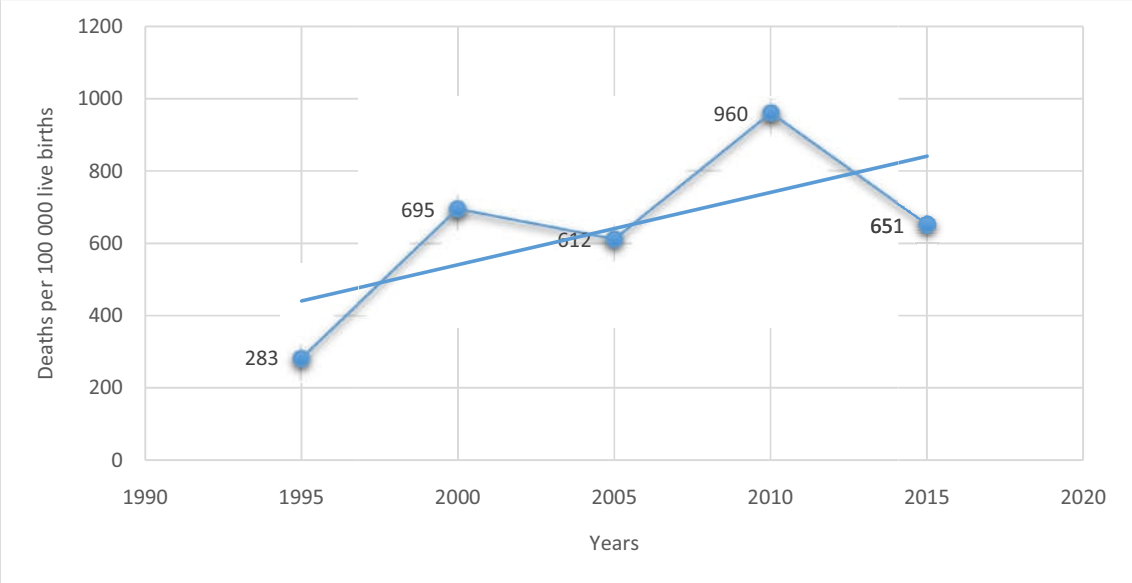
visible gap between households that have access to healthcare and those who are excluded from such benefits (WHO, 2005)

1.1.0 Maternal Mortality in Zimbabwe

Most African countries developed initiatives geared towards the achievement of the fifth Millennium Development Goal (Who, Unicef, Unfpa & Division, 2014). A multi donor transition fund was pooled for Zimbabwe with goal of to contribute to reduced maternal mortality (by 3/4) and under-5 mortality (by 2/3) (MDGs 4 and 5) and eliminate user fees for children under-5 and pregnant and lactating women by 2015 (Unicef, 2011).

It is estimated that 3000 women die each year during child birth and approximately 1.23% is lost yearly due to maternal complications in Zimbabwe (United Nations in Zimbabwe, 2013). Zimbabwe is ranked among 40 countries with high maternal mortality rate in the world having more than 960 per 100 000 lives births (WHO, 2014).

Figure 1: Maternal Mortality Ratio in Zimbabwe



Source: ZDHS 2015

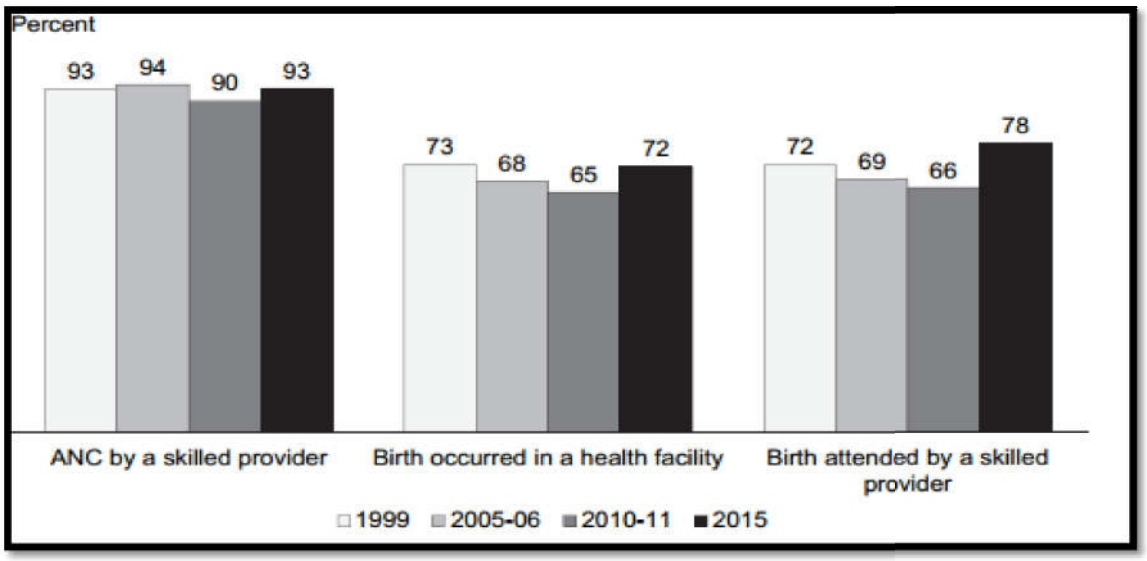
Figure 1 shows that there is an upward trend in the maternal mortality ratio in Zimbabwe. The Maternal Mortality Rate(MMR) recorded at 283 deaths per 100 000 live births in 1995/96 increasing to 695 deaths per 100 000 live births in 2000/01and decreased to 612 deaths per 100 000 live births. An alarming record was reached in 2010/11 with a MMR of 960 per 100 000 live births. In response to this worse record there was removal of user charges to encourage the uptake of maternal care in 2011 since there is an inverse relationship between the utilisation of maternal healthcare and maternal mortality. In 2015 MMR was 651 deaths per 100 000 live births which is a bit lower than that of 2010 but far

from achieving the global action plan of 112.5 deaths per 100 000 live births in 2015 which was under fifth goal of MDG.

1.1.2 Maternal Healthcare Utilisation in Zimbabwe

Antenatal Care is beneficial in preventing adverse outcomes of pregnancy therefore, it is advised it is recommended to be considered throughout the pregnancy. WHO recommends that to avoid complications a woman should have at least four antenatal care visits before delivery. Ninety-three percent of births to urban mothers were attended to by a health professional and 81 percent were delivered in a health facility, compared with 71 percent and 68 percent, respectively, of births to rural women (ZDHS, 2015). The survey further demonstrates that rural women are less likely than their counterparts to get antenatal care from a doctor.

Figure 2 Trends in Maternal Healthcare, Zimbabwe 1999-2015



Source: ZDHS 2015

Figure 2 shows the proportion of mothers reporting ANC from a health professional increasing from 93 to 94 percent for 1999 to 2005/06. ANC fell to 90 percent in 2010/11 and rose in 2015 to 93 percent. Skilled attendance during delivery was decreasing from 72 percent in 1999 to 69 percent in 2005/06 and finally to 66 percent in 2010/11 and went up in 2015 to 78 percent. Facility based deliveries decreases from 73 percent in 1999 to 65 percent in 2010/11 it then increased to 72 percent. From Figure to it is clear that 2010 figure for all the indicators of maternal healthcare is the lowest and as a result Zimbabwe recorded the highest maternal mortality ratio[1] shown in figure 1. This is an indication of an inverse

[1] 960 deaths per 100 000 live births

relationship between utilisation of maternal healthcare and maternal mortality ratio. Zimbabwe failed to meet the MDG target for ANC by skilled provider of 100 percent as well as 90 percent target of skilled assistance during delivery

1.2 Problem statement

Maternal mortality is rife in Zimbabwe, with the country ranked amongst the 40 countries with the highest mortality in the region. According to a UN Report (2014), Zimbabwe's fight to lower MMR was failing due to growing social inequalities, AIDS and lack of access to emergency and obstetric care among others. Preventable maternal mortality and morbidity are pressing human-rights issues that violate a woman`s rights to health, life, education, dignity, and information (Mungai, 2015).

There is a trend of high maternal mortality rate as shown by Figure 1 in the Background section. The 2015 figure[2] is still too high compared to other countries in SSA and still far from the 2020 target of 326 established by the Ministry of Health and Child Care (MoHCC). It is undoubted that MMR in any nation is related to the uptake of maternal care by mothers. High maternal mortality rates are an indication of poorly functioning health systems. Thus, low uptake of maternal care should be associated with high MMR. In this regard, it is important to understand the factors that influence mothers' uptake of maternal care in Zimbabwe. Knowledge of the factors influencing maternal care uptake is useful in the health sector as it has far reaching policy implications, which aids the targeting of health resources. Currently, there is scanty literature specifically dedicated at establishing the factors influencing maternal care uptake in Zimbabwe.

Maternal health care plays an important role in maternal mortality reduction, especially antenatal care, skilled attendance at birth and postnatal care (Machio, 2008). Zimbabwe failed to meet MDG goal 5 which was set for 2015. Zimbabwe through Transitional Health Fund has implemented a Free Maternal Healthcare Policy since 2012 which enables pregnant women in rural areas to have free access to maternity care services before, during and after childbirth from both accredited private and all public hospitals in the country this is because user fees dissuade service utilisation. Even with the scrapping of user fees in Zimbabwe's maternal mortality rate is still high.

High maternal mortality rate is detrimental to the growth of an economy. It has also some socio-economic consequences such as increased child labour participation, social isolation

[2] 651 deaths per 100 000 live births

reduced parental supervision and care. Maternal, new-born and child mortality and morbidity are limiting Africa`s development. Preventable maternal mortality and morbidity are pressing human-rights issues that viol Objectives of the study

Based on the discussions above it is clear that there is low utilisation of maternal healthcare in Zimbabwe which could be having adverse effects on maternal mortality as well as maternal morbidity.

1.3 Objectives of the study

The broad objective of this study is to establish the impact of health insurance influencing the uptake of maternal care.

Specifically, the study seeks:

To examine the factors influencing the uptake of maternal care in Zimbabwe

To examine the impact of health insurance on uptake of maternal health services

1.4 Research Questions

The study is based on the following research questions

How does household income affect the uptake of maternal healthcare?

Does health insurance affect the uptake of maternal healthcare?

Does access to health facility influence the uptake of maternal healthcare?

1.5 Research Hypothesis

Exposure to poor socio-economic conditions (e.g. residing in rural areas…) reduces maternal care uptake among mothers in Zimbabwe

Attaining higher levels of education, participation in the labour market increases maternal care uptake among mothers in Zimbabwe

1.6 Justification of the study

Maternal mortality is one of the greatest development and health challenges facing the developing world. Good health is vital to the socio-economic development of any country given that it enables people to participate in economic, social and political development(Chepkorir, 2014). Antenatal care is commonly understood to have beneficial impact on pregnancy and birth outcomes through early diagnosis and treatment of complications as well as promoting the health of the pregnant woman through nutrition.

Despite the fact that maternal health care utilization is essential for further improvement of maternal and child health, little is known about the current magnitude of use and factors

influencing the use of these services in Zimbabwe. Thus, the findings of this study will contribute to the existing body of academic literature on factors influencing maternal care uptake in Zimbabwe. The results of the study will also proffer policy advice. In spite of undoubted progress towards greater coverage rates, however, evidence from various African settings has shown that one quarter to one half of women continue not to attend ANC and not to seek skilled attendance at birth even after the reduction of user fees. It is therefore of utmost importance to understand who continues to remain excluded from access to maternal care services even following the reduction of user fees. Empirical evidence suggests that women still do not seek skilled assistance at birth at a health facility even after the abolition of user fees (Tann et al., 2007; De Allegri et al., 2011)

Furthermore, a study carried in Zimbabwe of establishing the determinants of maternal care utilisation done by Muchabaiwa., et al. (2012) which used 2005/6 DHS data which is way before the removal of user charges on maternal care. Kamutando (2014) did a study of identifying socioeconomic factors influencing the choice of delivery place that is: options available to women about the setting which they give birth at home, or at health facility (WHO, 2012), this study looks at maternal care at its broad spectrum since it includes four components which are: antenatal care, uptake of Tetanus Toxoid (TT) injections, place of delivery and postnatal care. Place of delivery is just a component of an umbrella term of maternal care and to also include the intervention of Transitional Health Fund.

1.7 Organisation of the study

The Study is organized in Five chapters; Chapter One is covering basic introductory and background issues, the statement of the problem, the research questions, the research objectives and significance of the study. Chapter Two proved an insight into literature pertaining the study topic whilst Chapter Three provides the methodology whilst Chapter Four deals with estimation and interpretation of results. Finally, Chapter Five concludes and summarises the study findings as well as giving study based policy recommendations and suggestions of areas for further study.

CHAPTER TWO

LITERATURE REVIEW

2.0 Introduction

Literature on utilisation of health care (for example maternal healthcare) fall under supply-demand framework (Yiva, 2011). On the supply side, good quality of maternal health service may not be offered. However, on the demand side even if good quality of service is offered individuals may not utilise those services (O'Donnell, 2008). Demand and Supply of health care seemingly interact making it difficult to extract factors that solely influence the uptake of health care. In maternal healthcare if the quality of the services offered are poor individuals will lose their interest in the services thereby leading a fall in demand for the care. It is perceived that lack of female health workers act as an obstacle to seeking care for women. It is claimed that women hesitate to seek for care for the fear of being examined by male doctors (Chepkorir, 2014). This chapter therefore, highlights factors influencing the uptake of maternal health care services (both theoretical and empirical) within an economic framework.

2.1 Review of the existing literature on the determinants of the uptake of maternal health care

Maternal care uptake has its stronghold on the theory of consumer behaviour whereby a rational consumer aims to maximise utility subject to budget constraint. Various theorist came up with different factors which influence the uptake of maternal care.Being concerned with how individuals allocate their resources to produce health, Grossman (1972) came up with health demand theory building from Becker`s theory of investment. The model is nested with many assumptions one of the key assumptions being: individuals value health but they don't value it above all else, if they value health that much they wouldn't be involved in risk activities such as smoking, drinking too much and driving fast. It assumes that individuals are producers of health. Within the Grossman demand for health framework to consumer behaviour it is assumed that individuals inherit a stock of health that depreciates at an increasing rate over time after some stage in the life cycle of health. Death ensues when stock of health falls below a certain level and people can choose their length of life[3].

The production function depend on environmental factors chief amongst them is level education of the producer which impacts the efficiency of the production process (Grossman, 1972). Individuals demand health for two reasons consumption commodity – sick days are a

[3]All death is suicide

basis of dissatisfaction and investment commodity – it determines the total amount of time available for market and non-market activities.

Health is a source of utility that enters directly into consumer's utility function. The intertemporal utility function of a typical consumer is given as:

$U \quad U(\ {}_0H_0, ..., \ {}_nH_n, Z_0, ..., Z_n)$ ……(1)

Where H_o is the inherited stock of health, H_i is the stock of health in the i^{th} time period, $_i$ is the service flow per unit stock, $h_i \quad {}_iH_i$ is the total consumption of health service and Z_i is the consumption of another commodity in the i^{th} period. Death occurs when the stock of health reaches minimum level of stock of health.

The investment component of health infers that health determines the number of days an individual is able to partake in market and nonmarket productive activities. Grossman modelled health as a capital good using the following model,

$H_t \quad H_{t\ 1} \quad {}_tH_t \quad I_t$ ……(2)

The model postulates that the amount of health stock (H_t) at period t depends on how an individual invest in his/her health (I_t) and the rate of depreciation $(\ _t)$. Depreciation is the amount of health stock that lost through injuries, age, carelessness and diseases. Inputs such as income, health care, time, environment and diet enter in the production function to accumulate health stock and produce health days as output. Gross investment is produced by consumers in health and other commodities in the utility according to a set of household production functions shown below.

$I \quad f(M, T_H, E)$ ……(3)

$Z \quad f(X, T_C, E)$ ……..(4)

Where I is gross investment in health which is a function of market heath care inputs, (M), the time input in the investment function (T_H) and education level (human capital) given by E. (Z) is the consumption of other goods and is a function of X which is a vector of goods input that contribute into the production of commodity (Z), (T_C) which is time inputs for Z.Education plays a pivotal role in determining health capital efficiency and hence determines household consumption behaviour

The model concludes that an individual can determine the optimal health capital by equating marginal efficiency of health capita to user cost. Factors that determine the demand for health service according to Grossman (1972) are education, wages and age. In both variants of the

model, age is inversely related to health demand. According to Grossman 1973 “Biological factors associated with ageing raise the price of human capital and cause individuals to substitute away from future health until death is chosen”. Aging results in two effects: It increases the rate of depreciation things deteriorate at a faster rate meaning there will be need for upkeep and rate of return on an investment is lower. Based on the former effect as people age their need for health increases due to increase in depreciation (decline in health stock). The second result entails that existence of old people results in gross investment with low health capital stock. Thus Older people are less efficient at turning health investment in health

stock (Chiremba, 2013).

The more education a person is the more efficient a person is in turning health investments into health stock. Also, Education may reduce depreciation thereby increasing the optimal stock of health. Therefore, there is a negative relationship between the demand for health and education. On wages, there are two effects. In the pure consumption case, wages reduce the demand for health because the higher the future wage, the higher the marginal cost of holding health stock as consumption good (Chiremba, 2013). On the other hand, wages have a positive relation with demand for health, as wages increases, the incentive to work increases as well as maintaining high levels of health stock.

In addition to factors reviewed by Grossman (1972), Andersen and Newman (1973) came up with socio-behavioural model which groups in a logic sequence the multilevel factors (predisposing, enabling and need based) which influence the human behaviour towards health. The model was specifically developed to investigate the uptake of biomedical (biological) health services. The model was developed with the aim to assist policy makers on why families use health services, and to define and measure equitable access to health care as well as coming up with policies that promote equity in health.

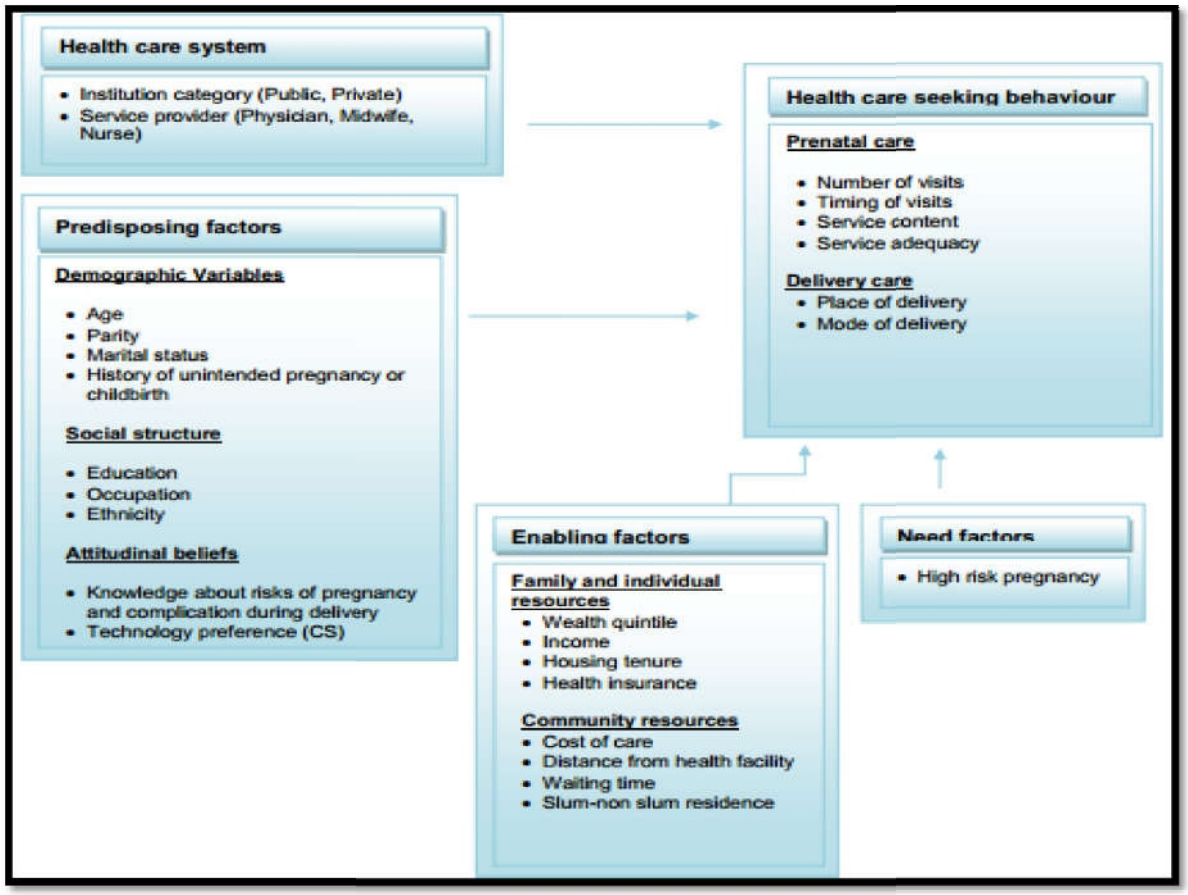
Predisposing Characteristics is postulated that some people are more likely to utilise services than others and this likelihood can be foretold by individual characteristics. People that possess certain socio-cultural characteristics of individuals that exist prior to their illness. These characteristics include demographic factors, such as age, sex, parity, etc.; social structural factors, which is a reflection of the individuals social standing or status and is measured by characteristic such as education, occupation, ethnicity, social networks, social interactions, and culture. Health Beliefs: Attitudes, values, and knowledge that people have concerning and towards the health care system.

Enabling characteristics: These are logistical aspect of obtaining health care. Being predisposed to health service is not enough, there is need for the availability of certain resources for the actualisation of health even when predisposing is available. The resources are termed enabling because they make health care services available at all levels of the society. Family resources include income, health insurance coverage and location of residence (Anderson and Newman, 2005). Family income is the paramount resource as it determines the funds available to acquire healthcare services such as consultation fees, admission fees among others. Resources at the community level entails the number of health facilities, health personnel and waiting time available to reduce the level of queuing up for health services. It also entails genetic factors and psychological characteristics

Need-based characteristics: The most immediate cause of health service use, from functional and health problems that generate the need for health care services. "Perceived need will better help to understand care-seeking and adherence to a medical regimen, while evaluated need will be more closely related to the kind and amount of treatment that will be provided after a patient has presented to a medical care provider." (Andersen, 1995). Measures of this characteristic include perceived needs i.e. the perception of illness and its severity or the probability of an illness occurring; and needs as evaluated by a health professional; Anderson and Newman, 2005). A woman's need for care may be influenced by past experiences in pregnancy and childbirth or personal preferences. Thus, perceived need serves as a stimulus for the use of health services. Perceived illness can be measured by the number of disability days, and symptoms experienced by the individual during a specified time frame (Anderson and Newman, 2005).

International Collaborative Study on health care modified the socio-behavioural model. The version added Health Service Systems(HSS) factors to enabling and predisposing factors. HSS refers to the structure of the health care system and its link to a country`s social and political macro-system. The modification is paramount as it considers a link between health seeking behaviour with structural levels within a macro-political and economic context. . However, the updated version of the model omits need factors which are central for understanding health-seeking behaviour (Weller *et al*., 1997).

Figure 3: An analytical framework for the determinants of maternal health seeking behaviour in Zimbabwe



Adopted from (Andersen and Newman, 2005)

A further modified of Andersen model was expounded by Kroeger (1983). Grounded on a widespread and well-elaborated literature revision, he proposed the following framework; – Interrelated explanatory variables, all of which are affected by perceived morbidity, An individual`s traits or predisposing factors such as age, sex, marital status, status in the household, household size, ethnic group, degree of cultural adaptation, formal education, occupation, assets (land, livestock, cash, income), social network interactions, Characteristics of the disorder and their perception: chronic or acute, severe or trivial, etiological model, expected benefits or treatment (modern versus traditional), psychosomatic versus somatic disorders. Characteristics of the service (health service system factors and enabling factors): accessibility, appeal (opinions and attitudes towards traditional and modern healers), acceptability, quality, communication, costs. The interaction of these factors guides the election of health care resources (Kroeger ,1983).

A rational consumer is assumed to maximise utility subject to income level, the price of health inputs, consumption activities, and the prospects of transforming health inputs into health (McGuire, Henderson & Mooney, 1988). Health production function recapitulates the relationship between health status and the various factors that may be used to produce good health. This can be characterized as follows:

Health = f (medical care, time, other inputs) ……(5)

Equation (1) implies that individuals use medical care in combination with other inputs and their own time to produce good health, which in this case, is maternal health (Henderson, 2005). The model assumes that an individual inherits an initial stock of health[4] which depreciates with age but can be increased through investments with things like a healthy lifestyle (going to the gym, good diet etc.) as inputs and also medical services; hence can be analysed as a capital good. The model assumes that individuals are not passive consumers of health but rather active producers of the same who spend time and money to produce health. In this case, equation (1) above can be translated into:

$H^p = f(M_h, X_h, T_h)$……..(6)

Where: Hp is the production of health; M_h are the market healthcare inputs, X_h are other inputs in the production of health and T_h is the time spend on improving health. This therefore shows that healthcare, which in this case is maternal health (Comprise of antenatal, delivery and postnatal care), is one of the factor inputs used to produce health.

According to Grossman (1972), demand for healthcare is a derived demand for health while demand for health is a derived demand from a demand for utility. Consumers demand health for two reasons: as consumption as well as an investment commodity. As consumption commodity, health enters the utility function of the consumer while as an investment; it determines the amount of time available for work (McGuire, Henderson & Mooney, 1988).

In addition to the factors alluded to, the literature suggests that the uptake of maternal health care service in developing countries of which Zimbabwe is not an exception, are influenced by socio-demographic characteristics of women, culture and availability as well as accessibility of services (Mekonnen & Mekonnen, 2002). Most studies came to that income, ethnicity, cost, education, culture, age, parity and decision making power as the main factors that influence the uptake of maternal healthcare services.

[4] Same as Grossman Assumption

It is a consensus between health agencies that the uptake of maternal healthcare service is a key factor in maternal and child mortality (Raghu). In order to avoid pregnancy related complications such as haemorrhaging, eclampsia and worse among them mortality there is need for uptake of maternal healthcare services. Economic status of a family determines the level of uptake of maternal care. There is a positive relationship between income and uptake of maternal health service (Daniels, Ahenkan, & Poku, 2013; Elo, 1992; Muchabaiwa, Mudavanhu, Mazambani, Chigusiwa, & Bindu, 2012; Mungai, 2015). This implies that women from well-off families demand more maternal healthcare services since they can afford.

For a developed economy China, a study was carried out by Liu *et al.* (2011) on the use of maternal healthcare services in 10 provinces of rural western China. The objective was to analyse the socioeconomic and demographic determinants associated with use of maternal health services. The study used a multistage probability sampling method to collect data from 14 112 women who came into 10 western provinces of China. 2-level logistic regression model was used to scrutinize the data. was 86.3%. The frequency of postnatal visits was 84.8%, and the average number of postnatal visits was 2.19. Han ethnicity, higher education, lower parity, higher wealth index, and lower altitude of county had a higher odds ratio for more than 4 prenatal visits, hospital delivery, and postnatal visits. The aforementioned factors are the same for developing countries except cost of service.

Elo (1992), carried a study assessing the utilisation of maternal healthcare in Peru looking specifically on the role of women`s education. The study used Peruvian Demographic Health Survey for women carried out in September to December 1986. Using both cross sectional and fixed effects logit model, the study found that there is a positive effect of maternal schooling on the use of prenatal care and delivery assistance. In addition, large differentials were found in the utilization of maternal health-care services by place of residence

Machio (2008) using the 2003 Kenya Demographic and Health Survey investigates the factors that influences the use of various maternal health care services in Kenya. She estimates five models to that effect; three probit models to analyse the determinants of antenatal, post-natal and delivery care services, a poison count data model to analyse the determinants of number of antenatal visits and a multinomial logit model to analyse the influences demand of antenatal care, skilled delivery care services as well as the number of antenatal care visits. As wealth increases so does the probability of using these services. Education of both the women and the husbands increases the demand for postnatal, delivery care and antenatal services as well as the early timing of antenatal visits. Being employed

positively influences use of antenatal and post-natal care; it however has no impact on use of delivery care and number of antenatal visits as well as timing of antenatal visits. While increase in the age of the mother has positively influences use of antenatal care, post-natal care, no of antenatal visits and timing of antenatal visits, it reduces use of skilled delivery services.

In the same vein, Arthur (2012) carried out a study to investigate the effect of wealth on maternal care uptake in Ghana via its effect on antenatal care use. Consistent with this study Arthur (2012) pivoted on the introduction of free maternal healthcare services to deal with financial barriers. The study used secondary data from 2008 Ghana Demographic and Health Survey. The study employs both univariate and multivariate analysis to investigate the effect of wealth and other socioeconomic variables on ANC use in Ghana. analysis involves the use of chi square to test the significance of association between ANC use and each of the predictors in the study. In reality there are a multiplicity of factors that do influence the mother in making such a decision, thus, the study goes a step further to carry out a multivariate analysis when these variables are allowed to interplay. It is revealed from the study that wealth still has a significant influence on adequate use of Antenatal care. Education, age, number of living children, transportation and health insurance are other factors that were found to influence the use of Antenatal care in Ghana.

Using a binary regression model, Mungai (2015) carried a study on the determinants of maternal healthcare services in Kenya using Kenya Demographic Health Survey (KDHS) 2008.The study found out that age of the mother, secondary education, more than secondary education, birth order, richer wealth quintile, richest wealth quintile and access to information were significant factors which influence utilization of antenatal care. Hospital delivery was shown to be influenced significantly by age, primary education, secondary education, more than secondary education, birth order, residence, and all wealth indexes, access to information. On the other, primary education levels and secondary education levels were shown to be statistically significant in influencing postnatal care. Analysis across and within the models indicate that education significantly determine utilization of the three models antenatal care, hospital delivery and postnatal care whereby in all cases, it increases the usage. Similar to education, age of the mother also influences usage of Antenatal care and hospital delivery positively and significantly. Finally, the study found out that access to information positively and significantly led to increase in utilization of antenatal care and hospital delivery while birth order reduces the usage of both antenatal and hospital delivery.

In addition to the findings of Mungai (2015), Kimani, Mugo and Kioko did a study on the econometric analysis of healthcare utilisation in Kenya. The trio used 2007 Kenya Household Health Expenditures and Utilization Survey (KHHEUS) and estimated a negative count data binomial model. The model was applied to both private and public health facilities. On top of the finding by Mungai (2015), the study found that income and distance are significant factors affecting public health care utilization they are not significant in explaining healthcare utilization in private facilities.

A related study on determinants of maternal health care utilisation in Zimbabwe was done by Muchabaiwa et al., (2012). The aim of the study was to determine factors that influence pregnant women to demand maternal health care services. The study used secondary data from Zimbabwe Demographic Health Services (ZDHS) 2005/06. A sample size of 8907 women was used and the logistic model was employed to estimate utilisation of maternal healthcare. Socio-economic, demographic and cultural variables such as wealth status, education, place of residence, age and marital status were used as independent variables. Utilisation of maternal healthcare was a binary variable which was coded one if a woman utilises or zero if otherwise. Utilisation of maternal healthcare was categorised into four services: antenatal care, delivery at health facility and postnatal care and tetanus injections. Wealth status, education, place of residence, religion and distance to health facility were significant factors that influence delivery at health facility.

The data used in this study by Muchabaiwa*et al.*, (2012) had several strengths. It had a large sample size which minimise variance associated with estimation. In addition, demographic health surveys are almost standard across nations giving better comparisons among countries. However, the data excludes other critical quantitative factors such as cost of transport, cost of health services and distances to the nearest hospital.

2.2 Conclusion

Studies conducted indicates that female education, age of the mother, distance to the health facility, quality of the service offered, place of residence, marital status, birth order, number of children, income, occupation of the husband are some of the factors that influence use of maternal health care services. Utilization of healthcare services of any nature implies consumption where utility is expected to be maximized. Here, a mother derives utility through consumption of healthcare services and other goods subject to her budget constraints and her ability to produce. According to Grossman (1972) education, cost of the service, income and age of the mother are considered important determinants of healthcare demand.

Empirical studies found socio-economic and demographic characteristic of a mother to influence maternal health care demand. Urban women have been observed to demand more maternal health care services than their counterparts in the rural areas. This is due to the advantage urban residents have regarding access to the health facility and various health promotion programs. Previous studies have found utilization of maternal healthcare services to be affected by certain factors. Physical accessibility to health facilities is negatively related to utilization of these services.

CHAPTER THREE

METHODOLOGY

3.0 Introduction

Steered by the literature reviewed in Chapter Two, this chapter outlines the method and procedures employed to find the determinants that influence the uptake of maternal healthcare, highlighting the impact of health insurance. The first sections present the analytical and empirical model. The chapter will also show the definition and justification of variables, estimation procedure, data sources and conclusion.

3.1 Analytical Framework

Empirical specification of the study is motivated by the healthcare utilisation model whose roots are in the utility maximisation[5]. A rational consumer aims allocate his/her income among competing needs with an aim of maximising utility. Borrowing from Mungai (2015) and Grossman (1972) mothers maximise their expected lifetime utility which is stated as follows:

$$U \quad U(C, X, H) \qquad \text{.....3.1}$$

Where U is the utility of the consumer (mother), C represent consumption goods which yield utility to a mother but does not have direct effect on her health; X is health related good or behaviour which directly affects the mother's health and finally H are health-status of the mother. Mother strives to maximise utility subject to budget constraint and health production function.

The amount of money an individual spends on medical healthcare (maternal healthcare) is constrained by individual wealth and income. Hence the budget constraint is specified as: -

$$CP_C \quad NP_N \quad MP_M \quad Y \qquad \text{.....3.2}$$

Where Y is exogenous income. P_M is the (out of pocket) price of maternal health services (M), P_N is the price of health-related goods and services (N) and finally P_C is the price of consumer goods (C). On the other hand, the production function is given as: -

$$H \quad f(M, N, S) \qquad \text{.....3.3}$$

Where maternal health services (M), (N) is the market purchased goods and (S) is sociodemographic and socioeconomic characteristics of a mother such as age, income, place of residence and birth order.

[5] For more insight on the application of utility maximisation theory of healthcare uptake see Kimani et al. (2016) and Chekporir (2014

Maximisation of (3.1) subject to budget constraint (3.2) and production function (3.3) can be presented in a langragean function as: -

$$L \quad U(C, X, f(M, N, S)) \quad (Y \quad CP_C \quad NP_N \quad MP_M) \text{.....3.4}$$

From equation (3.1) first order conditions can be derived and hence from the first order conditions we have the reduced form demand functions as: -

$$M \quad M(P_C, P_N, P_M, Y, S) \text{.....3.5}$$

$$X \quad X(P_C, P_N, P_M, Y, S) \text{.....3.6}$$

$$C \quad C(P_C, P_N, P_M, Y, S) \text{.....3.7}$$

From equation (3.5) the demand(uptake) for maternal healthcare comprised of all prices of medical goods and consumption goods which is consistent with demand theory (Kimani, Mugo, & Kioko, 2016). It is worth noting that M is the optimal demand for maternal health given number of visits. Equation (3.5) is the main equation for estimation.

3.2 Justification of the Theoretical Model

Maternal healthcare is a package consisting of four things namely post-delivery, antenatal care, uptake of Tetanus Taxoid(TT) and birth order. Each and every variable will be tested its influence on each and every component of maternal healthcare. Since the components of maternal healthcare are binary[6] in nature there is need for binary choice models namely Linear Probability Model(LPM), Probit and Logit.

Linear Probability Models denote a regression model whose dependant variable is binary in nature. This study is avoiding using LPM because it violets several assumptions of linear regression model and as it associated with many challenges which includes no guarantee of positive probability however with large samples there low probability that it will be so, non-normality of error term, greatest limitation of LPM concerns the formulation itself that the conditional expectations are interpreted as the probability of an event happening, in many cases it can lie beyond the limits (0, 1) (Maddala, 1983). Furthermore, with LPM it is not possible to calculate marginal effects.

Having disregarded LPM there is need for a choice between Logit and Probit. However, the choice between Probit and Logit is a matter of preferences, empirically one can either choose Probit or Logit[7] since the results tend to be very similar because cumulative normal distribution and logistic distribution are close to each other except for the tails (Logit has

[6] It can assume only two values, which for convenience and without loss of generality, we denote by 0 and 1

[7] Except the sample is large so that we have enough observation at the tails

more weight on the tails). Unlike LPM, Logit and Probit doesn't have constant marginal effects.

3.2.0 Logit Model

This study will use logit model as an estimation technique since it is by far the easiest and widely used discrete choice model. Logit model is an ideal rather than a restriction Its popularity is due to the fact that the formula for the choice probabilities takes a closed form and is readily interpretable (Train, 2002). Like the Probit and unlike the LPM, the formulation of the model ensures that the predicted probabilities lie between 0 and 1. The model can be presented in a functional form as:

$$\ln\left(\frac{P_i}{1-P_i}\right) = \sum_{k=0}^{k=n} B_k X_{ik} \quad \ldots\ldots 3.8$$

Where P_i is the probability of seeking maternal health care services given a vector of explanatory variables X_i. . the ideal and standard procedure of estimating a logit model is Maximum Likelihood Estimation(MLE) technique. Even when the independent variables are not normal Logit MLE will be consistent and therefore robust.

3.3 Empirical Model

To reveal the impact of health insurance on the uptake of maternal healthcare services in Zimbabwe a model was borrowed from theory as well as from Muchabaiwa et al (2013) , Mluleki et al (2015) and Mungai (2015). Antenatal visits measured the uptake of maternal healthcare. The logit model is modified to:

$$P(Uptake = 1/X) = B_0 + B_1 age_i + B_2 wq_i + B_3 med_i + B_4 r\lg n_i + B_5 reg_i + B_6 nlchild_i + B_7 mst_i + B_8 Hsize_i + B_9 res_i + B_{10} hins + B_{11} es_i + u_i$$

Where ? (?????? =1/X) is the probability of the uptake of maternal healthcare[8] given a vector of socioeconomic and demographic factors

$\boldsymbol{B_0}$ is the intercept of the function, ***age*** is the maternal age at birth, ***agesqd*** is the maternal age squared at birth, ***wq*** is wealth quantile, ***rlgn*** is religion, ***reg*** is region ***nlchild*** is number of living children, ***mars*** is marital status, ***hsize*** is household size, ***info*** is access to information,, ***res*** is area of residence, ***hins*** is health insurance, *es* is employment status of a mother and $\boldsymbol{u_i}$ is an error term.

[8] Which consist of antenatal care, uptake of Tetanus Toxoid (TT) injections, place of delivery and postnatal care

3.4 Definition and justification of variables

3.4.0 Dependent variable

Antenatal Care (*antenvits*)

The World Health Organization[9] defines antenatal care (ANC) as "care before birth", and includes education, counselling, screening and treatment to monitor and to promote the wellbeing of the mother and baby. In words ANC is healthcare and education during pregnancy. The prime aim of ANC is to maintain good health to pregnant women. The World Health Organization recommends at least four antenatal clinic attendance during the period of pregnancy whiles Obstetricians generally recommends monthly antenatal visits up to the seventh month and every two weeks to the eight month and every week after the eight month.ANC visits is recommended in the first trimester of pregnancy. The variable was coded as 1 if the women received at least 4 antenatal visists according to the ZDHS 2015 survey and 0 for visits less than 4.

3.4.1 Independent variables

Health Insurance (hins)

A dichotomous variable (Yes or No) indicating the status of the respondent (women). Yes, was coded as 1 and 0 for No. Health insurance increase the uptake of maternal healthcare services (Bosomprah, Ragno, Gros, &Banskota, 2015). Therefore, women who are insured are likely to use more of maternal healthcare package than the insured thereby improving the maternal outcomes.

Maternal age at birth (*age)*

A continuous variable measured by the age of the respondent at the time of birth. According to Grossman (1972) the demand for health capital tend to fall will age[10].From theory, ageing leads to rising depreciation in health stock which implies increasing marginal cost of health investment empirical studies on age presents mixed evidence. It is argued that older mothers demand more delivery and postnatal care which is because of complications that older mothers might have gone through in earlier births. Age can be positively related to the uptake of maternal healthcare because according to Grossman (1972) there is a positive relationship between age of a person and the rate of depreciation of health, hence it can be deduced that aged people use more healthcare services than the younger ones (Arthur, 2012; Chepkorir,

[9] WHO: The World Health Report 2000, Health systems: improving performance.
Geneva: World Health Organisation; 2000

[10] See Chapter Two

2014; Muchabaiwa et al., 2012). However, age can have a negative impact of utilisation of maternal healthcare since it captures past maternal experience especially where there were no complications in previous pregnancies and child health (Sarma and Rempel, 2007). Hence it difficult to know the effect of age on maternal healthcare service utilisation pr ior investigation

Wealth Quantile*(wq)*

Is a dummy variable measured as poorest, poorer, middle, rich and richest. Wealth represents the economic status of a family. Is expected that, there is a positive relationship between wealth and the use of antenatal care, since a wealthy woman is likely to meet up with expenses associated with the use of antenatal care (Arthur, 2012). It is well recognized that increased income positively affects utilization of healthcare services (I T Elo, 1992; Liu et al., 2011).The costs of seeking healthcare may include costs for transportation, user fees (official and/or unofficial), medications and other supplies. Women from poor families or those with limited financial resources may have difficulty paying for such costs and are likely to be deterred from using MHCS (Gabrysh& Campbell, 2009).

Maternal education (med)

High literacy level among women has been noted as an important factor influencing the uptake of maternal healthcare (Nzioki et al., 2015; Ononokpono & Odimegwu, 2014; Owino, 2000).This is a continuous variable representing the number of years a woman spends at school. According to Arthur (2012) "Education makes an individual more well-organized in utilising health care services and may make a mother have a more health conscious behaviour". It is argued that education augments women's autonomy resulting in women developing greater confidence and capabilities to make decisions regarding their own health (Kistiana, 2009). Furthermore, low levels of education affects the ability of a women to comprehend information about maternal healthcare services and also affects the ability to make informed decisions regarding maternal healthcare (Chama-chiliba & Koch, 2014). The study expects a positive relationship between the uptake of maternal healthcare and education attainment.

Region (rgn) and Place of Residence (res)

Place of residence either rural or urban and region of residence may also influence the uptake of maternal health care services. Studies indicate that religion is negatively associated with the use of some maternal health care services but shows no significant difference for others Regional and place of residence dummies save as crude proxies for service availability in different provinces. Provinces with more health facilities are likely to have high usage of

maternal health care services during delivery compared to provinces with few health facilities. Looking at Zimbabwe's ten provinces, pregnant women from provinces that have more health care facilities as well as good infrastructure are more likely to use health care services due to easy accessibility of maternal services. Results from the regional dummies enable us to see the extent of utilisation inequalities across the country. This is important to policy makers as it enables them to come up with policies that can reduce the inequalities through redistribution of health-care resources.

Religion*(rlgn)*

It is a common belief that religion and culture shape the way individual perceive their own heath and health services available to them. According to MoHCW (2010), religion and socio-cultural beliefs play a role in influencing health care seeking behaviour in rural areas of Zimbabwe. Zimbabwe is made up of many religious groups and the apostolic faith sector religion is one well known group that does not allow its members to seek medical care, hence, we expect its members to use maternal health care services less frequently. Women from religious groups that encourage pregnant women to seek care at health institutions are more likely to utilise health care services during delivery compared to their counterparts who are not allowed. The variable was characterised at ;0 for traditional; 1 for roman catholic;2 for protestant; 3 for Pentecostal; 4 for apostolic sect; 5 for other Christians; 6 for Muslims; 7 for none and 8 for any other religion.

Number of living children (nlchild)

This is a dummy variable representing the number of living children a woman has before last birth. Number of living children of an expectant mother proxies her experience on maternal healthcare services. According to Overbosch et al (2004), "Pregnancy is regarded as a natural process and women with some knowledge on maternity might consider antenatal care less essential". The more children a woman has the less likely she is to use maternal health care services, *ceteris paribus* This result is driven by the experience the woman now has with childbirth as she now knows whether she can have complications or not. Due to uncertainty and the perception of risk associated with first pregnancies, the probability of women seeking medical attention on the first pregnancy is higher than on subsequent ones. Empirically, there is a negative relationship between the use of maternal healthcare services and the number of children a mother has (Mekonnen & Mekonnen, 2002; Muchabaiwa et al., 2012; Mungai, 2015b). Therefore, we expect the probability of utilisation of maternal health care services to

decline with increase in number of children a woman has. This study will use number of living children as a continuous variable.

Household Size (hsize)

This is a continuous variable measured by the number of members in the household. A priori expectation is that household size is negatively related to demand for health care services. Individuals from large households are less likely to seek health care services from health facilities (Lawson, 2004). This is because the larger the household size is, while household income is constant, the lower per capita income. In households with more members, income may not be adequate to meet the direct and indirect costs of accessing health care services. Hence, there are high chances of seeking self-treatment in households with more members as compared to households with fewer members.

Employment Status (es)

This is a dummy variable 1 for women employed and 0 for unemployed women. The employment status of a women influences the uptake of maternal healthcare services. Generally, women who are employed have autonomy and are financially stable to finance their services. However, in many setting women do not control the money they earn (Furuta and Salway, 2006). There are mixed results in the association between employment status and uptake of maternal healthcare services.

Marital Status (mst)

Women decision making power with regard to reproduction and sexuality is limited (WHO, 1998). This is a dichotomous variable coded zero if women who are single[11] and one if otherwise. According to WHO (2003), young married women lack independence in decision make and at most times they seek permission from their husbands and mother in-laws regardless of whether the issue is beneficial or not. Married women have less access to maternal healthcare services than the single (Nyaki, 2014).

3.5 Data Sources and Collection

The study used secondary data from ZDHS 2015-2016 which was conducted by the Zimbabwe National Statistics Agency (ZIMSTAT) in collaboration with the Ministry of Health and Child Care (MoCHW) and the United Nations Population Fund (UNFPA). The 2015 ZDHS is the sixth such survey to be conducted in Zimbabwe as a follow-up to the 1988, 1994, 1999, 2005-06, and 2010-11 surveys and provides basic demographic and health indicators. Personal digital assistants (PDAs) was used rather than paper questionnaires for

[11] Never in a union, widowed, divorced, no longer living together/ separated

recording responses (Tsawe et al., 2015)during interviews. With permission granted, the data was obtained from measure DHS website. The ZDHS 2015-16 presents the major findings of a nationally representative survey with a sample of more than 11,000 households among others there is maternal health care.The demographic and Health Surveys are a source of reliable health data pertaining to maternal, child health, and general health of households surveyed.

3.6 Study Participants

The 2015 ZDHS achieved a higher response rates than the 2010-11 ZDHS for households, women, and men. A total number of 9 955 eligible women of age 15 – 49 were interviewed. The women who were eligible are those who had a live birth five years prior the interview. This large sample gives an advantage of low variance associated with estimating using large samples

3.7 Data Analysis

Data was analysed using STATA IC version 1 4

3.7.0 Estimation Procedure

This study will run two types of analyses univariate and multivariate. Univariate comprise of the frequency distribution of the four variables (Antenatal care, postnatal care, tetanus taxoid and place of delivery) central to this study. Furthermore, multivariate analysis was conducted using logistic regression model.

3.7.1 Diagnostic Tests

After estimation of the model, post estimation diagnostic tests are done before interpreting the estimated results since interpretation of results only become econometrically meaningful if the model passes post estimation diagnostic tests. Therefore, the study carried out the following tests:

Multicollinearity Test

This is a test for correlation between explanatory variables, that is, to check if they are not highly correlated. This study uses the pair wise correlation matrix approach to test for multicollinearity. Using the pair wise correlation matrix, the absolute correlation coefficient between two independent variables should not exceed 0.8, otherwise multicollinearity would be a serious problem (Gujarati, 2004). In the case of such multicollinearity, one of the highly-correlated variables should be dropped.

Specification Test

This is a test for appropriateness of the functional form of the model, omitted variables, irrelevant variable and measurement error. In the standard regression framework the two stochastic specifications are that of a zero conditional expectation of an error term and an error term that has a spherical covariance matrix (Hausman, 2017). Overall goodness of fit of the model was conducted using Hosmer-Lemeshow goodness of fit test and the adequacy of the model was tested using Linktest.

3.8 Conclusion

This chapter has described the empirical strategy of examining the impact of health insurance influencing the uptake of maternal health care. This includes analytical framework, estimation procedure, definition and justification of variables. Estimation procedures as well as diagnostic tests are embedded within this chapter. Chapter four shows the estimation, presentation and interpretation of the study findings,

CHAPTER FOUR

ESTIMATION, PRESENTATION AND INTERPRETATION OF RESULTS

4.0 Introduction

This chapter focuses on the estimation, presentation and interpretation of empirical results guided by the methodology outlined in chapter three. It comprehensively analyses the factors that influences the uptake of maternal healthcare in Zimbabwe. A number of variables have been identified which determine the low uptake of maternal healthcare. We then evaluate their relationship and the extent of their effects through binary logit model. Descriptive statistics are presented first then followed by the presentation of the econometric results. Stata IC 14 was used for estimation.

4.1 Descriptive Statistics

To assess the effects of the factors detailed in the previous chapter on the uptake of maternal health care we use four binary dependent variable namely: Antenatal visits,. A summary statistics of the continuous control variables is presented in **table 4.1**

Table 7: Demographic characteristics of continuous variables

Variables	Observations	Mean	Std.Dev.	Min	Max
Age	**20791**	**34.598**	**7.705**	**15**	**49**
Education	**20791**	**8.827**	**3.201**	**0**	**21**
Number of living children	**20791**	**3.496**	**1.755**	**0**	**12**
Household size	**20791**	**15.053**	**8.39**	**1**	**29**

Table 1 shows that out of 20791 women the average age of reproductive women is approximately 35 years. The average number of years spent at school is 9 years which is approximately O levels. Households have an average of 3 children with average household size of 15 people. From these results, it shows poor economic status which then influence the uptake of maternal healthcare service in Zimbabwe.

A univariate analysis (Table 2) shows the distribution of the categorical control variables through percentages. It comprises of the frequency distribution of the independent variables which are crucial to this study.

Table 8: Distribution of categorical control variables

Variable	Frequency	Percent
Wealth Quantile		
Poorest	4 215	20.27
Poorer	3 689	17.74
Middle	3 555	17.10
Richer	4 847	23.31
Richest	4 485	21.57
Place of Residence		
Urban	7 560	36.36
Rural	13 231	63.64
Marital Status		
Married	16 962	81.58
Not Married	3 829	18.42
Employment status		
Currently employed	9 912	47.67
Not currently employed	10 879	52.33
Religion		
Traditional	160	0.77
Roman Catholic	1 189	5.72
Protestant	2 891	13.91
Apostolic sect	9 535	45.86
Other Christians	1 163	5.59
Muslim	67	0.32
None	1 215	5.84
Insurance Cover		
No	18 635	89.63
Yes	2 156	10.37

Table 2 Distribution of categorical control variables *(Continued)*

Region		
Manicaland	2 370	11.40
Mashonaland Central	2 368	11.39
Mashonaland east	2 030	9.76
Mashonaland west	2 437	11.72
Mashonaland north	1 873	9.01
Matebeleland south	1 603	7.71
Midlands	2 283	10.98
Masvingo	2 223	10.69
Harare	2 188	10.52
Bulawayo	1 416	6.81

The Table 2 shows a total number of 20 791 women was interviewed. Many women who were sampled were from Mashonaland west (11.72%) (which is mostly rural) than other provinces in Zimbabwe. About 81. 58% were married and 18.42 % were single. More than half of the women interviewed were not employed and almost 90% of the women are not covered by an insurance. Due to high levels of unemployment the level of the poor and poorest quantile is quite high. Furthermore, most women interviewed were from apostolic sect (45.86 %).

4.3 Normality Test

Shapiro Wilk was used to test the normality of variables. From the test two of the dependent variables (antenatal care visits and the uptake of Tetanus Taxoid injection) are normally distributed. The other two dependent variables (place of delivery and postnatal care) are not normally distributed. On the explanatory variables only place of residence and employment status are normally distributed their rest of the variables are not normally distributed since their p values are less than 0.05 which result to the rejection of the null hypothesis which states that residuals are normally distributed.

4.4 Correlation analysis and Multicollinearity check

Correlation analysis is carried out to detect any autocorrelation between dependent variables and independent variables. Such bivariate analysis is undertaken using Pearson correlation. It also shows the strength of association between the study variables. Further we can be able to

detect Multicollinearity by identifying those variables which are highly correlated and either retain them if they are significant to our study and if they are not highly correlated or drop them if they pose a severe Multicollinearity or correct them. Multicollinearity implies the existence of a linear relationship between two or more explanatory variables. Multicollinearity makes it difficult to differentiate the individual effects of the explanatory variables and regression estimators may be biased in that they tend to have large variances (Murray, 2006). Pearson correlation matrix show that correlation coefficients are less than 0.8, the limit or cut off correlation percentage commonly suggested by prior studies after which multicollinearity is likely to exist (see Gujarati, 2003). Appendix 1 shows those relationships.

A Pearson's correlation test was carried out for all the variables. Variables are correlated if the correlation statistic is more than 0.8 or less than -0.8. The results of the test showed that there was low correlation among explanatory variables. From the pairwise correlation matrix there is a positive correlation between antenatal care visits and age, wealth quantile, mothers educational level, employment status and marital status. However antenatal care visits were found to be negatively correlated to region, place of residence, household size and health insurance cover. Based on the pairwise correlation matrix there is no problem of multicollinearity. On the other hand, the uptake of tetanus Taxoid injection is negatively correlated to age, wealth quantile, region, marital status and number of living children however, positively correlated education, place of residence, household size, employment status and health insurance.

Based on the pairwise correlation matrix there is a negative correlation between place of delivery and age, place of resident, household size, insurance cover, marital status, number of living children however with a positive relationship with other explanatory variables. In consistent with place of delivery, postnatal care has a negative relation with place of residence, household size, marital status and number of living children. There is no problem of multicollinearity on all variables of the four models since the absolute values of the pairwise coefficient is all less than 0.8

4.5 Goodness of fit test and Model Adequacy

Hosmer-Lemeshow goodness of fit test was used to test for the overall goodness of fit of the model. The overall goodness of fit of the model is reflected by non-significant p-values. From the maternal healthcare models 0.6894, 0,8923, 0,9050 and 0.2052 are the p-values of postnatal care, place of delivery, Tetanus Taxoid and Antenatal care respectively which

makes the goodness of fit of all the models. Link test was used to test for model adequacy, good model adequacy is seen with an insignificant _HATSQ and a highly significant HAT. The maternal healthcare models depict model adequacy (see appendix)

4.6 Econometric Results

To explore the impact of health insuranceon the uptake of maternal healthcare services in Zimbabwe, the study considered socioeconomic and demographic factors that significantly influence the utilisation of maternal healthcare. In so doing, the study conducted four binary logistic regression to explore factors influencing the uptake of maternal healthcare services in Zimbabwe.

Table 9: Logistic regression (Odds Ratio = OR) of factors influencing the uptake of maternal and child healthcare services in Zimbabwe

	Panel 1
VARIABLES	**Antenatal Care**
	OR
	(Standard
	Error)
Age	1.056***
	(0.00887)
Wealth quantile	
Poorest	
Poorer	0.987
	(0.110)
Middle	1.324**
	(0.162)
Richer	1.067
	(0.159)
Richest	1.690***
	(0.323)
Education	1.010
	(0.0161)

Region	
Manicaland	
Mash Central	1.496***
	(0.224)
Mash East	1.108
	(0.173)
Mash West	1.282*
	(0.191)
Mash north	1.670***
	(0.285)
Mash south	1.227
	(0.200)
Midlands	0.755**
	(0.106)
Masvingo	1.086
	(0.163)
Harare	0.537***
	(0.0774)
Bulawayo	0.890
	(0.160)
Place of residence	
Urban	
Rural	1.063
	(0.148)
Household size	0.995
	(0.00413)
Employment status	
Unemployed	
Employed	1.083
	(0.0812)
Insurance Cover	
Covered	

Not covered	0.599***
	(0.101)
Marital status	
Not married	
Married	1.326***
	(0.125)
Living children	0.773***
	(0.0281)
Religion	
Traditional	
Roman Catholic	1.472
	(0.705)
Protestant	1.680
	(0.775)
Pentecostal	1.425
	(0.649)
Apostolic sect	1.177
	(0.531)
Other Christians	1.219
	(0.579)
Muslim	1.404
	(1.147)
None	1.114
	(0.524)
Other	1.056
	(1.086)

4.7 Antenatal Care

Table 3 presents the results of a binary logistic regression which essentially confirm the results of a bivariate analysis. Panel I of Table 4.3 shows the factors influencing the uptake of antenatal care. From these results age, middle wealth quantile, richest wealth quantile, Mashonaland central, Mashonaland north, Harare, insurance cover, marital status and number

of living children were found to be statistically significant with other variables such as religion and place of residence being insignificant

Age of the mother was found to have a positive relationship with the use of antenatal care. This is in tandem with the postulations of Grossman theory. With an odds ratio of 1.056 the respondent at a given number of year is 1.056 times more likely to have used Antenatal care than a respondent with few years. In other words, one year increase in years increases the odds of using antenatal care by 5.6%. These results are consistent with the results of (Arthur, 2012; Chama-chiliba & Koch, 2014).

In contrary to the hypothesis stated in chapter one, wealth quantile is significant in influencing the uptake of antenatal care. Wealth was found to be positively related to the uptake of antenatal care. Specifically, it shows that the odds of middle income women utilising antenatal care is 1. 324 times the odds of poor women seeking antenatal care same applies for rich women with 1.690 times the odds of poor women seeking antenatal care. This is inconsistent with the results of (Arthur, 2012; I T Elo, 1992).

As expected the odds of the women visiting antenatal care clinics who are not covered by an insurance is 0.599 times lower than the covered women visiting antenatal care clinics. In contrary to the expected results by Nyaki (2014), the odds of married women seeking antenatal care is 1.326 times the odds of a single women in seeking antenatal care. The probable explanation is that if someone is married the person will be involved in a shared decision pertaining marital status even if the wife doesn't want, the husband can influence. Furthermore, women residing in Mashonaland central, Mashonaland North, Mashonaland west are more likely to use antenatal care the women who reside in Manicaland whilst those who live in Harare are less likely to use antenatal care compared to Manicaland women.

The number of living children the respondent have is inversely related to the uptake of antenatal care. The relationship is significant at 1 % level of significant. With an odds ratio of 0.773 the respondent at a given number of living children is 0.773 times less likely to have used Antenatal care than a respondent with few children. In other words, one child increase in number of living children decreases the odds of using antenatal care by 2.27%. These findings corroborate those of Mungai (2015) and Mekennon and Mekennon (2002), who found that due to experience of a mother the uptake of antenatal care decline with an increase in the number of living children.

4.10 Conclusion

The chapter gave the estimation, presentation and analysis of results. The study found that socioeconomic and demographic factors such age of a women, wealth quantile, education, marital status, place of residence, number of living children and region of residence such as Harare, Masvingo, Bulawayo, Midland and Mashonaland (west, east, north and south) to be statistically significant in explaining the uptake of maternal health service. However, the significance of these factors varies with the components of maternal healthcare services which are antenatal care, postnatal care, tetanus Taxoid injection and choice of place of delivery. Religion was found to be statistically insignificant in explaining the uptake of maternal healthcare probably due to the intervention of the government to ensure that the apostolic sect uses the health facility. Despite the removal of user charges on maternal healthcare, wealth quantile is still a significant factor determining the uptake of maternal healthcare services in Zimbabwe.The proceeding Chapter will present summary and conclusion of the findings from the study, policy implications and recommendations.

CHAPTER FIVE

SUMMARY, CONCLUSIONS AND POLICY RECOMMENDATIONS

5.0 Introduction

This chapter presents summary of the study results investigating socioeconomic and demographic factors influencing usage of maternal health care services in Zimbabwe. It further makes comprehensive conclusions based on the established relationship on key indicators of maternal health care services in Zimbabwe and thereafter major policy interventions are made. Likewise, outlined in this chapter are suggested areas of further study.

5.1 Summary and Conclusions of the Study

The study was undertaken to explore the factors that influence the uptake of maternal healthcare services in Zimbabwe. The study aimed at investing whether wealth is still a significant variable in influencing the uptake of maternal health services since the removal of user charges on maternity. The study explored four main indicators of maternal health services namely antenatal care, postnatal care, tetanus Taxoid injection and choice of delivery. Hypotheses were tested at 1%, 5% and 10% significance level upon estimating the logit models on antenatal care, choice of delivery, uptake of tetanus Taxoid injection and postnatal care respectively. Other estimation issues such as multicollinearity was undertaken to validate the model. A national representative cross-sectional data [Zimbabwe Demographic Health Survey (ZDHS 2015)] was used were study variable were identified and cleaned. STATA version 13 was used for the estimations undertaken in this study

The study found out that age of a mother, middle wealth quantile, richest wealth quantile, insurance cover, marital status, number of living children and those who reside in Harare, Midlands and Mashonaland (Central, West and North) were significant factors influencing the uptake of antenatal care. The use of Tetanus Taxoid injection was significantly influenced by poorer wealth quantile, middle wealth quantile and region (Masvingo, Mashonaland East and South).

The study also show that the choice of place of delivery is significantly influenced by the age of a mother, all wealth quantiles, place of residence and employment status and region with the exception of those who reside on Mashonaland West. Finally, age, middle wealth quantile, richer wealth quantile, education and region were significantly influencing the use of postnatal care.

Analysis across the models indicate that age of a mother significantly influence three models antenatal care, choice of place of delivery and the uptake of postnatal care. Wealth quantile is significantly influencing all of the four models estimated in this study. It is therefore, necessary to consider factors that influence the uptake of maternal healthcare to achieve the vision 2020 of MoCHW.

5.2 Policy Implications and Recommendations

This study has underscored the critical importance of the relationship between socioeconomic development and positive health outcomes as measured by the utilization of maternal health care services. Hence, there are several insights that can be derived from the empirical findings of this study. On a broader perspective, to begin with, drivers in the health sector need to adopt a multi-sectoral approach if meaningful results are to be achieved in improving utilisation of MHS in rural areas and maternal health in general. Consultations with the Ministries of Local Government and Rural Development, Road and Transport, Education, Communication and information should be made on issues relating to rural health in general and maternal health in particular.

The Government of Zimbabwe, on 2011 introduced a policy of free maternity services in all public facilities with an objective of reducing maternal and prenatal. However, with this policy people`s wealth is still an important factor determining the uptake of maternal healthcare services. It is therefore, recommended that policies that improve people`s income such as income generating projects and vocational training so that women have skills to do businesses. efforts should be made toward empowering women through formal education to equip them with the necessary skills to earn and control income. Findings indicated that more than half of the women are not employed and the average of women are not educated. This would help increase the autonomy of women in seeking to issues regarding their own health as many respondents attributed the non-use of the services to financial reasons. Women could also be trained to take up other vocations to supplement their incomes as the general levels of incomes disclosed were low.

Attaining the WHO standards pertaining the utilisation of maternal healthcare would not be feasible in many rural setting due to increase in the number of living children. It is recommendate that the Government through the Ministry of Health and Child Welfare stress more on family planning. Furthermore, the government of Zimbabwe should introduce national health insurance so that there is improvement in the key component of maternal health service namely antenatal care.

5.3 Limitations of the Study and Suggestions of Areas for Further Study

This study has mainly considered the socioeconomic and demographic factors influencing the uptake of maternal healthcare to the Zimbabwe as a whole. It will be interesting to consider factors that affect rural residence and do a study comparing the factors which influence the use of maternal health care and child immunisation in South African Development Countries (SADC). The other interesting area is studying the impact of public health expenditures on the uptake of maternal healthcare

REFERENCES

AbouZahr, C. (1998). Maternal and prenatal health. In C. J. L. Murray, and A. D. Lopez (Eds.), Health dimensions of sex and reproduction. *Global Burden of Disease and Injury* Series, 3, 111–164

Addai, I. (2000). Determinants of use ofmaternal-child health services in rural Ghana. *Journal of Biosocial Science*, *32*(1), 1–15.

Akunga, D, Menya, D & Kabue, M. (2014). Determinants of Postnatal Care Use in Kenya. *African Population Studies Journal*, *28*(3). https://doi.org/http://dx.doi.org/10.11564/28-3-638

Ar, A. (2009). An Assessment of Factors Influencing Utilization of Antenatal Care Services In Atwima Nwabiagya District of Ashanti Region., (Who 2003), 1–72.

Arthur, E. (2012). Wealth and antenatal care use: Implications for maternal health care utilisation in Ghana. *Health Economics Review*, *2*(1), 1–8. https://doi.org/10.1186/2191-1991-2-14

Ayele, D. Z., Belayihun, B., Teji, K., & Ayana, D. A. (2014). Factors A ffecting Utilization of Maternal Health Care Services in Kombolcha District , Eastern Hararghe Zone , Oromia Regional State , Eastern Ethiopia, *2014*(2001).

Babalola, S. O. (2014). Factors associated with use of maternal health services in Haiti : a multilevel analysis. *Pan American Journal of Public Health*, *36*(1), 1–9.

Bhatia, S. (1989). Patterns and cause of neonatal and postneonatal mortality in rural Bangladesh. *Studies in Family Planning*, *20*(3), 136–146.

Bosomprah, S., Ragno, P. L., Gros, C., & Banskota, H. (2015). Health insurance and maternal, newborn services utilisation and under-five mortality. *Archives of Public Health = Archives Belges de Santé Publique*, *73*, 51. https://doi.org/10.1186/s13690-015-0101-0

Chama-chiliba, C. M., & Koch, S. F. (2014). Assessing regional variations in the effect of the removal of user fees on institutional deliveries in rural Zambia, (April), 29.

Chepkorir, J. (2014). Determinants of maternal healthcare utilization in rural Kenya.

Chiremba, T. (2013). A dissertation submitted in partial fulfilment of the requirements of the Master of Science Degree in Economics (Msc Econ) June 2013, (June).

Daniels, A. A., Ahenkan, A., & Poku, K. A. (2013). Factors Influencing the Utilisation of Maternal Health Services: The Perspective of Rural Women in Ghana. *Journal of Public Administration and Governance*, *3*(2), 121–141. https://doi.org/10.5296/jpag.v3i2.3468

De Allegri, M., Ridde, V., Louis, V. R., Sarker, M., Tiendreb??ogo, J., Y??, M., … Jahn, A.

(2011a). Determinants of utilisation of maternal care services after the reduction of user fees: A case study from rural Burkina Faso. *Health Policy*, *99*(3), 210–218. https://doi.org/10.1016/j.healthpol.2010.10.010

De Allegri, M., Ridde, V., Louis, V. R., Sarker, M., Tiendreb??ogo, J., Y??, M., … Jahn, A. (2011b). Determinants of utilisation of maternal care services after the reduction of user fees: A case study from rural Burkina Faso. *Health Policy*, *99*(3), 210–218. https://doi.org/10.1016/j.healthpol.2010.10.010

Elo, I. T. (1992). Utilization of maternal health-care services in Peru: the role of women's education. *Health Transition Review : The Cultural, Social, and Behavioural Determinants of Health*, *2*(1), 49–69. https://doi.org/10.2307/40652032

Elo, I. T. . (1992). Utilization of maternal health-care services in Peru : the role of women ' s education Author (s): Irma T . Elo Source : Health Transition Review , Published by : *National Center for Epidemiology and Population Health (NCEPH)*, *2*(1), 49–69. Retrieved from http://www.jstor.org/stable/40652032

Grossman, M. (1972). On the Concept of Health Capital and the Demand for Health. *Journal of Political Economy*, *80*(2), 223–255. https://doi.org/10.1086/259880

Hausman, A. J. A. (2017). EC ON ME R C A, *46*(6), 1251–1271.

Jat, T. R. (2014). *Maternal health and health care in Madhya Pradesh state of India : an exploration using a human rights lens*

Kalin, Y. (2011). Access to and Utilization of Health Services in Rural Bangladesh: A Gender Perspective. *Master's Thesis, Lund University, School of Economics and Management*, *1*(September), 1–62.

Katenga-kaunda, L. Z. (2010). UTILISATION OF SKILLED ATTENDANCE FOR MATERNAL HEALTH CARE, (June), 1–111.

Kausar, F., Griffiths, P., & Ma tthews, Z. (1999). Poverty and Maternal Health Care Utilisation in Maharashtra : Associated Influences on Infant Mortality and Morbidity. *Opportunities and Choices Working Paper*, *2*(29), 1–50.

Ke Xu, David B Evans, P. K., Juliet Nabyonga, Peter Ogwang Ogwal, A., & Aguilar, A. M. (2005). The Elimination of User Fees in Uganda: Impact on Utilization and Catastrophic Health Expenditures, 14.

Kiango, P. (2015). Factors affecting utilisation of maternal health care services among pregnant mothers: a case of bumbuli district council. *Mzumbe University*

Kimani, D. N., Mugo, M. G., & Kioko, U. M. (2016). An Econometric Analysis Of Health Care Utilization In Kenya, *12*(16), 443–462.

https://doi.org/10.19044/esj.2016.v12n16p456

Kusumayati, A., & Nakamura, Y. (2007). Inc reased Utilization of Maternal Health Services by Mothers Using the Maternal and Child Health Handbook in Indonesia. *Journal of International Health*, *22*(3), 143–151.

Liu, X., Zhou, X., Yan, H., & Wang, D. (2011). Use of maternal healthcare services in 10 provinces of rural western China. *International Journal of Gynecology and Obstetrics*, *114*(3), 260–264. https://doi.org/10.1016/j.ijgo.2011.04.005

Makuta, C. M., Of, M., & Health, P. (2009). DESCRIPTION OF THE UTILISATION OF MATERNAL AND CHILD HEALTH CARE SE RVICES IN BALAKA DISTRICT OF MALAWI by, (November).

Mekonnen, Y., & Mekonnen, A. (2002). Utilization of maternal health care services in Ethiopia. *Dhs*, 1–23. https://doi.org/10.1590/S1020-49892008000800001

Muchabaiwa, L., Mudavanhu, D., Mazambani, L., Chigusiwa, S., & Bindu, V. (2012). Determinants of Maternal Healthcare Utilization in Zimbabwe. *International Journal of Economic Sciences and Applied Research*, *5*(2), 145–162. Retrieved from http://search.ebscohost.com/login.aspx?direct=true&db=ecn&AN=1339390&site=ehost-live&scope=site

Mungai, S. (2015a). Determinants of Maternal Health Care Services in Kenya By, (November).

Mungai, S. (2015b). DETERMINANTS OF MATERNAL HEALTH CARE SERVICES IN KENYA BY, (November).

Muranda, E. (2013). FACTORS INFLUENCING WOMEN ' S PREFERENCE FOR HOME BIRTHS IN THE MUTARE DISTRICT , ZIMBABWE, (June).

Muriithi M. K. (2013). The Determinants of Health Seeking Behaviour in a Nairobi Slum, Kenya. *European Scientific*, *9*(8), 151–164.

Nyaki, D. (2014). Equity in utlisation of Maternal Healthcare Services in the Kumasi Metropolis.

Nzioki, J. M., Onyango, R. O., & Ombaka, J. H. (2015). Socio-Demographic Factors Influencing Maternal and Child Health Service Utilization in Mwingi; A Rural Semi - Arid District in Kenya. *American Journal of Public Health Research*, *3*(1), 21–30. https://doi.org/10.12691/ajphr-3-1-4

Olayinka, O. A., Achi, O. T., Amos, A. O., & Chiedu, E. M. (2014). Awareness and barriers to utilization of maternal health care services among reproductive women in Amassoma community , Bayelsa State, *6*(January), 10–15. https://doi.org/10.5897/IJNM2013.0108

Ononokpono, D. N., & Odimegwu, C. O. (2014). Determinants of Maternal Health Care Utilization in Nigeria: a multilevel approach. *The Pan African Medical Journal*, *17*(Supp 1), 2. https://doi.org/10.11694/pamj.supp.2014.17.1.3596

Oppong, B. (2014). *Social determinants and the role of maternal health care services for equity in maternal*

Overbosch, G. B., Nsowah-Nuamah, N. N. N., van den Boom, G. J. M., & Damnyag, L. (2004). Determinants of antenatal care use in Ghana. *Journal of African Economies*, *13*(2), 277–301. https://doi.org/10.1093/jae/ejh008

Owino, B. A. (2000). Factors influencing utilisation of maternal health care services in Nyanza province, Kenya. Retrieved from http://erepository.uonbi.ac.ke:8080/xmlui/handle/123456789/18753

Oyerinde, K. (2013). Can Antenatal Care Result in Significant Maternal Mortality Reduction in Developing Countries? *Journal of Community Medicine & Health Education*, *3*(1), 2–3. https://doi.org/10.4172/2161-0711.1000e116

Study, A. C., & Kumasi, O. F. (2013). the Impacts of Free Maternal Delivery Policy on Maternal, 1–125.

Train, K. (2002). Discrete Choice Methods with Simulation.

Tsawe, M., Moto, A., Netshivhera, T., Ralesego, L., Nyathi, C., & Susuman, A. S. (2015). Factors influencing the use of maternal healthcare services and childhood immunization in Swaziland. *International Journal for Equity in Health*, *14*(1), 32. https://doi.org/10.1186/s12939-015-0162-2

Unicef. (2011). Health Transition Fund: Supporting the National Health Strategy to improve access to quality health care in Zimbabwe, (December).

United Nations in Zimbabwe. (2013). Maternal Mortality in Zimbabwe: Evidence , Costs and Implications, 1–8. Retrieved from http://www.zw.one.un.org/sites/default/files/UN-ZW_IssuePaperSeries-1_MMR_June2013.pdf

WHO. (2014). WHO | Trends in maternal mortality: 1990 to 2010. *Who*, *2015*. https://doi.org//entity/reproductivehealth/publications/monitoring/9789241503631/en/index.html

WHO. (2015). Background Note on MDGs , Non iscrimination and.

Who, Unicef, Unfpa, W. B. G., & Division, and the U. N. P. (2014). Trends in maternal mortality 1990 to 2013. https://doi.org/10

APPENDICES

Appendix A: Normality test

```
. swilk antevits postn_care plce_dev ttxi age med nlchild hsize wq rgn res es hins mst
```

Shapiro-Wilk W test for normal data

Variable	Obs	W	V	z	Prob>z
antevits	4823	0.99931	1.807	1.550	0.06055
postn_care	4826	0.99829	4.499	3.942	0.00004
plce_dev	5960	0.99900	3.182	3.054	0.00113
ttxi	4749	0.99987	0.335	-2.864	0.99791
age	20791	0.98771	113.467	12.897	0.00000
med	20791	0.97775	205.428	14.515	0.00000
nlchild	20791	0.96837	292.075	15.474	0.00000
hsize	20791	0.96823	293.305	15.486	0.00000
wq	20791	0.99081	84.886	12.106	0.00000
rgn	20791	0.97767	206.136	14.524	0.00000
res	20791	0.99997	0.274	-3.525	0.99979
es	20791	0.99999	0.080	-6.880	1.00000
hins	20791	0.99931	6.328	5.029	0.00000
mst	20791	0.99973	2.534	2.535	0.00562

Appendix B: Correlation Matrices

```
. correlate antevits age med nlchild hsize wq rgn res es hins mst
(obs=4823)
```

	antevits	age	med	nlchild	hsize	wq	rgn	res	es	hins	mst
antevits	1.0000										
age	0.0458	1.0000									
med	0.0847	0.0171	1.0000								
nlchild	-0.0612	0.7293	-0.2362	1.0000							
hsize	-0.0176	-0.0075	0.0222	-0.0054	1.0000						
wq	0.0836	0.0363	0.5226	-0.1955	-0.0096	1.0000					
rgn	-0.0393	-0.0060	0.2201	-0.0841	0.0177	0.2745	1.0000				
res	-0.0571	-0.0210	-0.4305	0.1725	0.0074	-0.7768	-0.2946	1.0000			
es	0.0401	0.1551	0.1788	0.0467	0.0007	0.2264	0.0356	-0.1734	1.0000		
hins	-0.0998	-0.1190	-0.4148	0.0696	-0.0227	-0.3558	-0.1079	0.2996	-0.1785	1.0000	
mst	0.0314	0.1544	-0.0016	0.1798	-0.0013	-0.0446	-0.0769	0.0313	-0.0528	-0.0672	1.0000

```
. correlate ttxi age med nlchild hsize wq rgn res es hins mst
(obs=4749)
```

	ttxi	age	med	nlchild	hsize	wq	rgn	res	es	hins	mst
ttxi	1.0000										
age	-0.0411	1.0000									
med	0.0013	0.0128	1.0000								
nlchild	-0.0651	0.7309	-0.2386	1.0000							
hsize	0.0015	-0.0046	0.0225	-0.0023	1.0000						
wq	-0.0297	0.0333	0.5177	-0.1951	-0.0074	1.0000					
rgn	-0.0694	-0.0065	0.2192	-0.0823	0.0164	0.2730	1.0000				
res	0.0522	-0.0197	-0.4269	0.1710	0.0039	-0.7755	-0.2941	1.0000			
es	0.0009	0.1535	0.1780	0.0432	-0.0002	0.2260	0.0369	-0.1732	1.0000		
hins	0.0176	-0.1152	-0.4076	0.0713	-0.0226	-0.3521	-0.1075	0.2978	-0.1760	1.0000	
mst	-0.0148	0.1546	-0.0016	0.1801	0.0001	-0.0444	-0.0759	0.0331	-0.0508	-0.0677	1.0000

```
. correlate plce_dev age med nlchild hsize wq rgn res es hins mst
(obs=5960)
```

	plce_dev	age	med	nlchild	hsize	wq	rgn	res	es	hins	mst
plce_dev	1.0000										
age	-0.0386	1.0000									
med	0.2814	0.0323	1.0000								
nlchild	-0.1797	0.7094	-0.2217	1.0000							
hsize	-0.0046	-0.0087	0.0227	-0.0034	1.0000						
wq	0.3029	0.0450	0.5166	-0.1889	-0.0058	1.0000					
rgn	0.1503	0.0050	0.2207	-0.0723	0.0064	0.2689	1.0000				
res	-0.2539	-0.0286	-0.4292	0.1644	0.0096	-0.7735	-0.2863	1.0000			
es	0.0251	0.1541	0.1761	0.0392	-0.0049	0.2286	0.0396	-0.1733	1.0000		
hins	-0.1321	-0.1248	-0.4082	0.0678	-0.0203	-0.3612	-0.1094	0.3027	-0.1806	1.0000	
mst	-0.0079	0.1432	0.0029	0.1769	0.0022	-0.0446	-0.0661	0.0355	-0.0550	-0.0590	1.0000

```
. correlate postn_care age med nlchild hsize wq rgn res es hins mst
(obs=4826)
```

	postn_~e	age	med	nlchild	hsize	wq	rgn	res	es	hins	mst
postn_care	1.0000										
age	0.0187	1.0000									
med	0.1059	0.0169	1.0000								
nlchild	-0.0319	0.7294	-0.2374	1.0000							
hsize	-0.0058	-0.0065	0.0210	-0.0035	1.0000						
wq	0.0909	0.0377	0.5213	-0.1936	-0.0082	1.0000					
rgn	0.0381	-0.0063	0.2202	-0.0851	0.0170	0.2731	1.0000				
res	-0.0580	-0.0227	-0.4289	0.1700	0.0061	-0.7762	-0.2927	1.0000			
es	0.0382	0.1539	0.1789	0.0454	-0.0005	0.2250	0.0363	-0.1718	1.0000		
hins	-0.0600	-0.1201	-0.4152	0.0692	-0.0238	-0.3556	-0.1065	0.2999	-0.1777	1.0000	
mst	0.0087	0.1547	-0.0028	0.1812	-0.0023	-0.0444	-0.0770	0.0316	-0.0521	-0.0672	1.0000

Appendix C: Model specification and adequacy test

```
. estat gof, table group(10)
```

Logistic model for antevits, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.6407	264	282.5	219	200.5	483
2	0.6933	345	322.7	137	159.3	482
3	0.7232	333	341.7	149	140.3	482
4	0.7481	364	355.5	119	127.5	483
5	0.7689	362	365.7	120	116.3	482
6	0.7908	382	376.1	100	105.9	482
7	0.8139	383	387.5	100	95.5	483
8	0.8418	399	398.8	83	83.2	482
9	0.8814	418	414.2	64	67.8	482
10	0.9742	436	441.2	46	40.8	482

```
      number of observations =      4823
            number of groups =        10
  Hosmer-Lemeshow chi2(8) =        10.94
                  Prob > chi2 =         0.2052
```

```
. linktest

Iteration 0:   log likelihood = -2633.9652
Iteration 1:   log likelihood = -2520.0241
Iteration 2:   log likelihood = -2515.0325
Iteration 3:   log likelihood = -2514.9975
Iteration 4:   log likelihood = -2514.9975

Logistic regression                                     Number of obs   =       4823
                                                        LR chi2(2)      =     237.94
                                                        Prob > chi2     =     0.0000
Log likelihood = -2514.9975                             Pseudo R2       =     0.0452
```

antevits	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	1.23731	.2090695	5.92	0.000	.8275411	1.647078
_hatsq	-.0977128	.0806186	-1.21	0.225	-.2557224	.0602968
_cons	-.1178142	.1291742	-0.91	0.362	-.370991	.1353626

```
. estat gof, table group(10)
```

Logistic model for plce_dev, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.6033	298	291.6	298	304.4	596
2	0.6923	384	389.0	212	207.0	596
3	0.7644	425	436.4	173	161.6	598
4	0.8199	470	471.5	124	122.5	594
5	0.8651	498	501.9	98	94.1	596
6	0.9018	530	526.9	66	69.1	596
7	0.9331	553	547.1	43	48.9	596
8	0.9561	567	563.4	29	32.6	596
9	0.9732	578	575.0	18	21.0	596
10	0.9977	586	586.3	10	9.7	596

```
      number of observations =      5960
            number of groups =        10
    Hosmer-Lemeshow chi2(8) =      3.59
                Prob > chi2 =      0.8923
```

```
. linktest

Iteration 0:   log likelihood = -2806.7739
Iteration 1:   log likelihood = -2412.7989
Iteration 2:   log likelihood = -2347.6611
Iteration 3:   log likelihood = -2341.3746
Iteration 4:   log likelihood =   -2341.32
Iteration 5:   log likelihood =   -2341.32

Logistic regression                             Number of obs   =       5960
                                                LR chi2(2)      =     930.91
                                                Prob > chi2     =     0.0000
Log likelihood =   -2341.32                     Pseudo R2       =     0.1658
```

plce_dev	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	.8541468	.08728	9.79	0.000	.683081	1.025213
_hatsq	.052605	.0287843	1.83	0.068	-.0038111	.1090212
_cons	.0524341	.064949	0.81	0.419	-.0748636	.1797319

```
. estat gof, table group(10)
```

Logistic model for postn_care, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.7585	345	336.8	138	146.2	483
2	0.7950	367	375.8	116	107.2	483
3	0.8237	392	390.0	90	92.0	482
4	0.8495	405	404.6	78	78.4	483
5	0.8677	409	414.0	73	68.0	482
6	0.8827	420	422.8	63	60.2	483
7	0.8948	426	429.5	57	53.5	483
8	0.9087	446	434.5	36	47.5	482
9	0.9263	442	443.3	41	39.7	483
10	0.9720	452	452.8	30	29.2	482

```
      number of observations =      4826
            number of groups =        10
  Hosmer-Lemeshow chi2(8) =         5.62
                  Prob > chi2 =         0.6894
```

```
. linktest

Iteration 0:   log likelihood = -2036.6954
Iteration 1:   log likelihood = -1954.2772
Iteration 2:   log likelihood = -1945.4766
Iteration 3:   log likelihood = -1945.4244
Iteration 4:   log likelihood = -1945.4244

Logistic regression                             Number of obs   =       4826
                                                LR chi2(2)      =     182.54
                                                Prob > chi2     =     0.0000
Log likelihood = -1945.4244                     Pseudo R2       =     0.0448
```

postn_care	Coef.	Std. Err.	z	P>|z|	[95% Conf.	Interval]
_hat	.7454376	.3581692	2.08	0.037	.0434389	1.447436
_hatsq	.0785903	.1082315	0.73	0.468	-.1335395	.2907202
_cons	.1831967	.2840939	0.64	0.519	-.3736172	.7400106

```
. estat gof, table group(10)

Logistic model for ttxi, goodness-of-fit test

(Table collapsed on quantiles of estimated probabilities)
```

Group	Prob	Obs_1	Exp_1	Obs_0	Exp_0	Total
1	0.2952	118	124.4	357	350.6	475
2	0.3384	148	150.8	327	324.2	475
3	0.3717	176	169.0	299	306.0	475
4	0.4003	189	183.9	286	291.1	475
5	0.4272	187	196.2	288	278.8	475
6	0.4488	209	208.1	266	266.9	475
7	0.4701	221	217.8	254	257.2	475
8	0.4923	227	228.3	248	246.7	475
9	0.5203	251	240.4	224	234.6	475
10	0.6339	250	257.1	224	216.9	474

```
      number of observations =      4749
            number of groups =        10
  Hosmer-Lemeshow chi2(8) =         3.42
                  Prob > chi2 =     0.9050
```

Appendix D: Regression Results

Logistic regression

Number of obs	4823
LR chi2(21)	236.50
Prob > chi2	0.0000
Pseudo R2	0.0449

Log likelihood = -2515.7142

antevits	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	1.057222	.008857	6.64	0.000	1.040005	1.074725
_Iwq_1	.9978789	.1104611	-0.02	0.985	.8032547	1.239659
_Iwq_2	1.353811	.164784	2.49	0.013	1.066475	1.718561
_Iwq_3	1.103011	.1632701	0.66	0.508	.8252455	1.474268
_Iwq_4	1.785636	.3393765	3.05	0.002	1.230309	2.591622
med	1.019226	.015986	1.21	0.225	.9883703	1.051044
_Irgn_1	1.471619	.2199177	2.59	0.010	1.097975	1.972415
_Irgn_2	1.101342	.1711344	0.62	0.534	.8121882	1.493441
_Irgn_3	1.308679	.1937221	1.82	0.069	.9791089	1.749184
_Irgn_4	1.708717	.2856314	3.20	0.001	1.231351	2.371145
_Irgn_5	1.226083	.1976649	1.26	0.206	.8939062	1.681696
_Irgn_6	.7863259	.1089019	-1.74	0.083	.5993986	1.031548
_Irgn_7	1.099953	.1646502	0.64	0.524	.8202747	1.47499
_Irgn_8	.546475	.0781076	-4.23	0.000	.4129602	.7231567
_Irgn_9	.8704004	.1547084	-0.78	0.435	.6143603	1.233147
_Ires_1	1.051149	.1453885	0.36	0.718	.8015516	1.37847
hsize	.9950073	.0041174	-1.21	0.226	.98697	1.00311
_Ies_1	1.079232	.0806731	1.02	0.308	.9321529	1.249518
_Ihins_1	.5781613	.0973163	-3.26	0.001	.4156947	.8041248
_Imst_1	1.306269	.1230443	2.84	0.005	1.086059	1.571129
nlchild	.7678312	.0278955	-7.27	0.000	.7150582	.8244989
_cons	1.229637	.4352654	0.58	0.559	.6144258	2.460844

Logistic regression

Number of obs	4749
LR chi2(21)	140.01
Prob > chi2	0.0000
Log likelihood = -3154.5572	
Pseudo R2	0.0217

ttxi	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	1.009588	.0069789	1.38	0.167	.9960014	1.023359
_Iwq_1	1.269471	.1261129	2.40	0.016	1.04487	1.542353
_Iwq_2	1.217825	.1271351	1.89	0.059	.9924841	1.494329
_Iwq_3	1.016161	.1311666	0.12	0.901	.7890215	1.308688
_Iwq_4	1.200926	.1942023	1.13	0.258	.874718	1.648787
med	1.014205	.0134756	1.06	0.288	.9881345	1.040964
_Irgn_1	1.707722	.2128162	4.29	0.000	1.337644	2.180188
_Irgn_2	1.428307	.1908614	2.67	0.008	1.099202	1.855947
_Irgn_3	1.118519	.1415643	0.88	0.376	.872794	1.433425
_Irgn_4	1.359987	.1860042	2.25	0.025	1.0402	1.778087
_Irgn_5	1.519596	.2072787	3.07	0.002	1.163111	1.985342
_Irgn_6	1.176094	.1477261	1.29	0.197	.9194434	1.504386
_Irgn_7	1.425287	.1841539	2.74	0.006	1.106428	1.836038
_Irgn_8	.7598288	.1003911	-2.08	0.038	.5864786	.9844174
_Irgn_9	.583638	.0920307	-3.41	0.001	.4284718	.7949959
_Ires_1	1.059997	.1270296	0.49	0.627	.8381024	1.34064
hsize	1.000346	.0035627	0.10	0.923	.9933871	1.007353
_Ies_1	1.059076	.0680349	0.89	0.372	.9337829	1.20118
_Ihins_1	1.184597	.1408525	1.42	0.154	.9383392	1.495482
_Imst_1	.9898347	.0821274	-0.12	0.902	.8412745	1.164629
nlchild	.8755393	.0281396	-4.14	0.000	.8220879	.9324661
_cons	.4127278	.1210049	-3.02	0.003	.2323302	.733199

Logistic regression

Number of obs	= 5960
LR chi2(21)	= 927.47
Prob > chi2	= 0.0000
Log likelihood = -2343.0388	Pseudo R2 = 0.1652

plce_dev	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	1.029702	.0088288	3.41	0.001	1.012543	1.047153
_Iwq_1	1.408711	.1393819	3.46	0.001	1.160384	1.710182
_Iwq_2	1.895631	.2114459	5.73	0.000	1.523378	2.358849
_Iwq_3	2.862717	.4715442	6.39	0.000	2.072856	3.953553
_Iwq_4	4.309504	1.070739	5.88	0.000	2.648121	7.013209
med	1.158539	.0183954	9.27	0.000	1.12304	1.19516
_Irgn_1	1.505574	.2043813	3.01	0.003	1.153856	1.964502
_Irgn_2	1.339581	.2019034	1.94	0.052	.996953	1.799961
_Irgn_3	.8682252	.1138443	-1.08	0.281	.6714602	1.12265
_Irgn_4	3.149579	.535057	6.75	0.000	2.257609	4.393963
_Irgn_5	2.382658	.4295332	4.82	0.000	1.673445	3.392438
_Irgn_6	1.815722	.2596503	4.17	0.000	1.371913	2.403102
_Irgn_7	1.834364	.2729395	4.08	0.000	1.370356	2.455489
_Irgn_8	1.370632	.2341932	1.85	0.065	.980574	1.915851
_Irgn_9	1.697782	.4597067	1.95	0.051	.9986259	2.886429
_Ires_1	.6423666	.1163281	-2.44	0.015	.4504393	.9160719
hsize	.9979475	.0043599	-0.47	0.638	.9894387	1.006529
_Ies_1	.8352532	.065891	-2.28	0.022	.7155979	.974916
_Ihins_1	.5442583	.1594659	-2.08	0.038	.3064825	.9665056
_Imst_1	1.327808	.1434132	2.63	0.009	1.074482	1.64086
nlchild	.7748291	.0268601	-7.36	0.000	.7239329	.8293035
_cons	.9651094	.4369294	-0.08	0.937	.3973892	2.343889

Logistic regression — Number of obs = 4826
LR chi2(21) = 182.01
Prob > chi2 = 0.0000
Log likelihood = -1945.6917 — Pseudo R2 = 0.0447

postn_care	Odds Ratio	Std. Err.	z	P>|z|	[95% Conf.	Interval]
age	1.018806	.0097601	1.94	0.052	.9998546	1.038116
_Iwq_1	1.011901	.1272464	0.09	0.925	.7908597	1.294722
_Iwq_2	1.367566	.1939135	2.21	0.027	1.035744	1.805694
_Iwq_3	1.564453	.2950553	2.37	0.018	1.081001	2.264117
_Iwq_4	1.526463	.357459	1.81	0.071	.9646201	2.41555
med	1.076984	.0191465	4.17	0.000	1.040104	1.115172
_Irgn_1	3.901754	.6922523	7.67	0.000	2.755745	5.524344
_Irgn_2	3.375735	.6504928	6.31	0.000	2.3139	4.924839
_Irgn_3	1.929757	.2959512	4.29	0.000	1.428764	2.60642
_Irgn_4	2.108472	.3580577	4.39	0.000	1.511535	2.941154
_Irgn_5	2.280257	.4086331	4.60	0.000	1.604887	3.239838
_Irgn_6	3.259052	.561067	6.86	0.000	2.325688	4.567002
_Irgn_7	1.641649	.2532045	3.21	0.001	1.213369	2.221099
_Irgn_8	2.276427	.3992484	4.69	0.000	1.614235	3.210264
_Irgn_9	1.264473	.2377393	1.25	0.212	.8747247	1.827881
_Ires_1	1.098795	.2021825	0.51	0.609	.7661119	1.575945
hsize	.9974494	.0049011	-0.52	0.603	.9878894	1.007102
_Ies_1	1.034484	.0923221	0.38	0.704	.8684776	1.232222
_Ihins_1	.8316839	.1585419	-0.97	0.334	.5723949	1.208428
_Imst_1	1.07026	.121415	0.60	0.549	.8568902	1.336759
nlchild	.9327455	.0391175	-1.66	0.097	.859143	1.012653
_cons	.8592292	.3556787	-0.37	0.714	.3817275	1.934037