UNIVERSITY OF SOUTHAMPTON

SCHOOL OF SOCIAL SCIENCES

DIVISION OF SOCIAL STATISTICS

SPATIAL INEQUALITIES IN PREGNANCY PLANNING AND DELIVERY CARE UPTAKE IN GHANA: MULTILEVEL AND SMALL AREA ANALYSIS

BY

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DOCTOR OF PHILOSOPHY

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DEDICATION

This thesis is dedicated to Professor James Annorbah-Sarpei,
Executive Director of the Centre for Community Studies, Action and Development,
Accra, Ghana, who has been a great father and lasting inspiration to me

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To God be the Glory.

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ABSTRACT

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SPATIAL INEQUALITIES IN PREGNANCY PLANNING AND DELIVERY CARE UPTAKE IN GHANA: MULTILEVEL AND SMALL AREA ANALYSIS

By Fiifi Amoako Johnson

Pregnancy intentions and the uptake of care at childbirth are two distinct but related aspects of maternal health that have been associated with maternal health and survival. National estimates show that unintended pregnancies and home deliveries continue to be unacceptably high in Ghana. A district approach to initiating maternal health activities has been emphasised by local, national and international organisations. Nonetheless, spatial inequalities in maternal health within and across administrative districts, where health planning and monitoring is focal, are not known. District level statistics to plan and monitor progress in safe motherhood activities are also non-existent. The determinants approach, which has received much attention, only gives support to decision-making at the national level and not the local administrative level. In this study the 1998 and 2003 Ghana Demographic and Health Survey (GDHS) and the 2000 Ghana Population and Housing Census (GPHC) have been used to quantify the spatial inequalities in pregnancy planning and use of delivery care and investigates the contextual factors that mitigate the spatial inequalities after controlling for individual and household level predictors using multinomial multilevel logit models. Using DHS and Census data the study further examines the feasibility of applying small area estimation techniques to derive district by age statistics using the EBLUP extension of the Fay-Herriot estimator. This is also aimed at furnishing local level statistics at both the central and local government levels to aid policy planning and monitoring of maternal health activities.

The results show that there is considerable exposure to mistimed pregnancies within rural communities and the Savannah Zone, while urbanised communities and the Coastal and Forest Zones have high exposure to unwanted pregnancies. The inequalities, associated with exposure to unintended pregnancies, were significantly high between rural communities and the Savannah and Forest zones of Ghana. Inequalities between urban communities and the Coastal Zone have declined and become less important. The results show that more urbanised communities and zones have lesser inequalities in exposures to unintended pregnancies than less urbanised communities and zones. Considering uptake of care at birth, the results show that home deliveries under the supervision of unskilled attendants were more pronounced within rural communities and the Savannah Zone of Ghana. Unlike exposures to unintended pregnancies, the results of the analysis on delivery care uptake show high and increasing inequalities between urban communities and the Forest and Coastal Zones, while rural inequalities, irrespective of zonal differences remain relatively high. The results suggest that urbanisation plays an important role in uptake of delivery care. However, unlike contraceptives, which are relatively cheap and more accessible to urban dwellers, obstetric care is quite expensive, and there is an indication that the urban poor cannot afford such services. District level estimates of exposures to unintended pregnancies and home deliveries; confirm high levels of unmet need for spacing and propensity of home deliveries in the Savannah Zone and high levels of unmet need for limiting within the Forest and Coastal Zones. The results suggest that the inequalities in maternal health care should be taken into account in the provision of family planning services and essential obstetric care.

MAP OF GHANA AND COUNTRY STATISTICS

COUNTRY STATISTICS

***Location ....Western Africa, bordering the Gulf of Guinea, Cote d'Ivoire, Burkina Faso and Togo
***Climate.....Tropical; warm and comparatively dry along southeast coast; hot and humid in southwest; hot and dry in north
*Capital..... Accra
*Population.....18,912,079
*Population growth rate.....2.7 percent
*Age structure:.....< 15 years: 41.3%; 15 – 64 years: 53.4 years; >64 years: 5.3%
**Life expectancy.....56.8 years
*Population density.....79.3 persons per sq. km
*Most urbanised regions.....Greater Accra (87.7%), Ashanti Region (51.3%)
**Adult literacy rate (15+ years), 2003...45.9%
**GDP Per capita (PPP) [2004 est.].....$2,238
**Population living below $1 a day.....44.8%
**Population living below $2 a day.....78.5%
***Natural resources.....Gold, timber, diamonds, bauxite, manganese, rubber, hydropower, petroleum, silver, salt, limestone

* 2000 Ghana Census (GSS) **Human Development Report 2005 ***World Fact Book 2005 (CIA)

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CHAPTER ONE

1.0 INTRODUCTION

1.1 BACKGROUND

The launch of the Safe Motherhood Initiative in 1987 prompted the world's attention to the poor state of maternal health in sub-Saharan Africa. Since then, reducing the unacceptably high maternal mortality and morbidity rates in sub-Saharan Africa has been a common goal in several international conferences. These include the 1990 World Summit for Children, the 1994 International Conference on Population and Development (ICPD), the 1995 Fourth World Conference on Women and the 2002 World Summit on Sustainable Development. Despite all these calls, there has not been measurable decline in maternal deaths and illnesses in sub-Saharan Africa. This thesis aims to contribute to a better understanding of the spatial inequalities in maternal health care in Ghana, interlinking two distinct but related pre-disposing indicators of maternal deaths and illness: (1) exposures to unintended pregnancies and (2) delivery care uptake.

At the 2000 Millennium Summit of the States of the United Nations convened by the United Nations Assembly, the 5th Millennium Development Goal (MDG) aimed at reducing maternal mortality ratios, by three-quarters between 1990 and 2015 was enacted. Recent estimates show that sub-Saharan African countries are lagging behind in reaching this goal (Wagstaff and Claeson, 2004). The inability of sub-Saharan African countries to reach the 5th MDG has been linked to several challenges faced by the continent and the initiatives it has undertaken so far. These include socio-economic vulnerability, inadequate health provision and financing and unfavourable government policies and actions (WHO 1998; Hulton et al. 2000; Bertrand et al. 1995; Asenso-Okyere et al. 1997; Akin and Hutchinson 1999; Magadi et al. 2002; Elo 1992;

Kuato Defo 1997; Raghupathy 1996; Kutzin 1993; Gertler and Van der Gaag 1990; Ascadi and Johnson-Ascadi 1993; Thaddeus and Maine 1990; Wall 1998; Boulle 1997; Chigunta 1998; Wagstaff and Claeson 2004). The HIV/AIDS pandemic has also posed a major challenge to maternal health initiatives on the continent (Raisler and Cohn 2005; Desgrees du Lou 1999). These challenges have resulted in wide inequalities in uptake of maternal health care in sub-Saharan Africa.

Past research in development studies that have focused attention on spatial inequalities have highlighted the plight of rural dwellers. In Ghana, Demographic and Health Surveys have reported wide inequalities with urban and more industrialized areas having better demographic and health indicators than rural areas. In recent times, the well-off living conditions of urban and industrialised dwellers have been disputed (Magadi et al 2003). It is well documented that urban poverty is growing, while rural poverty remains consistently high (UNFPA 1996). The effect of the growing urban poverty and continuing cycle of rural poverty on maternal health between and within rural and urban areas, have received little or no research attention in Ghana.

Wide inequalities have also been reported between the ecological zones of Ghana: the Coastal Zone, Forest Zone and Savannah Zone. The Coastal Zone of Ghana is characterised by a rapid growth in port towns, harbours most of the economically vibrant districts of Ghana and also holds the seat of government and all the ministries except for the regional ministries. The Forest Zone is the prime cocoa, timber and mineral producing areas, while the Savannah Zone is dry low grassland. Researchers have identified broad disparities between the Savannah Zone and the rest of the country. Research findings in Ghana reveal high ecological zone differentials in implementation of government policies including education, economic activities and wide scale population and health activities (Songsore 1998, Vanderpauye-Orgle 2002). The mid-1980s saw an increasing awareness of the deprived Savannah Zone and a shift in policy focus to facilitate development in the area. Two decades after the country's attention was drawn to the ecological divide it worthwhile investigating the inequalities that exist in maternal health care between and within the ecological zones.

Two issues that exacerbate maternal ill health in sub-Saharan Africa are: (1) high levels of unintended pregnancies and (2) low uptake and poor quality of delivery services. The most recent Ghana Demographic and Health Survey (GDHS) shows that more than half of all deliveries in Ghana take place at home (70 percent in rural Ghana and 20 percent in urban Ghana) in the presence of unskilled birth attendants. The GDHS also reports that Ghana's TFR would have been about one birth less if all unintended births were avoided. Despite the high proportion of unskilled care and high levels of unintended pregnancies in Ghana, very little evidence exists regarding the geographical differentials that exist. Nonetheless, it is important to identify and understand the existing spatial inequalities, in order to target at risk populations with the appropriate interventions.

In this research the third (1998) and the fourth (2003) series of the GDHS and the 2000 Ghana Housing and Population Census (GPHS) are used to investigate spatial inequalities in pregnancy planning and uptake of delivery care. The study also investigates the contextual factors that mitigate these spatial inequalities. The study further examines the feasibility of applying small area estimation techniques to DHS and census data to derive district by age estimates to aid target groups and areas with prioritised maternal health needs with the appropriate interventions. The study is also aimed at furnishing both central and local government with local area statistics to aid policy planning and initiatives, monitoring and evaluation of maternal health activities.

1.2 RATIONALE OF THE STUDY

Research evidence shows that skilled care at childbirth is very low in Ghana. About 56 percent of all deliveries in Ghana take place at home under the supervision of unskilled attendants (GSS, NMIMR and ORC Macro 2004). In addition, a high proportion of pregnancies are unwanted (GSS, Macro International 1994, 1999 and GSS, NMIMR and ORC Macro 2004). Nonetheless, it is widely reported that these are two pre-disposing factors of maternal deaths and illnesses, especially in sub-

Saharan Africa (Baker and Khasiani 1992, Campbell et al. 1995, Bankole et al. 1999, AbouZahr and Wardlaw 2001, Marston and Cleland 2000 and Ronsmans et al 2002). For maternal health initiatives to achieve their set objectives and reach the 5th MDG, at risk populations to maternal deaths and illnesses need to be identified and targeted with the appropriate interventions. No research in Ghana has focused on identifying spatial differentials in these risks.

Also, resources available for improving maternal health in sub-Saharan Africa to reach the 5th MDG are meagre and scarce. There is therefore, the need for research that aid governments, policy makers, planners and health practitioners to target high-risk groups and areas with the appropriate interventions. Identifying the spatial inequalities and deriving local level estimates of exposures to unintended pregnancies and deliveries supervised by unskilled attendants will aid both central and local government allocation of health funds and distribution of resources as well as planning, implementation, monitoring and evaluation of maternal health activities. It will also aid activities and programmes of public health practitioners and non-governmental organisations in improving maternal health in Ghana.

1.2.1 Research Problem

Studies in maternal health in Ghana have focused on identifying the determinants that influences maternal health outcomes. Nonetheless, the determinants approach, country and regional level statistics only gives support to decision-making at the national level and not the local administrative level where major decision-making and initiatives on maternal health care are focal. For interventions to be successful, the importance of grassroots participation, planning, monitoring and evaluation of maternal health activities at the local level cannot be over emphasised. Presently, very little is known in Ghana about:

- the spatial variations in women's exposures to unintended pregnancies and their propensity to seek non-institutional delivery care;

- the effect of the growing poverty gap reported for urban dwellers and the continuing-cycle of under development in rural dwellers and its effect on maternal health care in Ghana;

- the factors that mitigate these inequalities; and,

- administrative (local) level statistics to aid decision-making, monitoring and evaluation of maternal health activities are also non-existent, despite the fact that decentralisation of the health system is herald as one of the major strategies to bridge the inequality gap.

1.2.2 Objectives

This research makes an attempt to link two aspects of maternal health: (a) pregnancy intentions and behaviour[1] and (b) delivery care seeking behaviour. The overall aim of this thesis is to quantify the spatial inequalities (within and across zones and regions of Ghana) associated with women's exposure to unintended pregnancies and their propensity to seek delivery care in non-institutional care under the supervision of unskilled birth attendants. The specific objectives of this thesis are to:

- Determine the levels of inequality in women's exposures to unintended pregnancies (mistimed and unwanted) and delivery care (institutional and non-institutional) and the spatial variations between PSUs and districts in Ghana by using survey data.

[1] Pregnancy intentions defined in the present research incorporate women's attitudes, perceptions and decision making related to contraception, fertility and reproduction. Conversely, an unintended pregnancy is defined as those conceptions that were either unwanted or mistimed. Further details of the definitions are discussed later in the appropriate chapters.

- Investigate the contextual factors that mitigate the spatial differentials using survey and census data.

- Explore the feasibility of producing small area (district-level) estimates, combining data from Demographic and Health Survey and the census, for the purpose of making comprehensive district level population and health policies.

- Provide small area (district level) estimates of exposures to unintended pregnancies and delivery care in non-institutional settings using both survey and census data; and,

1.2.3 Specific Research Questions

In relation to the objectives listed above, the following research questions are addressed in this study:

1. To what extent does the level of exposures to unintended pregnancies and delivery care in non-institutional settings vary within and across PSUs and districts in Ghana?

    - How much of these variations have changed over time between the two survey periods?

    - Which factors explain these spatial variations within and across PSUs?

2. Is it feasible and pragmatic to derive small area estimates of unintended pregnancies and delivery care in non-institutional settings using survey and census data?

1.3 METHODOLOGICAL APPROACH

Answering the research questions posed in this study, the main statistical method adopted for the analysis is the multilevel modelling technique. The multilevel modelling technique is a statistical methodology with proven statistical reliability and relevance based on empirical statistical theories and applications. To derive local-level statistics of exposures to unintended pregnancies and home deliveries, the Empirical Best Linear Unbiased Predictor (EBLUP) extension of the Fay-Herriot type model for small area analysis was adopted.

1.3.1 Multilevel Modelling Techniques

To answer the research question posed in this study requires adopting a statistical technique that accounts for both individual and areal variations. Thus, multilevel modelling is an appropriate technique for such analysis. Multilevel modelling is a technique for analysing hierarchically structured data. The technique is chosen for three main reasons - the sampling design of DHS surveys, the importance of grouping effects and the fact that geographical areas are convenient for monitoring and target setting. The standard sampling design to which statistical models are linked to is the simple random sampling with replacement from an infinite population. This approach assumes that the selection of one unit is independent of the selection of other units and the selection of a unit is constant across all units in the population. The DHS data for this study comes from a multi-stage sampling scheme, which has dependent observations (Snijders and Bosker, 1999). Ignoring the hierarchical structure of the dataset may lead to bias estimation of standard errors and hence unreliable estimation of confidence intervals (Snijders and Bosker 1999; Madise et al 2002).

Also, dwellers differ in terms of access to services and traditional practices. Individuals in a community or an area are more likely to be affected by similar areal

characteristics. To ignore this relationship risks overlooking the importance of group effects. The multilevel modelling technique allows for the variation at each level of clustering to be modelled and the group effects on individual outcomes analysed. The group-level variance from the multilevel model is a natural measure of inequalities, permitting comparison/changes in inequalities between areas to be assessed. Identifying inequalities between areas has been acknowledged to be of significant importance to policy initiative and programme planning.

The rural-urban divide as well as the ecological divide in Ghana remains a major concern in the country's developmental process. Thus, the spatial inequalities in pregnancy planning and uptake of delivery care are investigated at three spatial levels of developmental importance: (1) inequalities between all PSUs; (2) inequalities between and within rural PSUs and urban PSUs; and, (3) inequalities between and within the three ecological zones of Ghana.

1.3.2 Small Area Analysis

In recent times policy makers, local governments, planners and businesses have shown growing demand for reliable small area statistics. Small area statistics have aided programme implementation and monitoring of developmental activities, particularly in the developed world. In the developing world, small area statistics are almost non-existent. Unfortunately, census data which could aid derive small area statistics do not collect information on maternal health indicators. Demographic and Health Surveys, which collects key information on maternal health indicators, cannot be used directly to generate reliable small area statistics, due to small samples from small areas. Nonetheless, this study aims to derive reliable small area statistics that will aid maternal health initiatives in Ghana. The question is how to produce reliable estimates for small areas or domains, based on very small samples and access the reliability of the estimates. In the past three decades, survey statisticians have explored the possibility of generating efficient small area estimators. This has led to several

empirical studies on both the theoretical and practical application of small area techniques and has led to the preposition of different small area estimators. This study investigates the feasibility of applying DHS and census data to recently developed small area estimators to study the spatial variations in pregnancy planning and maternal health care in Ghana.

1.4 SCIENTIFIC AND POLICY RELEVANCE OF STUDY

1.4.1 Scientific Relevance

This study contributes to:

- a better understanding of the spatial inequalities that exist in pregnancy planning and uptake of delivery care between and across PSUs in Ghana; and,

- a better understanding of the feasibility of using small area estimation techniques to produce reliable and valid administrative level estimates from DHS and census data.

1.4.2 Policy Relevance

The policy relevance of understanding the spatial inequalities and producing administrative level statistics of women's exposures to unintended pregnancies and their propensity to seek non-institutional delivery care supervised by unskilled attendants are:

- it will allow policy makers to target resources, monitoring change and enacting informed policies on maternal health policies more effectively; and,

- it helps ensure that policies enacted at the national level marks the need of dwellers at the local level.

1.5 ORGANISATION OF THESIS

The thesis is organised into seven chapters. Chapter one introduces the research problem, outline the rationale, objectives and relevance of the research.

Chapter two of the thesis presents an overview of existing knowledge on the challenges and inequalities in maternal health care. The review is divided into four broad sections: the state of maternal health in sub-Saharan Africa; the challenges and inequalities in maternal health care; the situation of maternal health care in Ghana and the emergence of the district approach in tackling the challenges and bridging the inequality gap. Finally, the gaps in the literature that this study intends to address are discussed.

Chapter three describes the sources of data and methods of data analysis adopted for the study. The first section of the chapter describes the data. The analysis uses data from the third (1998) and fourth (2003) of the series of DHS surveys in Ghana and the 2000 Ghana Population and Housing Census. The second section describes the statistical methods: Multinomial multilevel logit models and small area estimators. This section focuses on model formulation, estimating intra-PSU correlation coefficients and estimating probabilities and inequalities on the probability scale. A brief discussion on small area estimators and references for recent developments in small area estimators is also given. The multilevel logit models adopted for the study is

discussed. Previous applications and importance of small area statistics and challenges in deriving small area statistics are also discussed in this chapter.

Chapter four presents the findings of the factors associated with pregnancy planning behaviour. This chapter uses data from the 1998 and 2003 GHDS to investigate factors influencing pregnancy planning behaviour using two-level logit regression model. The effect of geographical variables, socio-economic and household characteristics on pregnancy planning behaviour is examined. The spatial inequalities (after controlling for the significant geographical variables, socio-economic and household characteristics) are examined firstly between all sampled PSUs in the 1998 and 2003 GDHS. The inequalities that exist between rural PSUs (villages) and between urban PSUs (cities) are also examined. Finally, inequalities between and within the three ecological zones of Ghana are also investigated.

Chapter five presents the findings of the factors associated with uptake of delivery care. This chapter also uses data from the 1998 and 2003 GHDS and a two-level logit regression model. Furthermore, geographical effects, socio-economic and household characteristics are examined. At the second stage, spatial inequalities in uptake of delivery care are examined, with particular emphasis on the inequalities existing between rural PSUs (villages), between urban PSUs (cities) and between PSUs within the three ecological zones of Ghana.

Chapter six focuses on deriving district by age estimates (proportions) of women exposed to unintended pregnancies and home deliveries using data from the 2003 GDHS and 2000 GPHC. The Fay-Herriot model was employed for this purpose. The analysis on exposures to unintended pregnancies was disaggregated to mistimed and unwanted pregnancies. This is aimed at identifying the appropriate intervention for different risk-groups and areas. Valid measures of error are used to assess the validity of the estimates.

Finally, Chapter seven provides the summary of the main findings and conclusions of this research, including policy and scientific implications and recommendations for future research.

CHAPTER TWO

2.0 MATERNAL HEALTH: A REVIEW OF CHALLENGES AND INEQUALITIES IN SUB-SAHARAN AFRICA

2.1 INTRODUCTION

Inequity and inequality are used extensively in the literature to describe differentials in health care uptake (Ngom et al 2003). Inequity has been associated with unfairness and injustice in provision of health care. Inequality on the other hand is about comparison in the ability to obtain access to health care (Mooney 1987, Calman 1997 and Ngom 2001). Inequalities in health care can be categorised into two main groups: (1) socio-economic and (2) spatial (geographic). Studies investigating socio-economic inequalities in health care uptake have focused on poverty (income/wealth), cultural and gender differences. Spatial inequality, on the other hand looks at how a community or a group of people living in close proximity are different from another in accessing health care. As mentioned earlier, this study focuses on the spatial inequalities in exposure to unintended pregnancy and uptake of delivery care in Ghana, taking into account some of the socio-economic characteristics that mitigate these inequalities.

This chapter presents a general overview of the state of maternal health in sub-Saharan Africa. Existing knowledge on the challenges faced by maternal health initiatives in sub-Saharan Africa, which also contributes to inequalities in maternal health care uptake, is also discussed. The chapter outlines a contextual framework that illustrates these challenges. The chapter further discusses the divide that exists in uptake of maternal health care in sub-Saharan Africa. These challenges are also presented in the context of Ghana.

2.2 THE STATE OF MATERNAL HEALTH IN SUB-SAHARAN AFRICA

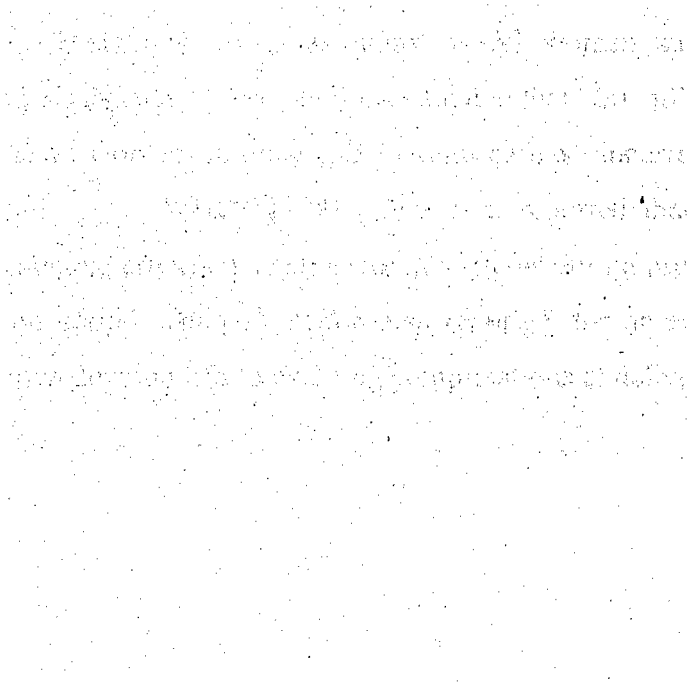
2.2.1 The Magnitude of Maternal Deaths and Illnesses

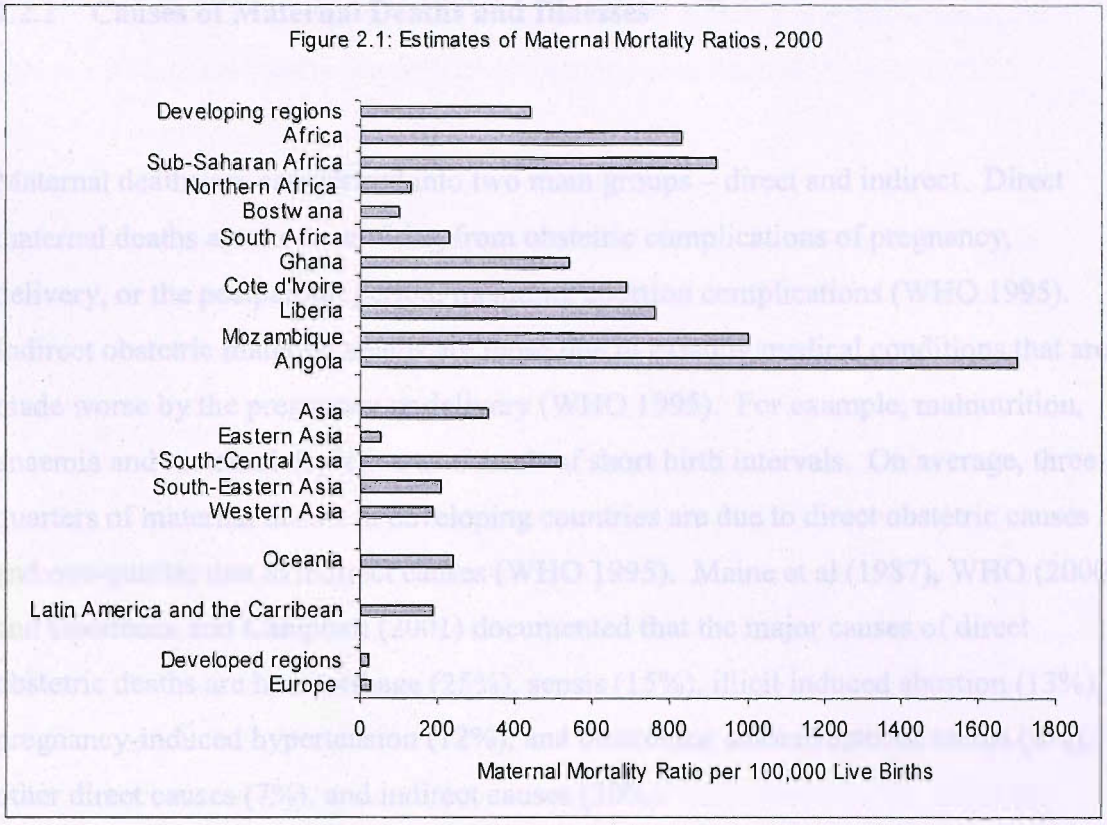
The 9th and 10th revision of the World Health Organisation (WHO) International Classification of Diseases defined maternal death as "*the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management but from accidental or incidental causes*" (WHO, 1992). Three main measures of maternal death are discussed in the literature – (1) maternal mortality ratio (2) maternal mortality rate and (3) lifetime risk of a maternal death. The maternal mortality ratio, the number of maternal deaths per 100,000 live births, is a measure that indicates the risk of maternal death among pregnant and recently pregnant women and reflects a woman's basic health status, access to health care and quality of care. The maternal mortality rate is a measure of the likelihood that a pregnant woman will die from maternal causes in a given year. This rate can therefore be reduced through making childbearing safer and or reducing the number of pregnancies (WHO 1998). The lifetime risk of a maternal death reflects both the probability of becoming pregnant and the probability of dying as a result of that pregnancy cumulated across a woman's reproductive years. It reflects the chance of a woman dying from complications of pregnancy, childbirth, or unsafe abortion during her lifetime.

For the past one and half decades there has been growing concern about the continuing threats to women's health due to pregnancy and childbirth, particularly in developing countries. The Safe Motherhood Initiative and International Day of Action for Women's Health are some of the initiatives lunched in the 1980s to raise global awareness of the tragic situation of maternal health problems in developing countries. Modern health care for pregnancy and childbirth became a norm in developed countries more than a century ago. Despite the highly accumulated knowledge about the causes and recommendation about care for pregnancy and childbirth, maternal

mortality remains the leading cause of death to women in developing countries (Berer and Ravindran 1999). Maine (1999) indicated that maternal mortality and morbidity has attracted wide spread attention in three main ways: first, its magnitude, second, its epidemiologic nature; and finally its programmatic requirements.

Worldwide, it is estimated that 529,000 women die annually as a result of pregnancy and childbirth; 99 percent occur in developing countries (WHO, UNICEF and UNFPA 2004). In Europe death to women as a result of pregnancy and childbirth is estimated at 2,500 compared to 251,000 for Africa and 247,000 for sub-Saharan Africa (WHO, UNICEF and UNFPA 2004). Worldwide, lifetime risk of maternal death is estimated at 1 in 74, 1 in 2800 for the developed world, 1 in 2400 for Europe, 1 in 20 for Africa and 1 in 16 for sub-Saharan Africa (WHO, UNICEF and UNFPA 2004). The disparity in maternal mortality between developing and developed countries is greater than any other demographic indicator (WHO 1998 and McCarthy and Maine 1992). Figure 2.1 below shows the regional and some selected sub-Saharan Africa country differentials in levels of maternal deaths.





Source: WHO, UNICEF and UNFPA (2004) 2000 Revised Estimates of Maternal Mortality

In addition to maternal deaths, complications related to pregnancy and childbirth is responsible for about 15 million illnesses, injuries and disabilities to women annually (UNICEF 2003). Wall (1998) and UNICEF (2003) indicated that for every maternal death in the developing world, as many as 30 women sustain serious injuries, infections and disabilities. Presently it is estimated that 300 million women (more than a quarter of adult women) in developing countries have incurred this type of damage (UNICEF 2003). A WHO (1994) publication reported that about 40 percent of pregnant women experience acute obstetric problems during pregnancy, childbirth and the postpartum period. The publication also reported that an estimated 15 percent of pregnant women develop life-threatening complications at delivery.

2.2.2 Causes of Maternal Deaths and Illnesses

Maternal deaths are categorised into two main groups – direct and indirect. Direct maternal deaths are those resulting from obstetric complications of pregnancy, delivery, or the postpartum period, including abortion complications (WHO 1995). Indirect obstetric maternal deaths are those due to existing medical conditions that are made worse by the pregnancy or delivery (WHO 1995). For example, malnutrition, anaemia and maternal depletion as a result of short birth intervals. On average, three-quarters of maternal deaths in developing countries are due to direct obstetric causes and one-quarter due to indirect causes (WHO 1995). Maine et al (1987), WHO (2000) and Goodburn and Campbell (2001) documented that the major causes of direct obstetric deaths are haemorrhage (25%), sepsis (15%), illicit induced abortion (13%), pregnancy-induced hypertension (12%), and obstructed labour/ruptured uterus (8%), other direct causes (7%), and indirect causes (20%).

Haemorrhage a sudden and severe bleeding during pregnancy or the postpartum period is responsible for about a quarter of all maternal deaths in the absence of prompt and appropriate life-saving care. It is even more dangerous when a woman is anaemic. Sepsis is often a consequence of unhygienic environments and equipments used during delivery. Pregnancy-induced hypertension is a convulsion, which can be prevented by careful monitoring during pregnancy and by treatment with relatively simple anticonvulsant drugs. Over 90 percent of vesico-vaginal fistula infections, a hole that develops in the birth canal that allow leakage of urine or faeces from the bladder or rectum is caused by obstructed labour (Bangser et al 1999). Obstructed labour can also result in permanent nerve damage and loss of sensation and muscle deterioration in the feet and legs resulting in damaged reproductive system, infertility or other gynaecological disorders (Royston and Armstrong, 1989). Abortion is illegal in most countries of sub-Saharan Africa including Ghana. Studies have revealed that in such countries, women rely on untrained persons, in unhygienic and unsafe environments for abortion mostly resulting in hazardous outcomes, particularly in the early and

adolescent years (Magadi 2004, Baker and Khasiani 1992). Illicit abortions in sub-Saharan Africa are mostly as result of unintended pregnancies (Magadi 2004).

Obstetric complications in sub-Saharan Africa are further aggravated by malaria, malnutrition, anaemia and female genital mutilation (UNICEF 2003). Malaria is endemic to the poorest countries and communities. Over 90 percent of malaria deaths occur in sub-Saharan Africa. Between 200,000 and 500,000 women develop severe anaemia as a result of malaria in sub-Saharan Africa (Miaffo et al 2004). Malarial anaemia is estimated to be responsible for not less than 10,000 maternal deaths each year in sub-Saharan Africa. *Plasmodium falciparum*, the most deadly form of malaria, which is predominant in sub-Saharan Africa increases, the chance of abortions, stillbirth, prematurity and intrauterine growth retardation, high rates of placental malaria and low birth weight (Miaffo 2004). In the past decade, effective strategies for controlling malaria in pregnancy has be devised and demonstrated to improve the health of pregnant women (Magnussen 2003, Miaffo 2004). However, inequalities in the provision of health services and infrastructure such as portable water sources and sanitation render some communities vulnerable to malaria infections, prevention and treatment in sub-Saharan Africa (Magnussen 2003, Miaffo 2004).

While malnutrition prevalence has declined significantly in most developing countries in the last decade, it has remained nearly static for sub-Saharan Africa (World Bank 1998). Between 5 to 20 percent of sub-Saharan African women are considered malnourished (Huffman 2001). The main reason being that sub-Saharan African women consume less than the recommended daily caloric intake. Malnutrition in women is a correlate of economic vulnerability, lack of access to basic health services, inadequate household access to food, poor maternal care and unsafe water and sanitation facilities (WHO 1995, Rajalakshmi 1998). The consequences of maternal malnutrition are increased risk of infections, anaemia, compromised immune functions, lethargy and weakness and low productivity (Huffman 2001). Maternal malnutrition is also associated with increased risk of fetal and neonatal deaths, growth

retardation and low birth weight and preterm birth (Huffman 2001). The associated risk of maternal malnutrition is highly allied with maternal deaths and illnesses.

A UNICEF (2003) report revealed that anaemia influences haemorrhage and sepsis during delivery and has been responsible for about 20 percent of maternal deaths in Africa and Asia. Among 12 sub-Saharan African countries studied by Huffman (2001), it was reported that between 21 and 80 percent of women were reported to be anaemic. In Ghana the rate was 64 percent. Severe maternal anaemia is considered to be associated with about half of all maternal deaths worldwide and can also result in preterm births, stillbirths, spontaneous abortions and perinatal and neonatal deaths (Magadi 1999). In developing countries anaemia is commonly caused by micronutrient deficiencies, particularly, iron, vitamin A, zinc, folic acid, riboflavin and iodine deficiencies (Huffman 2001). Infections such as hookworm, malaria and HIV also exacerbate nutritional status of women through loss of appetite and reduced nutrient absorption.

Female Genital Mutilation (FGM) has also been highly associated with risk of maternal deaths and illnesses (UNICEF 2003). It is estimated that every year two million girls undergo FGM (UNICEF 2003). Larsen and Yan (2000) estimated that a total number of about 100 to 130 million girls and women have been mutilated worldwide. The prevalence ranges from 5 percent in Uganda to about 98 percent in Somalia (Toubia 1998). WHO (2000) reported that FGM can lead to complications such as haemorrhage and infection and can cause severe difficulties during childbirth.

2.2.3 Consequences of Maternal Deaths and Illnesses

Maternal mortality and morbidity has severe consequences not just because a woman in her prime age is dead or disabled, but also has an immense effect on surviving children, dependants, the community and nation as a whole. A United Nations report

by Manuah (1998) estimated that about 31 percent of households across sub-Saharan Africa are headed by women, often with no working resident male. Recent DHS (2003) in Ghana reported that 34 percent of households are headed by women, 32 percent in Kenya (2003 KDHS), 27 percent in Malawi (2000 MDHS) and 47 percent in Eritrea (EDHS 2002). Considering that a substantial proportion of households in sub-Saharan Africa are headed by women, death or injury to a woman can greatly affect the health and livelihood of surviving children and dependants. A study by the Family Care International (1998) found that the death of a mother increases the chance of death of surviving children 3 to 10 times within two years compared with their counterparts living with both parents.

Vesico-vaginal fistula and utero-vaginal prolapse are illnesses associated with childbirth that have very devastating consequences (Bangser et al, 1999 and Ravindran and Bhavani, 1999). Wall (1998) documented that woman who contract obstertric fistula may be incapable of providing adequate care for their surviving children, with serious health consequences for the mothers as well. Wall (1998) further indicated that more than 90% of the foetuses involved in obstructed labour die and the vast majority of patients who develop fistula have no living children.

The development of illnesses, injuries and disabilities to women due to complications related to pregnancy and childbirth often leads to isolation and abandonment of these women by their husband, relatives and communities (Bangser et al 1999). In a study by Murphy (1981) in Nigeria, it was revealed that 14 percent of new fistula patients were divorced. Forty-two percent were still living with their husband, but by the time the condition was recognized to be chronic, only 11 percent were still living with their husbands. Seventy-seven percent of women who developed this damage were separated from their husbands for more than two years. The vast majority of women in sub-Saharan Africa who develop these damages have no access to good reproductive health services and counselling (World Bank, 1999)

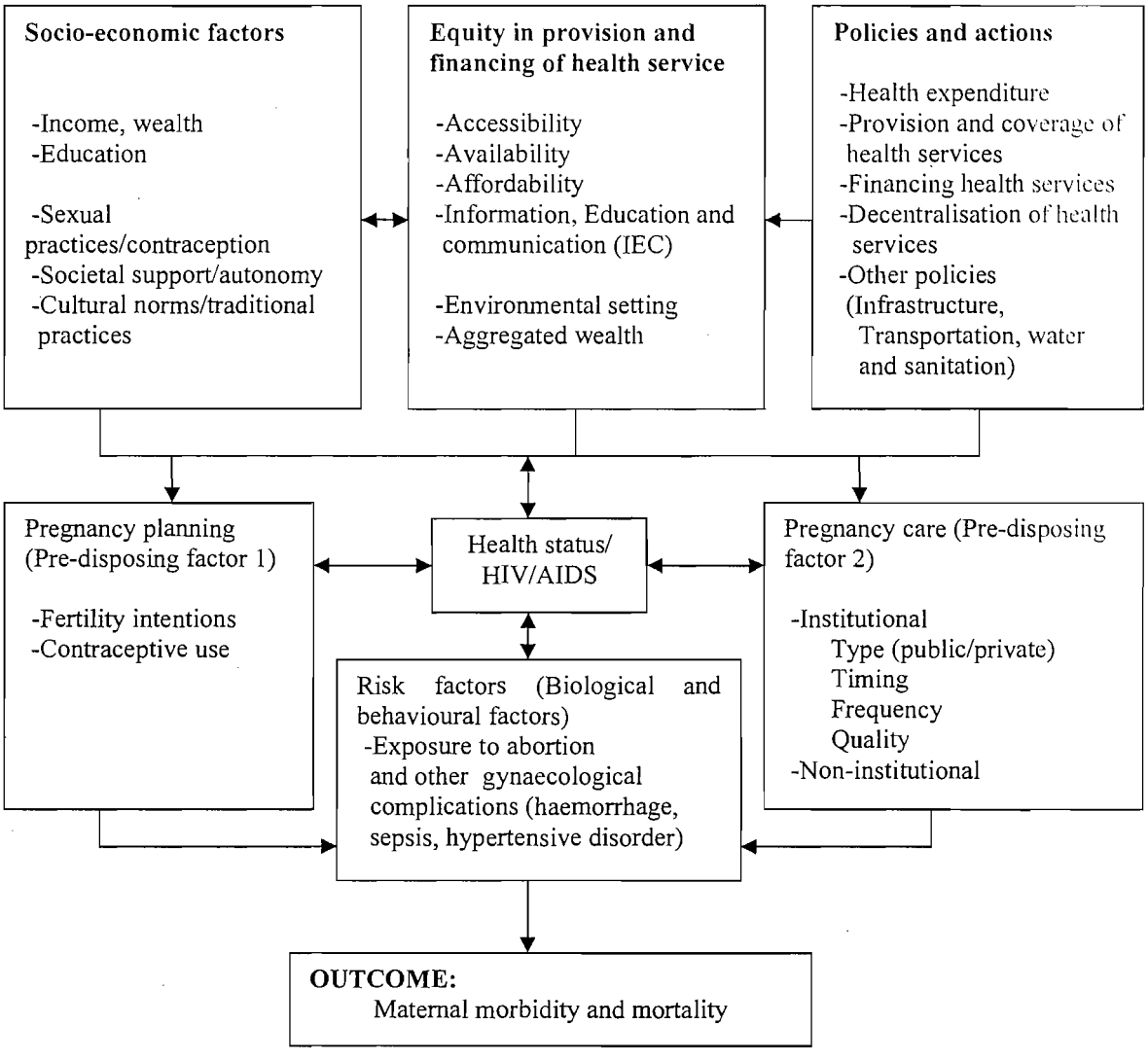
2.3 INEQUALITIES IN MATERNAL HEALTH CARE IN SUB-SAHARAN AFRICA: TOWARDS A CONCEPTUAL FRAMEWORK

Maternal health care initiatives in sub-Saharan Africa have faced substantial challenges over the years. The fifth Millennium Development Goal (MDG) of reducing maternal mortality ratio by three quarters by 2015 has been the benchmark for measuring improvements in maternal health outcomes. Recent studies have shown that despite all the efforts to reach the fifth MDG, sub-Saharan African countries are lagging behind in reaching this goal. The challenges facing maternal heath initiatives in sub-Saharan Africa have been a major contributor to the lack of improvements and wide differentials in maternal health care.

The challenges and factors that mitigate inequalities are conceptualised in the framework below (Figure 2.2). The formulation of the framework was partly based on the discussion in Wagstaff and Claeson (2004). It is worthwhile to note that this study does not intend to investigate the inter-relationship between the variables presented in the conceptual framework. Rather, the study investigates the spatial inequalities that exist in exposures to unintended pregnancies and delivery care uptake, controlling for the significant predictors as illustrated in the conceptual framework, subject to the availability of data.

The factors mitigating the inequalities in maternal health care in sub-Saharan Africa has been categorised into (1) socio-economic factors, (2) equity in provision and financing of health service and (3) government policies on health. The HIV/AIDS pandemic in sub-Saharan Africa has also become a major challenge to maternal health initiatives. An essential feature of these factors is that they do not only operate independently but also collectively through the pre-disposing factors to influence maternal health.

Figure 2.2: Conceptual Framework for Analysing Inequalities in Maternal Health Care in Sub-Saharan Africa



2.3.1 Socio-economic and Cultural Factors

I. Socio-economic Factors

A range of socio-economic factors poses wide inequalities in accessing maternal health care. Identifying these factors is very important in supporting maternal health decision-making at both the local and national level. Studies have reported compelling evidence of rich-poor driven inequality in accessing maternal care services (Appiah-

Kubi 2004, van den Boom et al 2004, Stephenson et al 2004, Brugha and Pritze-Aliassime 2003, Kunst and Houweling 2001, De Brouwere and Van Lerberghe 2001, Gwatkin et al 2000). Kunst and Houweling (2001) showed that there exists enormous dissimilarity between the highest and lowest wealth quintiles in uptake of maternal health care in many countries. De Brouwere and Van Lerberghe (2001) documented that there are only very few countries where there are no variations in access to maternal health care, whereas in many countries there is an extreme situation of a 100 percent non-institutionalised care for women of low socio-economic status.

A survey of 44 countries by Gwatkin (2000) reported that 26 countries have a disparity between the richest and poorest quintile in delivery attendance of above 50 percent and three countries with disparities above 90 percent. Appiah-Kubi (2004) identified that Ghanaian women from poor households are three times less likely to opt for institutional delivery under the supervision of a skilled medical personnel. Stephenson et al (2004) reported a positive linear relationship between household amenities index and delivery in a health facility in five sub-Saharan African countries (Ghana, Malawi, Kenya, Tanzania and Ivory Coast). A plausible explanation given by Kunst & Houweling (2001) for the low use of care among poor women is their low educational status, which reflects their financial status.

Strong correlations have been identified between health effects and educational levels, occupation and incomes levels of women and economically productive members of their households. A woman's education, her income status and occupation are more likely to influence her autonomy, attitudes and preference towards contraception and more important her affordability status and health care seeking behaviours (Appiah-Kubi 2004, Lutalo et al. 2000, Mroz et al. 1999, Guilkey and Jayne 1997, Campbell et al 1995, Njogu 1991 and Dow and Werner, 1982). Educational levels of women, their occupation, income levels and autonomy status further influence their age at first marriage and first birth, parity, birth spacing, access to health services including family planning, access to information and knowledge on contraception; factors known to influence maternal heath (Magadi 2004, Appiah-Kubi 2004, Bongaarts et al. 1984).

Correlations between education, occupation and income of other household members also act to influence maternal health care through household wealth and spousal communication and decision-making.

II. Cultural Factors

There are several cultural practices and norms in sub-Saharan Africa that have been identified to influence maternal heath. Cultural practices and traditional beliefs such as female genital mutilation, women's lack of autonomy in decision-making and demand on women to have large family sizes and participate actively in economic activities including farming influence maternal health (Appiah-Kubi 2004, Magadi et al 2002, Avotri and Walters 2001 and WHO 1998). The 1960 Ghana Population and Housing Census identified more than 90 separate ethnic groupings, each defined by its own language and customary practices (Alan Guttmacher Institute 1995). The different customary practices of each of these ethnic groupings reflect their maternal health care seeking behaviours. The diverse cultural practices also affect other aspects of life such as timing of first marriage, marital types (monogamous and polygamous) and fertility levels which are concurrent with maternal health (Bhatia 1984, Aryee 1985, Goody 1989 and Nankunda 1990).

Ascadi and Johnson-Ascadi (1993) reported that in some sub-Saharan African cultures, pain and illness are considered to be a normal part of women's life, therefore it is deemed unnecessary to seek medical care, including maternal health care. Kutzin (1993) reported that the inability of women in some developing countries to make decisions in relation to choice of medical care severely affects their choice of care during pregnancy, birth and after birth. A conflict between biomedical and traditionally perceived causes of health conditions also limits women's access to care. In some parts of sub-Saharan Africa it is perceived that a prolonged labour is a punishment for past infidelity and an unassisted delivery a sign of courage, thus discouraging women from seeking childbirth care (Thaddeus and Maine, 1990). Wall (1998) reported that in

Hausa societies where shame plays an important role particularly in first birth, newly pregnant girls are expected to exhibit modest behaviour by remaining quiet in their vital condition and not talk at all about their pregnancy. For the dislike of the performance of episiotomies in western-style hospitals and the fear of exposing one's genitals to a stranger during delivery, Wall (1998) reported that, Hausa women in Nigeria prefer resorting to traditional Hausa midwives or barbers. These local midwives and barbers have been reported to use unsafe and unhygienic kits such as sharp knives, razor blades and pieces of glass or any suitable instrument to make a series of random cuts in an attempt to alleviate an obstruction during a prolonged labour. These social pressures pose a major barrier and create wide inequalities in maternal care in sub-Saharan Africa.

2.3.2 Equity in Provision and Financing of Health Services in Sub-Saharan Africa

I. Physical Access to Health Services

Geographical proximity to a great extent influences women's choice, timing and continuum of seeking health care. The Declaration of Alma-Ata in 1978 in the former USSR was aimed to promote *"health for all"* through primary health care. Almost three decades after the enactment of the declaration, high inequalities in the provision health services still exist in sub-Saharan Africa. Research findings have highlighted the plight of rural dwellers in accessing health services. A higher proportion of sub-Saharan Africa's population are rural dwellers; however health care resources are often concentrated in large urban cities making them inaccessible to a greater proportion of the population (van den Boom et al 2004, Lindelow 2004, Chigunta 1998, Boulle 1997 and MoH 1996). Boulle (1997) documented that 56 percent of Rural South Africans live more than five kilometres from a health facility as compared to 13 percent of their urban counterparts. In Zambia, Chigunta (1998) identified that 52 percent of the rural population live outside the perimeter of five kilometres to the nearest health centre. In

Ghana it is estimated that about 40 percent of the population live more than 15 kilometres from a health facility, with rural communities most affected (van den Boom et al 2004 and MoH 1996).

The deterrent effects of the monetary expense of travel time to seek care and the opportunity cost of patients and caregivers time, where necessary, also have significant impact on uptake of maternal health care (van den Boom et al 2004). In Ghana it is estimated that it takes on average 4 hours to get to a facility with a doctor, 2.8 hours to a facility with a medical assistant, 2.5 hours to a nurse and 2.7 hours to a midwife (van den Boom et al 2004). A study in Cameroon by Litvack and Bodart (1993) revealed that the burden of transport cost and the opportunity cost of patients and caregiver(s), where necessary, has significantly lowered uptake of maternal health care. In Cote d'Ivoire, a study by Gertler and van de Gaag (1990) found that, travel time, which reflects the opportunity cost of an individual's time, was more deterrent to uptake of maternal health care particularly to poor persons. Obuobi et al (1999) reported that over 90 percent of Ghana's private sector health providers are located in the Accra and Tema Districts of the Greater Accra Region only. Lindelow (2004) reported from a study in Mozambique that women resident within less than a 30 minutes travel time to a health facility are twice more likely to use the service compared to those within three or more hour travel time.

II. Cost Effects on Accessing Health Care

Studies have also shown that the availability of health services does not necessary guarantee use or less inequality in accessing health services. Magadi et al (2003) and Todd (1996) noted that although hospitals in cities and big towns in sub-Saharan Africa consume a greater proportion of the health budget, owing to economic deprivation among other factors, geographical proximity to health services do not give urban residents much advantage over their rural counterparts. These studies attributed these findings to the growing urban population and growing slum communities in

urban areas of sub-Saharan Africa. A study by APHRC (2002) in Kenya reported that only 52 percent of urban slum women give birth in a health facility compared to about 75 percent of their urban non-slum counterparts. To support the claim of economic deprivation in use of maternal health services in urban areas, studies in Ghana and Kenya where antenatal care services are less expensive compared to delivery care, the difference in uptake between the slum dweller and non-slum dweller is less dramatic (GSS 2004 and APHRC 2002). Appiah-Kubi (2004) investigating maternal health uptake in Ghana also identified wealth as an important predictor of use of institutional delivery care but less important for use of antenatal services which are less expensive (Levin et al 2000). This assertion suggests that while inequalities in urban communities may be increasing, it has remained consistently high among rural communities.

III. Quality of Health Care

Another factor that poses inequalities in maternal health care uptake aside physical proximity and affordability is the quality of services clients receive. Hulton et al (2000) noted that quality of care can affect women's decision to seek care. Most often than not, this may result in delays in decision to seek care, irrespective of the availability of services. A study in Ghana by Boakye–Yiadom (2004) noted that not only quantity put poor communities at a disadvantage but also quality. Hulton et al (2000) indicated that a woman with a complication is likely to delay or avoid accessing care from a health facility where she has experienced a disrespectful treatment.

IV. Ecological Effects on Accessing Health Care

Other ecological characteristics, including climate, soil, rainfall, temperature, altitude and seasonality also operate through the personal and household characteristics to influence maternal health care uptake. In rural subsistence communities, ecological

characteristics highly influence incomes, accessibility and delivery of services, particularly community outreach health programmes which serves mainly rural and deprived urban communities. Affordability of services is likely to be low during the lean season, when farm yields are low. Inaccessible roads during the raining season influence the accessibility and delivery of services to communities with poor road networks, crucially where outreach health care is the main source of health care (Hulton et al, 2000). Stephenson et al (2004) reported a significant positive association between mean annual rainfall of a community and the odds of delivering in a health facility in Kenya. Nonetheless, this association could also be negative, particularly in localities with poor road networks.

In summary, the decision to seek care, therefore does not only depends on the overall care, but ranges from the actual decision to care on the part of the individual and her family, to delays in reaching an adequate health facility and finally, delays in receiving adequate care at the facility. Factors that influence delays in seeking care, which includes, accessibility of facilities, condition of roads, adequacy of referral systems and shortage of supplies, inadequate facilities, attitude and competence of health personnel operate collectively to influence care seeking and maternal health outcomes. These factors drive the three delays discussed in Thaddeus and Maine (1994).

2.3.3 Government Policies and Action on Health Provision

Government policies and action in provision and financing health care has highly contributed to the growing inequalities in accessing health care in sub-Saharan Africa. Health care expenditure and recovery of health care cost are some of the government policies in sub-Saharan Africa that has influenced and created high inequalities in uptake of health care including maternal health care. Research evidence shows that most income-earning opportunities and the hospitals that consume large proportions of health budget are concentrated in cities and big towns (Ensor et al 2001, World Bank 1999 and Kwast 1989). It has been estimated that in some countries of sub-Saharan

Africa about 75 percent of the overall health budget is used for hospitals located in urban areas, while only 25 percent goes to primary-health care services that serve rural areas (Magadi 2003).

In the mid 1980s most sub-Saharan African governments introduced cost recovery programmes intended at recovering the full cost of health provision in public health institutions as a means of improving efficiency and the financial sustainability of the health care system. The introduction of user fees further widened the inequality gap in the seeking of health care. Uptake of health care was reported to reduce after the introduction of user fees, with people not willing to pay fees for services particularly when quality of services were not improving (Goodburn and Campbell 2001, Alderman and Lavy 1996 and Levin et al. 1999). Kutzin (1993) reported that poorer women tend to have a greater burden of ill health, yet they use health services to a lesser extent than their well-to-do counterparts due to their inability to afford user fees. A household study in Cote d'Ivoire and Peru by Gertler and Van der Gaag (1990) revealed that user fees deterred women from poorer socio-economic backgrounds from seeking delivery care than their richer counterparts. These women may delay seeking treatment until serious complication develops, with possible life threatening consequences.

It has been argued that the cause of the slow progress in reaching some of the MDGs including reduction in maternal mortality is attributable to low government health spending. In Ghana, government allocation to the Ministry of Health declined from $10 per capita in 1978 to $6 per capita in 2001 (MoH 1996, 2002). There have been quite a lot of arguments whether extra government spending will have an effect on reducing mortality particularly in sub-Saharan Africa. However, evidence suggests that with good governance, quality country policies and institutions, extra government spending can make a difference in reducing mortality (Burnside and Dollar 2000 and Rajkumar and Swaroop 2002). Good health sector policies and increased government spending is believed to boost both the public and private sector health provision through improved financing, coverage and availability of needed inputs (Wagstaff and

Claeson 2004). Government policies on infrastructural developments, transportation, energy, agriculture and water and sanitation can also impacts on the health sector and improve health service delivery (Wagstaff and Claeson 2004).

2.3.4 Health Status of Women and the HIV/AIDS Pandemic

Health status prior to and during pregnancy has been identified to be one of the factors that have an important influence on the chances of a woman developing and surviving a complication (McCarthy and Maine, 1992). According to Royston and Armstrong (1987), the leading pre-existing health conditions that are aggravated by pregnancy and delivery and account for approximately a quarter of maternal deaths in developing countries are malaria, hepatitis, anaemia, and malnutrition. In some instances the presence of some of these pre-existing conditions do not operate independently, but may result or influence the presence of other risk factors, including the two pre-disposing factors, thereby increasing a woman's risk of dying (see Figure 2.2).

The HIV/AIDS pandemic in sub-Saharan Africa has added additional challenges to maternal health care initiatives. UNAIDS/WHO (2004) estimate shows that worldwide about 39.4 million people are infected with HIV/AIDS. Of this number about 65 percent are in sub-Saharan Africa. Women constitute about 57 percent of HIV/AIDS victims in sub-Saharan Africa. In countries like South Africa, Zambia and Zimbabwe women are six times more likely than men to be infected (UNAIDS/WHO 2004). Woman's vulnerability to HIV/AIDS is attributable not only to biological differences, but also to deeply entrenched socio-economic inequalities that further compound their susceptibility. Bicego et al (2002) documented that HIV/AIDS further elevates the risks of direct and indirect maternal deaths. It is estimated that HIV prevalence among pregnant women ranges from 5 percent in most West African countries to about 28 percent in South Africa and 37 percent in Botswana and Swaziland (Raisler and Cohn 2005). In a study in Rakai, Uganda, maternal mortality ratio was estimated at 1687 and 310 per 100,000 live births among HIV-positive and

HIV-negative women respectively (Sewankambo et al 2000). Bicego et al (2002) estimated mortality ratio of 4389 and 2100 per 100,000 live births among HIV-positive women in Malawi and Zimbabwe respectively. This is an indication that communities with high HIV/AIDS prevalence are more susceptible to maternal deaths and illness.

A study of pregnant adolescents visiting antenatal care services in the Chikwawa District of Southern Malawi found that of 123 adolescents who tested for HIV 27 percent were HIV positive (Brabin et al 1998). Gregson et al (2002) using a comparative parallel cross-sectional population and antenatal survey data from rural Zimbabwe reported a 26 percent (n=576) HIV prevalence in recently pregnant women and 26 percent (n=5138) in all women aged 15-44 years. Meda et al (2001) monitored the trends of the HIV epidemic between 1995 and 1999 among pregnant women in the Bobo-Dioulasso town of Burkina Faso and found that among antenatal clinic attendees, HIV prevalence was 7.5% (n=401) in 1995, 10% (n=200) in 1996, 7.6% (n=448) in 1997, 8.4% (n=642) in 1998 and 5.3% (n=716) in 1999. Kwesigabo et al (2000) investigating dynamics of HIV infection prevalence and incidence in the Kagera region of Tanzania using antenatal-clinic-based sentinel surveillance system reported a decreased prevalence among antenatal care attendees from 22.4% in 1990 to 16.1% in 1993 and further to 13.7% in 1996.

Evidence emerging from the selected publications indicates that the HIV pandemic is posing a grave challenge to maternal health initiatives in sub-Saharan Africa. The already stretched financial and human resource base of the health sector in sub-Saharan Africa is breaking down due the magnitude of the epidemic and its intervention requirements (Raisler and Cohn 2005, Desgrees du Lou 1999).

2.4 THE GHANA SITUATION

2.4.1 The State of Maternal Health and Maternal Care in Ghana

I. The State of Maternal Health

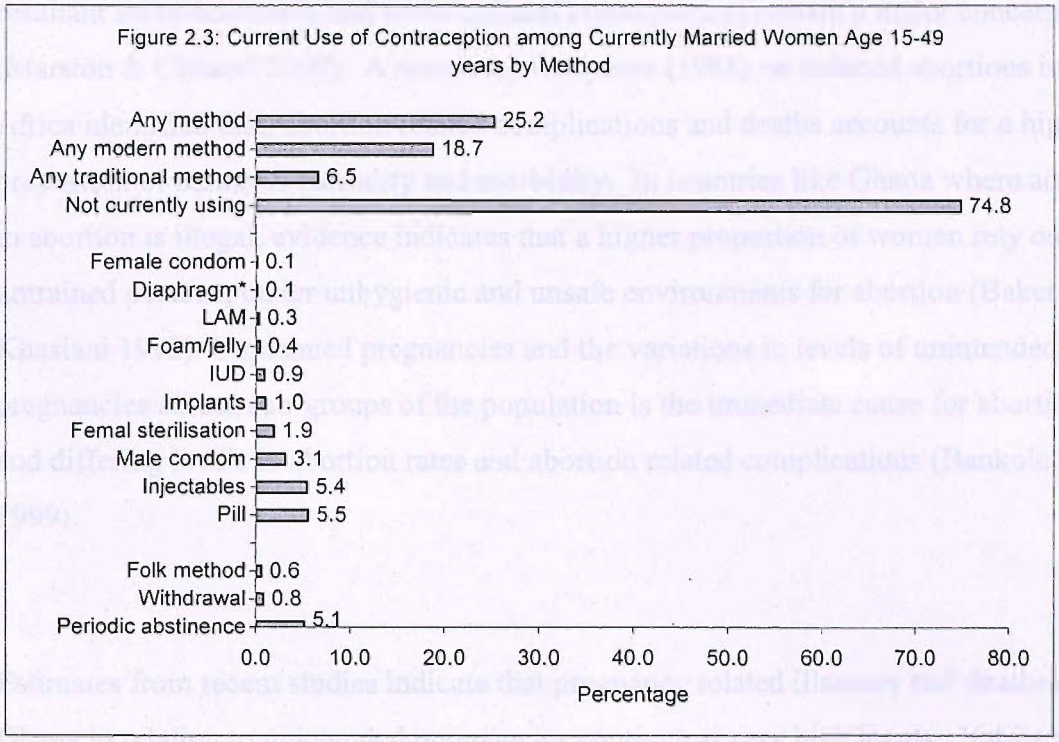
Ghana is categorised among group *E* countries by the WHO, UNICEF and UNFPA (Hill et al, 2000). This implies Ghana does not have direct reliable data on maternal mortality. Nonetheless, recent estimates show that maternal mortality rates in Ghana are unduly high and remain an unsolved tragedy, despite the established fact that most causes of maternal deaths are preventable. WHO/UNICEF/UNFPA (2004) estimates of maternal mortality rates in 2000 shows that out of every 100,000 live births in Ghana about 540 mothers die compared to 41 in Malaysia, 30 in Singapore, 33 in Cuba and 24 for European nations. Ghana's high maternal mortality rate may be due to gaps in antenatal care utilisation, lack of proper supervision during delivery and inadequate postnatal care. High fertility rates, unplanned pregnancies, malnutrition and harmful traditional practices may also contribute to Ghana's high maternal mortality rate. Areas where these practices influence maternal health needs to be identified and targeted with the appropriate interventions.

At a symposium on Safe Motherhood in Accra, Ghana, it was reported that there are five main preventable causes of maternal deaths in Ghana (The Daily Graphic 2002). These are severe bleeding with shock, infection arising from the womb, complications arising from unsafe abortion, hypertensive complication and ruptured uterus. Studies such as Ngom et al (1999) identified abortion as the leading case of maternal deaths in Ghana. A collaborative research by the University of Ghana, the Korle-Bu Teaching Hospital, the University of Michigan (USA) and the Multi-disciplinary African Women's Network in a study in the City of Accra in 2001 reported abortion as the leading cause of maternal deaths in the city (The Daily Graphic 2001). The Panos

Feature Services (1999) documented that approximately 1,200 women die each year in Ghana from induced abortions. Factors that have been identified to explain the high levels of maternal mortality in Ghana include high disease burden during pregnancy, delays in seeking care, and lack of adequate health facilities to manage serious obstetric complications (Appiah-Kubi 2004).

II. Pregnancy Planning

Demographic and health surveys in Ghana in the 1990s and early 2000 revealed that about 65 percent of fecund married women with an intention to postpone or limit childbearing do not contracept. However, fertility intentions do not translate into reality. Contraceptive methods remain the well-known and most reliable methods to avert conception. Although they do not cancel out entirely the chances of conceiving (Fu et al. 1999, Ranjit et al. 2001), contraceptives minimize the risk of conception of sexually active women. Despite the high desire to postpone or limit childbearing and the overwhelming evidence of the almost universality of contraceptive knowledge (over 90.0%) only 25 percent of married women in Ghana contracept, of which only 19 percent use modern methods (GSS, NMIMR and ORC Macro 2004). This is a clear indication that a high proportion of women in Ghana have an unmet need for spacing and limiting. Figure 2.3 below shows current contraceptive use among currently married women aged 15-49 years by method.



Source: 2003 Ghana Demographic and Health Survey
*Diaphragms are no longer available in Ghana (GSS, NMIMR and ORC Macro 2004)

Demographic and Health Surveys in Ghana shows that Ghana's fertility declined from 6 births per woman in the 1993 GDHS to about 4.4 at the time of the 2003 GDHS (GSS and Macro International 1994 and GSS, NMIMR and ORC Macro 2004). This remarkable decline has been attributed to various factors including improved economic status and female education, child survival, and increased use of modern methods of contraception. Nonetheless, unintended fertility still accounts for a substantial proportion of Ghana's total fertility. Ghana's TFR would have been about one birth less if all unwanted births had been avoided (GSS and Macro International 1994, 2004).

Abortion complications resulting from unintended pregnancies have been acknowledged as a major cause of maternal morbidity and mortality (Baker and Khasiani 1992; Campbell et al 1995; Bankole et al. 1999; GSS, Health Research Unit [MoH] and ORC Macro 2003). The prevalence of unintended pregnancies - associated adverse abortions, high maternal morbidity and mortality related complications and the

resultant socio-economic and socio-cultural consequences remain a major concern (Marston & Cleland 2000). A review by Coeytaux (1988) on induced abortions in Africa identified that, abortion related complications and deaths accounts for a high proportion of maternal mortality and morbidity. In countries like Ghana where access to abortion is illegal, evidence indicates that a higher proportion of women rely on untrained persons, under unhygienic and unsafe environments for abortion (Baker and Khasiani 1992). Unplanned pregnancies and the variations in levels of unintended pregnancies across sub-groups of the population is the immediate cause for abortion and differing levels in abortion rates and abortion related complications (Bankole et al. 1999).

Estimates from recent studies indicate that pregnancy related illnesses and deaths in Ghana in relation to unintended pregnancies continue at very high levels. Nabila and Fayorsey (1996) using hospital records from Ghana reported that 13 percent of all maternal deaths were due to abortions. A study by Taylor and Abbey (1994) using hospital records in a hospital in the Eastern region of Ghana identified that 20 percent of hospital admissions were due to abortion related complications. The adverse socio-economic and socio-cultural consequences of unintended pregnancies such as infertility, isolation, abandonment and poverty and its effects on the health and livelihood of surviving children has been documented by Wall (1998), Family Care International (1999), Bangser et al. (1999) and Ravindran et al. (1999).

III. Pregnancy Care

Previous studies have shown that gynaecological complications resulting from inadequate pregnancy care is a major cause of direct obstetric deaths (Hulton et al. 2000; Kane et al. 1992; WHO 1998). The continuum of pregnancy care (antenatal, perinatal and postnatal) is essential in preventing adverse pregnancy outcomes. In Ghana, uptake of antenatal care is very high. The 2003 DHS reported an increment in the proportion of mothers receiving antenatal care from a doctor, nurse or midwife to

92 percent from 87 percent in 1998. Antenatal care is high in both urban (97.9%) and rural Ghana (90.6) but only 14 percent of antenatal care in rural Ghana is provided by a doctor compared to 34 percent for urban Ghana (GSS, NMIMR and ORC Macro 2004). Nurses provide about 64 percent of all antenatal care in Urban Ghana and 75 percent in Rural Ghana (GSS, NMIMR and ORC Macro 2004). The high uptake of antenatal care in Ghana may be due to outreach programmes undertaken by Community Health Nurses. The World Health Organisation (WHO) recommends a minimum of 4 antenatal care visits per pregnancy. The 2003 DHS shows that only 69 percent of mother had four or more visits with only 46 percent receiving antenatal care in the first trimester.

Delivery care has been associated with high levels of maternal mortality and morbidity (UNFPA 1999). A great proportion of maternal deaths occurring during delivery as documented by the literature are preventable. The use of unskilled attendants at delivery has been identified to be associated with high pregnancy related deaths (AbouZahr 1998; Hulton et al 2000; Shiffman 1991; Bulatao and Ross 1991; Hill et al 2004; Robinson and Wharrad 2001). In developed countries where skilled attendants attend about 99 percent of deliveries, birth related deaths are relatively low compared to developing countries where skilled attendants attend only 42 percent of deliveries (WHO, 1997).

In Ghana, institutionalised deliveries are less common. Results of the 2003 DHS shows that the proportion of births attended by trained medical personnel (doctors, nurses and midwifes) constitutes 47 percent of all births, an improvement of only 3 percent from 1998. More than half of all births recorded in the 1998 and 2003 DHS occurred at home under the supervision of unskilled attendants. Medically trained attendants attend 80 percent of all deliveries in urban areas compared to only 31 percent in rural areas. This clearly depicts an inequality in health care provision between rural and urban Ghana.

Another component of pregnancy care essential for the survival of the mother is postnatal care. Postnatal care is essential for monitoring and treating complications resulting from delivery. Research evidence shows that most maternal deaths occur within two days of delivery. This is an indication of the importance of receiving postnatal care. The most recent DHS report for Ghana (2003) shows that only 25 percent of mothers (26% in urban and 25% in rural) received postnatal care within 2 days of delivery, with more than 50 percent of women not receiving any postnatal care.

IV. HIV/AIDS in Ghana

National levels of HIV/AIDS infections in Ghana are estimated to have risen from 2.4 percent in 1994 to about 3.1 percent in 2003 (UNAIDS 2004). Although national-level trends of the epidemic in Ghana has shown a different pattern (slow growth) evidence shows that HIV infections observed at antenatal site in some communities follow a gradient similar to those seen in countries with advanced epidemics (Schierhout et al 2003). The 2003 Ghana HIV Sentinel Survey reported that HIV prevalence rate at antenatal sites ranged from 0.6 percent in Nalerigu in the Northern region to 9.2 percent in Agomanya in the Eastern region (Ghana AIDS Commission 2004). UNAIDS (2004) estimates show that of the 320,000 adults aged 15-49 infected with HIV/AIDS in Ghana, more than 56 percent are women.

Although HIV/AIDS in Ghana has not reached an epidemic stage, it is already putting a lot of strain on the already stretched health resources in the country due to its intervention requirements. There is also the fear that the prevalence in Ghana can surge and reach epidemic stage given all three countries surrounding Ghana (Cote d'Ivoire, Burkina Faso and Togo) have reached epidemic prevalence (Buve, Bishikwabo-Ngarhaza and Mutangadura 2002). This will have a great impact on the already strained maternal health initiatives in Ghana.

2.4.2 The Health System in Ghana

Before the introduction of modern health care by the British in the 19th century, African traditional medicine was the health care system practiced in Ghana. Ghana's health system presently constitute a three tie structure – national, regional and district, with the district level being the focal point. The national level constitutes the Ministry of Health (MoH) and Ghana Health Service (GHS). The MoH is responsible for policy formulation, monitoring and evaluation of progress in achieving targets. The GHS is responsible for allocation of resources and creation of partnership with the private sector. At the regional level, the 10 Regional Health Administrations serve as a link between the national and district levels and is mainly responsible for allocation of resources within the region. At the district level, the District Health Management Team (DHMT) is tasked with operational planning and implementation of services within the district, focusing on health facilities including hospitals, health centres, health post and clinics.

The 2002 Ghana Service Provision Assessment Survey (GSPAS) documented that there are 2,262 health facilities countrywide. These comprise 292 hospitals, 622 health centres/post and 1348 clinics (GSS, Health Research Unit (MoH) and ORC Macro 2003). There are 10 regional hospitals (one in each region), 75 district hospitals, 262 maternal and child health centres, 12 university hospitals and several other quasi government, religious and private health institutions (GSS, Health Research Unit (MoH) and ORC Macro 2003). The MoH is in charge of 49 percent of all health institutions in Ghana. Private medical practitioners accounts for 41 percent of health institutions. Christian health associations own 8 percent of health institutions, while quasi government institutions including universities, the military, the police and prison service are in charge of two percent. The 2002 GSPAS shows that the three northern regions of Ghana are most disadvantaged in distribution of all health institutions. Only six percent of all health institutions are in the Northern region of Ghana, four percent in the Upper East and Upper West compared to 18 percent in the Ashanti region and 15 percent in the Greater Accra region (GSS, Health Research Unit (MoH) and ORC

Macro 2003). Doctor population ratio for Ghana is 1:16,587 (MoH 2002). This ranges from 1:4,317 in the Greater Accra Region to 1:64,000 in the Northern Region (MoH 2002). This shows a wide disparity in access to health care in Ghana.

2.4.3 Government of Ghana Policy Initiatives to Bridge the Inequality Gap in Maternal Health Care Uptake

The Government of Ghana (GoG) in partnership with international organisations have implemented several programmes and actions aimed at bridging the inequality gap in health care delivery, empowering women and improving maternal health. While some of these policies have directly targeted maternal health, others have indirectly targeted improvements in maternal health through economic empowerment, education and improved basic public facilities. Most of these policy initiatives have been rooted on targets (become an upper middle income country by 2020) set out in the Ghana Vision 2020 agenda developed in 1993. These initiatives include the revision of the Ghana National Population Policy and the Medium Term Health Strategy/Five-Year Programme of Work. The Ghana National Poverty Reduction Programme, the National Safe Motherhood Programme, the Decentralisation of the Health Sector Act, and recently the introduction of the National Health Insurance Scheme. Table 2.2 below demonstrates some of the policies and actions undertaken in Ghana to improve maternal health care. See Campbell (2001) for international policies that have been aimed at improving maternal health in developing countries and the international actors involved in driving these policies.

Table 2.1: Policies and Actions to Improve Health Care in Ghana

Policy	Year of inception	Actors	Indicator/Goals	Observation
Revised Ghana National Population Policy	1994	Government of Ghana/ National Population Council	• Reduce the high rates of infant, child and maternal morbidity and mortality • Promote safe and effective fertility management • Promote reproductive and sexual health for all	Recent estimates suggests that these targets are yet to be achieved
The Medium Term Health Strategy: Five-Year (1997 – 2001) Programme of work	1997	Ministry of Health, Ghana	1997 to 2001 targets: • Reduce IMR from 66 to 50 per 1000 live births • Reduce U5MR from 132 to 1000 per 1000 live births • Reduce MMR from 214 to 100 per 100,000 live births • Increase life expectancy from 58years to 60 years • Reduce fertility growth rate from 3 to 2.75 • Reduce TFR from 5.5 to 5.0	Estimates from the recent GDHS shows that all the mortality targets were not achieved.
The Medium Term Health Strategy: Five-Year (2002 – 2006) Programme of work	2002	Ministry of Health, Ghana	• Bridge the inequality gap in health care delivery through reducing financial barriers and geographical access to health services	On-going

Table 2.1 Cont.: Policies and Actions to Improve Health Care in Ghana

Policy	Year of inception	Actors	Indicator/Goals	Observation
The Ghana National Poverty Reduction programme	1995	Inter-Ministerial Committee on Poverty Reduction (IMCPR): • Health, Finance, Education, Employment and social welfare, Local Government and Rural development, the Agriculture and Infrastructure ministries. • The National Council for Women and Development; and, • The National Development Planning Commission	Health Targets • Improve access to basic health facilities • Drop in rural child malnutrition from 28% to 24% • Decline in infant mortality rate from 57 to 52 per 1000 live births • Decline in under-five mortality from 108 to 95 per 1000 live births. • Targeted 50 percent share of supervised deliveries by 2001 • Improvements in exemptions for fees and charges.	On-going/Recent GDHS estimates suggests that the targets on maternal health were not achieved
The National Safe Motherhood Programme	1995	The Ghana Health Service (GHS), Ministry of Health (Ghana), USAID and IntraHealth International	• Reduce the high levels of maternal mortality and morbidity through improving quality and coverage of maternal health services and increase awareness about maternal health issues in communities. • Provide assistance to strengthen the training, supervision and referral capacity of MoH Regional Resource Management Teams	On-going

Table 2.1 Cont.: Policies and Actions to Improve Health Care in Ghana

Policy	Year of inception	Actors	Indicator/Goals	Observation
Decentralisation of the Health Sector Act	1996	Government of Ghana	• Delegate power to Regional Health Administrations, District Health Administrations and sub-Districts in allocation of resources, operational planning and implementation of services. • Reduce inequalities in health delivery and improving the health status of the people	Faced a number of challenges • Under resourcing and funding of decentralised units • insufficient staffing • inadequate training • poor management • insufficient management systems and procedures
National Insurance Health Scheme	2004	Government of Ghana	• To offer affordable health care, especially to the poor and vulnerable	On-going

2.4.4 Financing Health Care in Ghana

Ghana's health sector is financed through government and donor contributions. The health sectors share of total expenditure as a percentage of GDP increased from 4.1 percent in 1997 to 4.7 percent in 2001, translating to per capita expenditure equivalent to about US$6 in 2001 (WHO 2005). This is low even by sub-Saharan African standards. As at 2001 government expenditure constitutes about 60 percent of total health expenditure, with the remaining 40 percent from the private sector. Overall general government expenditure on health as a percentage of total government expenditure declined from 9.4 percent in 1997 to 8.6 percent in 2001.

In order to generate enough funds to ensure efficiency and the financial sustainability of the health care system the Government of Ghana with the support of the World Bank and the International Monetary Fund (IMF) introduced the *"cash and carry system"* in 1985 as a means of recovering the full cost of health provision in public health institutions. The Hospital Fees Regulation set the fees to be charged for consultation, laboratory, medical, surgical and dental services, hospital accommodation and other diagnostic procedures. The Hospital Fees Regulation also specified that hospital drug fees should cover full cost of drugs. It was reported that the introduction of user fees in Ghana further widened the inequality gap in seeking health care (Waddington and Enyimayew 1990). The cash and carry system has also received a lot of criticisms, although multilateral agencies such as the World Bank and IMF dispute these critics. A quote by a Ghanaian medical practitioner, in the State of the World News Internationalist magazine 287 states:

"The system (cash and carry) is stinking and dehumanising. Patients who do not have the ability to pay for medical services are turned away from hospitals only to die at home. The poor, the disabled and accident victims are asked to pay on the spot before getting medical attention. This system has no human face. Our health service is in confusion".

The introduction of the 5YPOW set out a new budgeting strategy for financing the health sector in Ghana, which was suppose to increase the health sector share of the government's budget as a percentage of GDP from 5.9 percent in 1997 to 7.3 percent in 2001. Nonetheless, WHO estimates as indicated earlier shows that the health sector share of the government's budget rose from 4.1 percent in 1997 to 4.7 percent in 2001, an indication of under achievement.

2.4.5 Cost of Maternal Care Services in Ghana

Cost of maternal health services has been one of the major barriers to use of services, even in communities where services are readily available. A study by Levin et al (1999) assessed the cost of maternal care services in the South Kwuhu District of Ghana. This section summarises the cost of maternal health services based on the South Kwuhu District case study.

The direct cost of routine services ranged from $2.46 for antenatal care at public health centre to $9.59 for vaginal delivery at public hospitals. The cost of antenatal care services ranged from $2.46 to $3.36, while cost of vaginal delivery ranged between $3.79 and $9.59. In health centres the average cost of antenatal care was between $2.72 and $4.92 in hospitals. There was a higher differential between hospital and health centres in cost of vaginal delivery; average unit cost was 43% higher at hospitals. The cost of drugs supplied ranged between $1.49 and $2.59.

Labour cost of caesarean section on average cost $12.55 at public hospitals and $8.65 in mission hospitals, while, materials needed for caesarean section cost on average $51.20 in public hospital and $38.02 in mission hospitals. Labour cost of post-abortion complication was $5.00 in public hospitals and $2.40 in mission hospitals. Materials needed for post-abortion complication on average cost $43.55 in public hospital and $41.80 in mission hospitals. For postpartum haemorrhage, labour cost

was on average $29.69 in public hospitals and $3.35 in mission hospitals. Materials for postpartum haemorrhage on average were identified to cost $36.48 in public hospitals and $25.78 in mission hospitals.

Services provided by community practitioners (private midwives and traditional birth attendants) differ from that provided by institutionalised health care providers and involve lower overhead costs. Cost of materials used by private midwives for antenatal care were about half those at health centres. Table 2.2 below shows the average unit cost of services provided by midwives and TBAs.

Table 2.2: Average Unit Cost of services Provided by Private Midwives and TBAs

	Private Midwife ($)	TBA ($)
Antenatal Care		
Labour	1.56	NA
Materials	1.13	0.16
Other personnel	0.33	0.14
TOTAL	3.02	0.30
Vaginal Delivery		
Labour	8.81	3.23
Materials	3.55	0.26
Other personnel	0.39	0.23
TOTAL	12.75	3.72

User fees are the highest total cost for maternal services per client. User fees makes up more than 75% of the total cost of maternal services. Cost of antennal care to clients varied from $0.61 at public hospitals to $3.15 at mission hospitals. The cost of first antenatal care visits was greater than subsequent visits by 27% in public health centres and 60% in public hospitals. Cost of vaginal delivery to clients on average ranged from $11.77 in public hospitals to $18.10 in mission hospitals. The average cost of caesarean section ranged from $66.97 in public hospitals to $111.750 in mission hospitals. The average user fees charged by community practitioners were $2.08 for antenatal care and $8.99 for delivery care. The range of charges for antenatal care by private midwives was $1.04 -$8.33 and $1.46-$14.58 for delivery care. Delivery care charges by TBAs ranged from $1.25 to $9.38.

In Ghana it is estimated that about 79 percent of the population live on less than two US dollars a day (UNDP 2003). Forty-five percent live on less than one US dollars a day, with 40 percent living below the national poverty line (UNDP 2003). Given the economic status of the people, the cost of maternal health care documented by Levin et al (1999) will no doubt be high for a substantial proportion of the population. It is therefore not surprising that economic vulnerability may pose a high inequality in use of health services.

2.5 TACKLING THE MATERNAL HEALTH CHALLENGES AND INEQUALITIES: THE DISTRICT APPROACH

The demand for district (local) level statistics has increased over the past few years, due to the growing interest in local-level participation in the developmental process in sub-Saharan Africa. Governments, policy makers, planners and businesses have expressed very high interest in local-level statistics for local level policy planning, implementation, monitoring and evaluation of activities. Developed country governments have used local level statistics to implement several developmental projects (see Chapter Three). Local level statistics has been used mainly in the field of health, agriculture, income and poverty initiatives and assessing labour force participation.

In sub-Saharan Africa, local level governance has been heralded as a major strategy for improving the well being of the people and encouraging grass-root participation in developmental activities. Nonetheless, local level statistics to aid policy formulation, implementation, monitoring and evaluation of the developmental process are non-existent. According to the 2004 State of World Population Report by UNFPA, high on the list of global safe motherhood priorities is a district sector approach to safe motherhood initiatives. International organisations such as the WHO, UNICEF and the World Bank have also placed emphasis on the importance of a district approach to promoting safe motherhood (UNFPA 2004). The main agenda is promoting district-

level access to family planning services to reduce unintended pregnancies and improving overall quality and capacity of health institutions (UNFPA 2004).

Nonetheless, local-level studies on maternal health care in sub-Saharan Africa have only focused on a few districts (one or two districts). The inability of these studies to capture inequalities that exist between and within communities nationwide in health care delivery, does not aid the process of identifying target groups with prioritised needs. Some of the recent district-level studies on maternal health in sub-Saharan Africa include Urassa et al (1997), MacLeod and Rhode (1998), Ngom et al (1999), Orach (2000), Zezai (2001), Smith et al (2001), Kyomuhendo (2003), Stekelenburg et al (2004) and Uzochukwu et al (2004).

Although these studies give a good insight into maternal health issues and challenges within districts across sub-Saharan Africa, it does not demonstrate the extent of inequalities that exist between districts nationwide. Zezai (2001) noted significant inequalities in uptake of maternal health care in the eight districts of the Midlands Province of Zimbabwe. These inequalities may even be wider nationwide and needs to be investigated. There is a clear indication that studies with the ability to capture inequalities nationwide will aid identification of vulnerable groups and their specific needs as well as aid interventions, monitoring and evaluation of the success of Safe Motherhood Programmes. It will aid central government allocation of health funds and regional administrators planning and execution logistics to districts.

2.6 SUMMARY

Levels of maternal deaths and illnesses continue to be unacceptably high in Ghana and sub-Saharan Africa as a whole. Research evidence shows that inadequate pregnancy planning and pregnancy care, coupled with lack of access to basic health facilities are mainly responsible for the high levels of maternal deaths and illnesses in sub-Saharan

Africa. The literature shows that maternal health initiatives in sub-Saharan Africa are faced by several challenges. These include socio-economic factors, equity in health provision and financing and government policies on health care provision. The HIV/AIDS pandemic in sub-Saharan Africa in recent times has also become a major challenge to maternal health initiatives. Developing country governments, with the aid of international donor organisations have initiated several policies and programme to counter these challenges. However, most of these policy initiatives have not achieved their set targets. The progress so far made in improving maternal health in sub-Saharan Africa suggests that a greater proportion of countries in sub-Saharan African are not going to reach the 5th MDG by 2015.

In recent times, governments and international organisations such as the WHO, UNICEF, UNFPA, the World Bank, and the International Monetary Fund have emphasised on a district sector approach to Safe Motherhood Programmes. The decentralisation of governance and health sector in most countries of sub-Saharan Africa has been aimed at eliminating or reducing inequalities in accessing basic public health facilities including maternal health. Despite all these proposals over the years, research that captures nationwide inequalities between and across communities on maternal health care is non-existent in sub-Saharan Africa. Statistics at the district level that will be used to monitor and evaluate local level programmes on maternal health are also non-existent. Therefore, studies with the ability to capture inequalities nationwide and produce district level statistics will aid identification of vulnerable groups and their specific needs. This will also aid interventions, monitoring and evaluation of the success of the proposed district-level Safe Motherhood Programmes. These studies will also aid central government allocation of health funds and regional administrators' health planning activities and distribution of resources.

CHAPTER THREE

3.0 DATA AND METHODS

3.1 INTRODUCTION

This chapter describes the sources of data and methods of data analysis adopted for the study. Two main sources of data are used in this study: the Ghana Demographic and Health Survey (1998 and 2003 GDHS) and the 2000 Ghana Population and Housing Census (GPHC). The methods adopted for the analysis are Multilevel Logistic Regression Models. An Empirical Best Linear Unbiased Predictor (EBLUP) extension of the Fay-Herriot Model for small area analysis is adopted for deriving age by district estimates of proportions of women exposed to unintended pregnancies and home deliveries.

3.2 DESCRIPTION OF DATA

3.2.1 The Ghana Demographic and Health Survey

There have been four DHS in Ghana (1988, 1993, 1998 and 2003). The data for this study comes from the third (1998) and fourth (2003) surveys. DHS are nationally representative surveys aimed at collecting information on demographic and health indicators including information on fertility, family planning, infant and child health, maternal health, nutrition, HIV/AIDS/STIs and reproductive health.

The 1984 GPHC listing of Enumeration Areas (EAs) also referred to as Primary Sample Units (PSUs) was the sample frame for the third GDHS while the 2000 GPHC

PSUs forms the sample frame adopted for the fourth GDHS. Both the third and fourth GDHS sample was weighted independently to adjust for over sampling in the three northern regions of Ghana: Northern, Upper East and Upper West Regions and also the Brong-Ahafo Region in the fourth GDHS. The sample selection approach adopted for the 1998 and 2003 GDHS was a two-stage sampling of households. The fist stage comprised of sampling of 400 PSUs (138 urban and 262 rural) for the 1998 GDHS and 412 PSUs (174 urban and 238 rural) for the 2003 GDHS using systematic sampling. At the second stage, using systematic sampling, households were selected from each of the selected PSUs in all regions. For both 1998 and 2003 GDHS, 15 households were selected from each of the sampled PSUs in each region, except the Northern, Upper East and Upper West regions where 20 households were sampled from each of the sampled PSUs. In the 2003 GDHS, 20 PSUs were also sampled from the Brong-Ahafo region. Overall, interviews were successfully completed for 4,843 women aged 15-49 and 1,546 men aged 15-49 from 6003 households covering 400 PSUs in the 1998 GDHS. The 2003 GDHS covered 5,691 women aged 15-49 and 5,015 men aged 15-59 from 6251 households covering 412 PSUs throughout Ghana.

3.2.2 The 2000 Ghana Population and Housing Census

The 2000 GPHC is the most recent census information in Ghana. The census information, apart from its use for descriptive and analytical statistics, is also used as the base for sampling designs and field operations for surveys. The 2000 GPHC forms the sampling frame for the 2003 GDHS. It is therefore a rich source of contextual data for explaining spatial effects and suitable auxiliary information for deriving small area demographic and health statistics.

The 2000 GPHC is the fourth post-independence census in Ghana, following the 1960, 1970 and 1984 Censuses. The time-gap between preceding censuses is an indication that censuses in Ghana are becoming less regular. Thus, using recent census information to derive small area estimates from regularly conducted surveys would be an important source of statistics for governments, planners and policy makers.

The 2000 Census with the slogan ***Get Involved and Be Counted*** *because* ***Everyone Counts*** started on 20th of March 2000 with the listing of housing/dwelling structures and the enumeration of people in confinements (hospitals, prisons and boarding schools). The main field operations started on census night 26th of March 2000. The 2000 Census covered information on demographic characteristics, access to health and communication facilities, socio-economic development and dwelling types. Although a detailed description of the field operation of the 2000 Census would have been of much interest in this chapter, the information is yet to be published by the Ghana Statistical Services. Nonetheless, this does not affect the estimation procedure adopted for the analysis.

3.2.3 Outcome Variables

The inadequacy of maternal mortality data in less developed settings has been widely reported (AbouZahr and Wardlaw 2001). In addition, it is reported that maternal mortality does not provide the needed information to inform planning and monitoring of safe motherhood activities (Ronsmans et al 2002). This study does not focus on maternal mortality per se. Rather it focuses on two pre-disposing factors that exacerbate the risk factors associated with maternal deaths and illnesses: (1) pregnancy planning intentions and (2) uptake of delivery care, which reflects access, use and unmet need for maternal health care. Most surveys have used binary outcomes to describe the relationship between the desire for a child or not, the use and non-use of contraceptives, institutional and non-institutional deliveries and the background characteristics of respondents. In this study, polychotomous responses are derived to investigate the spatial inequalities that exist between and across PSUs in pregnancy planning and uptake of delivery care in Ghana. See Chapters Four and Five for the multi-category classification of the outcome variables.

3.2.4 Explanatory Variables Used in the Analysis

The explanatory variables used in the analysis are classified into: (1) geographic variables; (2) individual woman-level variables; (3) household-level variables; and, (4) contextual variables. The geographic, individual woman-level and the household-level variables are derived from the 1998 and 2003 GDHS, while the contextual variables are derived from the 2000 GPHC. The contextual variables derived from the census were: (1) composite score of the socio-economic development of a PSU; (2) a composite score of the socio-economic development of a district; (3) composite score of access to health facilities at the district level (distance to the nearest health facility derived from the 20 largest communities in a district); and the Total fertility Rate (TFR) of a district.

The contextual variables were used to examine the effect of areal characteristics on pregnancy planning behaviour and uptake of delivery care in Ghana in Chapters Four and Five. In Chapter Six the contextual variables were used as auxiliary information to derive district-level estimates of exposures to unintended pregnancies and uptake of home delivery care. Since data on access to health facilities and TFR for the 412 PSUs (enumeration areas) sampled in the 2003 GDHS were not available, the composite scores for the districts were used as proxy variables for distribution of health facilities and TFR. The geographic, individual woman-level and household-level variables used in the analysis and their categorization are described in Chapters Four and Five. The following section describes the derivation of the composite scores.

I. Derivation of Composite Scores

The composite scores were derived using Principal Component Analysis (PCA). PCA involves a mathematical procedure that transforms a number of correlated variables into a smaller number of uncorrelated variables called *Principal Components.* The new sets of variables (principal components) are a linear combination of the original

variables which are derived in decreasing order of importance, with the first principal component accounting for as much of the variability in the data as possible, and each succeeding component accounts for as much of the remaining variability. Suppose the data have p variables, $X_1, X_2....X_p$, for n PSUs or districts. The first principal component (Z_1) is a linear combination of these variables given by:

$$Z_1 = a_{11}X_1 + a_{12}X_2 + ...a_{1p}X_p$$

Where the coefficients $a_{11}, a_{12}, ...a_{1p}$ (factors loadings used to derive the scores) are chosen such that the variance of Z_1 is maximized. The covariance approach for deriving principal components was used in this analysis since all the variables used in the derivation are measured on the same scale. The first principal components are used to describe access to health services and levels of socio-economic development.

A Pearson Correlation Coefficient of 0.77, significant at $p < 0.01$ was observed between access to hospital and access to clinics. The correlation matrix of the socio-economic indicators (from the 2000 GPHC) for the 412 PSUs sampled in 2003 GDHS and 110 districts of Ghana are shown in Appendix One, Tables 1.1 and 1.2. The first principal component for access to health services explains 88 percent of the variability in the dataset, while the first principal component for socio-economic development at the PSU-level explains 59 percent and 67 percent at district-level.

Table 3.1 below presents descriptive analyses of the variables and their factor loadings used to derive the scores. With respect to socio-economic development, agriculture and no education have negative loadings, indicating that districts with high agricultural employment and high proportion of uneducated population tend to have low socio-economic development. It is worthwhile noting that over 60 percent of Ghana's population resides in agrarian PSUs, while almost 47 percent have no formal education, with only 13 percent having education beyond junior secondary level (GSS 2002).

Table 3.1: Description of variables and Component Matrix of First PC

Variables	Mean	Standard deviation	Loadings of first principal component
PSU-Level Analysis			
Socio-economic development (%)			
Literacy	51.1	25.2	0.834
Professional/Technical	8.1	8.1	0.580
Administration/Managerial	0.3	0.7	0.505
Clerical	4.5	4.4	0.895
Sales	14.4	13.9	0.773
Service	6.1	7.4	0.586
Agriculture	49.4	33.5	-0.968
Production	8.6	7.1	0.418
Other sectors	8.7	8.2	0.691
Students	31.6	15.2	0.544
District-Level Analysis			
Socio-economic development (%)			
Literacy rate	50.1	18.3	0.887
No education	45.9	17.4	-0.848
Pre-school	4.1	1.3	0.618
Primary	20.4	4.8	0.522
Middle/JSS	19.7	8.9	0.784
Secondary/SSS	4.6	2.1	0.931
Vocation/Technical/Commercial	1.9	1.2	0.914
Post Secondary	1.8	0.7	0.847
Tertiary	1.6	1.0	0.808
Professional/Technical	5.0	2.3	0.945
Administration/Managerial	0.2	0.2	0.831
Clerical	2.9	2.1	0.943
Sales	10.6	6.8	0.857
Service	4.7	2.2	0.835
Agriculture	61.5	18.3	-0.935
Production	13.7	6.2	0.758
Other sectors	1.4	1.0	0.522
Level of Urbanization	30.8	22.6	0.760
Access to health services (Km)			
Distance to nearest hospital	16.5	12.50	0.939
Distance to nearest clinic	4.52	4.05	0.936
Distance to nearest traditional health facilities	0.82	1.00	0.120

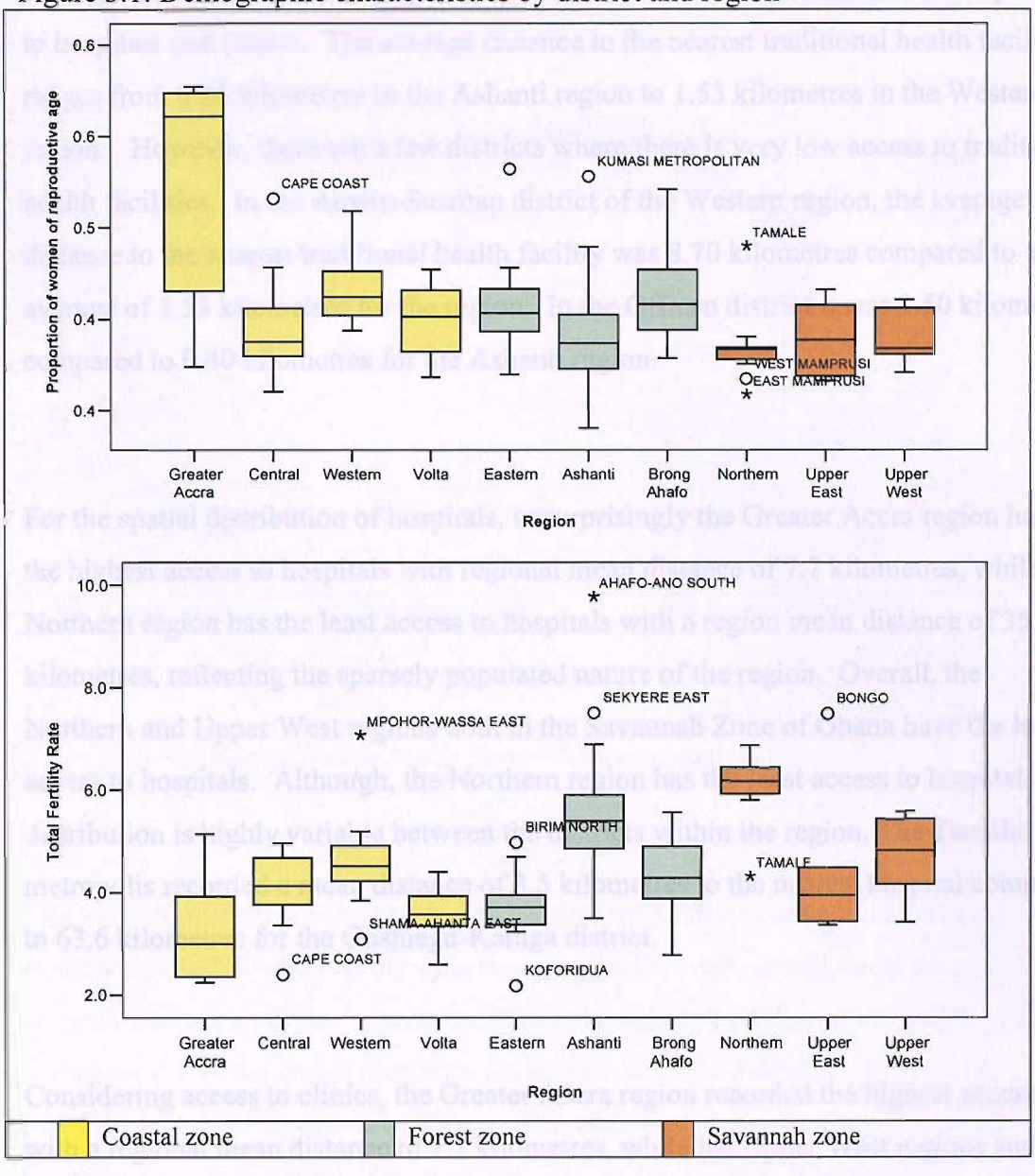
II. PSU /District Characteristics

A. Demographic Characteristics

Figure 3.1 below shows some demographic characteristics of the 110 districts by the 10 regions of Ghana. Analysis of data from the 2003 Ghana Population and Housing Census shows that 47.3 percent of women in Ghana are of reproductive age (15 – 49 years). The Greater Accra region had the highest proportion of women of reproductive age (52 per cent); however the distribution is highly variable (between 42 percent and 58 percent).

District level fertility rates were measured via the average number of births (children aged 0-12 months) in the census year to women of reproductive age (15-49 years) in the census year, computed using 5-year age groupings (TFR). Figure 3.1 show that the Greater Accra region has the lowest mean fertility rate of 3.1, while the Northern region has the highest mean fertility rate of about 6.5. The Ahafo-Ano South district in the Ashanti region has the highest fertility rate of about 9.8 births. A study by Buor (2003) reported low use of maternal health services in the Ahafo-Ano South district mainly due to distance to services, low incomes, high cost of services and low levels of education. This may explain the high TFR recorded in the district.

Figure 3.1: Demographic characteristics by district and region



B. Spatial Inequalities in Access to Health Services

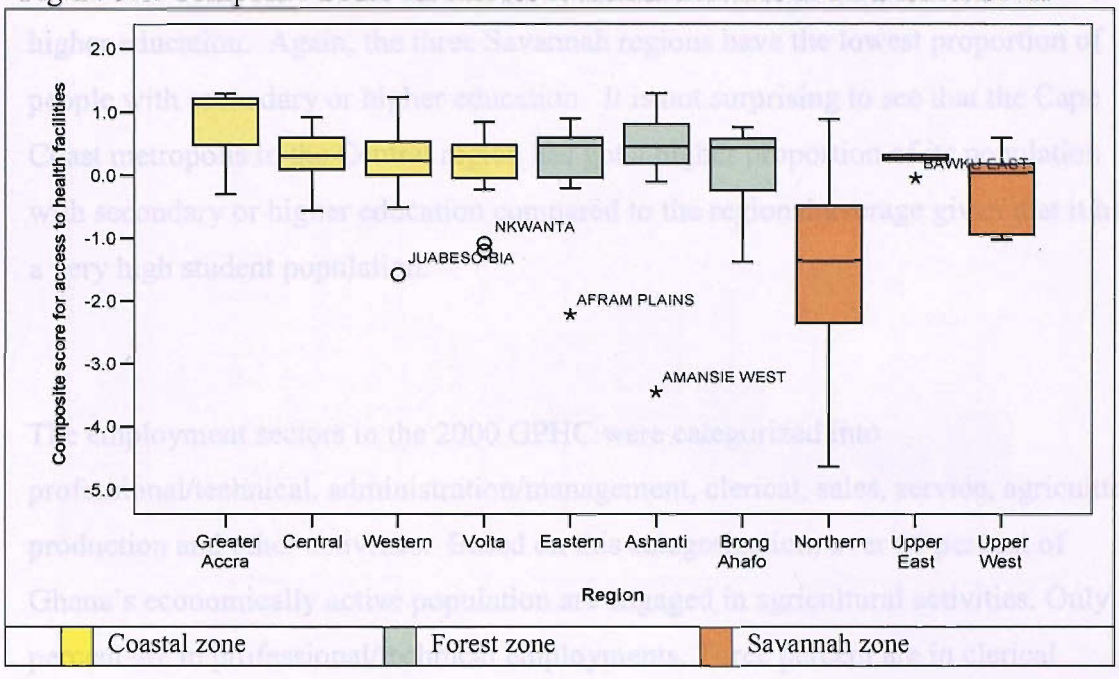
Figure 3.2 below shows composite score for access to health services by region and district measured via distance to the nearest traditional health facility, hospital and clinic computed from the 20 largest communities in a district (GSS 2002). Figure 3.2 shows that the Greater Accra region has the highest mean score of access to health services, while the Northern region has the lowest mean score, but with a high variability.

The data shows that there is very high access to traditional health facilities compared to hospitals and clinics. The average distance to the nearest traditional health facility ranges from 0.40 kilometres in the Ashanti region to 1.53 kilometres in the Western region. However, there are a few districts where there is very low access to traditional health facilities. In the Aowin-Suaman district of the Western region, the average distance to the nearest traditional health facility was 8.70 kilometres compared to an average of 1.53 kilometres for the region. In the Offinso district it was 3.50 kilometres compared to 0.40 kilometres for the Ashanti region.

For the spatial distribution of hospitals, unsurprisingly the Greater Accra region has the highest access to hospitals with regional mean distance of 7.7 kilometres, while the Northern region has the least access to hospitals with a region mean distance of 35.4 kilometres, reflecting the sparsely populated nature of the region. Overall, the Northern and Upper West regions both in the Savannah Zone of Ghana have the least access to hospitals. Although, the Northern region has the least access to hospitals the distribution is highly variable between the districts within the region. The Tamale metropolis recorded a mean distance of 3.5 kilometres to the nearest hospital compared to 63.6 kilometres for the Gushiegu-Karaga district.

Considering access to clinics, the Greater Accra region recorded the highest access with a regional mean distance of 1.5 kilometres, while the Upper West regions and Northern recorded the least access of 4.6 and 9.6 kilometres respectively. Again the distribution is highly variable in the Northern region, with the nearest distance to the nearest clinic in the Tamale metropolis being 2.0 kilometres and 18.9 and 24.5 kilometres in the Nanumba and Gushiegu-Karaga districts respectively.

Figure 3.2: Composite Score for Access to Health Services at the District Level



C. Spatial Inequalities in Socio-Economic Development

The socio-economic development of the regions and PSUs/districts of Ghana are assessed through literacy levels, educational achievements, employment rates, employment within different sectors of the economy and level of urbanization. Figure 3.3 below shows the composite score for socio-economic development of PSUs/districts by the regions of Ghana. The Greater Accra region unsurprisingly has the highest socio-economic development score in the country. The three Northern regions (Savannah zone) recorded the lowest mean score for socio-economic development. This reflects the low-income status and high poverty levels within these regions (GSS 2000).

The 2000 Ghana Population and Housing Census recorded a literacy rate of 53.3 percent nationwide. At the regional level, literacy rate ranges from 20.8 percent in the Northern region to 69.6 percent in the Greater Accra region. Literacy levels are lowest in the three Savannah regions of Ghana. It is important to note that although literacy levels are generally high in the Greater Accra region it is highly skewed. On

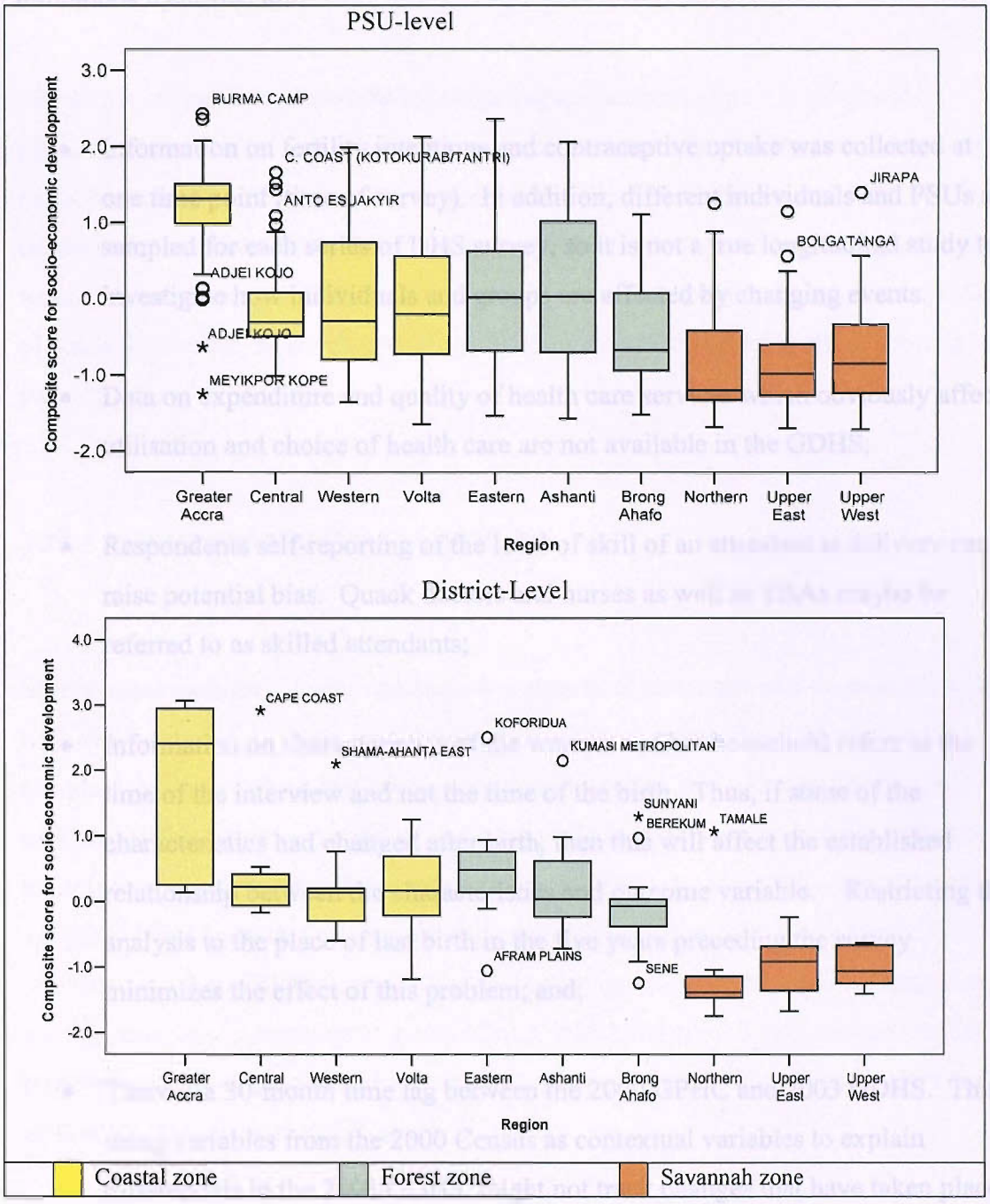
educational achievements, only 12.5 percent of Ghana's population have secondary or higher education. Again, the three Savannah regions have the lowest proportion of people with secondary or higher education. It is not surprising to see that the Cape Coast metropolis in the Central region has got a higher proportion of its population with secondary or higher education compared to the regional average given that it has a very high student population.

The employment sectors in the 2000 GPHC were categorized into professional/technical, administration/management, clerical, sales, service, agriculture, production and other activities. Based on this categorization, over 60 percent of Ghana's economically active population are engaged in agricultural activities. Only 5 percent are in professional/technical employments. Three percent are in clerical employment, while only 0.2 percent is in administrative/management. The production sector employs 14 percent of the economically active population, while 11 and 5 percent are in sales and service production.

At the regional level, almost 80 percent of the people in the Savannah Zone of Ghana are engaged in agricultural activities, compared to only 30 in the Greater Accra Region. The production sector employs over 22 percent of the economically active population in the Greater Accra region compared to about 10 percent in the three Northern regions. Employment in the professional/technical sector, administrative/management, service provision and sales are also lower in the three Northern regions, compared to the Coastal and Forest zones.

At the district level, the census data shows that metropolitan areas and regional capitals tend to have higher employment in the professional/technical, administration/management, clerical and production sectors, while more rural districts tend to have higher engagements in agriculture. As expected the census data show that metropolitan areas and regional capitals are highly urbanized. Figure 3.3 below clearly reflects the socio-economic developments of the districts and regions in Ghana.

Figure 3.3: Composite Scores for Socio-Economic Development at the PSU and District Level



3.2.5 Data/Study Limitations

Although the data from the 2000 GPHC and 2003 GDHS provide valuable information to improve our understanding of the spatial inequalities in pregnancy planning and

delivery care uptake in Ghana, it is important to recognise their limitations: The limitations identified are:

- Information on fertility intentions and contraceptive uptake was collected at one time point (time of survey). In addition, different individuals and PSUs are sampled for each series of DHS survey, so it is not a true longitudinal study to investigate how individuals and groups are affected by changing events.

- Data on expenditure and quality of health care services which obviously affects utilisation and choice of health care are not available in the GDHS;

- Respondents self-reporting of the level of skill of an attendant at delivery can raise potential bias. Quack doctors and nurses as well as TBAs maybe be referred to as skilled attendants;

- Information on characteristics of the woman and her household refers to the time of the interview and not the time of the birth. Thus, if some of the characteristics had changed after birth, then this will affect the established relationship between the characteristics and outcome variable. Restricting the analysis to the place of last birth in the five years preceding the survey minimizes the effect of this problem; and,

- There is a 30-month time lag between the 2000 GPHC and 2003 GDHS. Thus, using variables from the 2000 Census as contextual variables to explain differentials in the 2003 GDHS, might not track changes that have taken place over the 30-month period. However, using a combination of variables to derive composite indices minimizes this problem, in that not all the variables will change significantly over a short period of time.

3.3 STATISTICAL METHODS

The statistical model adopted for investigating spatial inequalities in pregnancy planning behaviour and uptake of delivery care in this study is Multinomial Multilevel Logit Models. The EBLUP extension of the Fay-Herriot Model is used with contextual data from the 2000 Census to derive district-level estimates (proportions) of women at risk of unintended pregnancies (Mistimed and unwanted) and the proportion of home deliveries. These statistical methodologies are discussed in the following sections.

3.3.1 Multinomial Multilevel Logit Models

Multinomial multilevel logit regression is a statistical technique used in modelling data with multi-category response and complex patterns of variability. The standard sampling design to which statistical models are linked to is the simple random sampling with replacement, assuming that the selection of one unit is independent of the selection of other units (Snijders and Bosker 1999). As indicated earlier, the 1998 and 2003 GDHS comes from a multistage sampling scheme, which has dependent observations. Ignoring the sample design implies ignoring the hierarchical structure, thus ignoring the importance of group effects, which may result in biased estimation of standard errors and hence unreliable estimation of confidence intervals (Snijders and Bosker 1999; Madise et al 2002).

To account for the hierarchical structure imposed by the sampling technique, the multilevel approach allows for the correlation of outcomes at each level to be modelled, understand where and how effects are occurring, avoids exaggerating the sample size and ensures that standard errors associated with estimated parameters in the model are correctly estimated (Goldstein, 1995, Snijders and Bosker, 1999, Rasbash et al. 2000 and Griffiths et al. 2002).

I. Model Formulation

The response variables derived for this study are polychotomous and on the nominal scale (see Chapters Four and Five). Considering a 2-level model (level-1 being the individual woman and level-2 the PSU she belongs to), a multivariate generalization of the logit model can be defined for the polychotomous response variable with t response categories as:

$$\log\left(\frac{\pi_{ij}^{(s)}}{\pi_{ij}^{t}}\right) = \beta_0^{(s)} + \beta_1^{(s)} x_{1ij} + ... + \beta_p^{(s)} x_{pij} + \mu_{0j}^{(s)}, \qquad s = 1,.....,t-1 \qquad 3.1$$

and one category of t chosen as the reference category, with π_{ij} being the probability that individual i in district j has response S, $x_{1ij},....,x_{pij}$ are a set of explanatory variables, $\beta_0^{(s)}, \beta_1^{(s)},...., \beta_p^{(s)}$ are regression coefficients and $\mu_{0j}^{(s)} \sim N(0, \sigma_u^2)$ are the level-2 random effects with the level-1 random effects constrained to follow a multinomial distribution. The variance of the level-2 random effect σ_u^2 is the between PSU variance after accounting for the covariates. The random area effect included in the multilevel model account for between area variation beyond that explained by the covariates. In this way, a random area effect (variance) is a unique area specific parameter that shows how different one area is from another..Thus, the estimated variance of the level 2 random effects $\hat{\sigma}_u^2$ can be used as a measure of the level of inequality between PSUs (Rao 2003).

The model can also be allowed to accommodate separate random-effect variance terms for groups of either i or j units (Hedeker 2003). Suppose the interest is to allow the random-effect variance terms to vary by rural-urban residence, X_{ij} representing rural-urban residence is specified as a 2 x 1 vector of dummy variables indicating rural and

urban residence. The random-effect term is then expressed as a 2 x 1 vector of independent random-effect terms for rural and urban PSUs.

The $\pi_{ij}^{(s)}$, the probabilities are calculated using the expression;

$$\pi_{ij}^{(s)} = \frac{\exp(\beta_0^{(s)} + \beta_1^{(s)} x_{1ij} + ... + \beta_p^{(s)} x_{pij} + \mu_{0j}^{(s)})}{1 + \sum_{h=1}^{t-1} \exp \beta_0^{(h)} + \beta_1^{(h)} x_{1ij} + ... + \beta_p^{(h)} x_{pij} + \mu_{0j}^{(h)}} \qquad 3.2$$

with the probability of the baseline category given by:

$$\pi_{ij}^{(s)} = \frac{1}{1 + \sum_{h=1}^{t-1} \exp \beta_0^{(h)} + \beta_1^{(h)} x_{1ij} + ... + \beta_p^{(h)} x_{pij} + \mu_{0j}^{(h)}} \qquad 3.3$$

The reader is referred to Goldstein (1995) and Snijders and Bosker (1999) for a more detailed discussion on multilevel models.

II. Model Building Process

To address the research questions set out in Chapter One, the analysis in Chapters four and five adopted a three-stage model building process. The first stage was aimed at identifying the inequalities that exist in pregnancy planning behaviour and uptake of delivery care between PSUs. The second stage was aimed at investigating if the inequalities identified in the first stage of the model building process vary within rural PSUs and urban PSUs. The third stage of the model building process investigates if the inequalities identified for rural-urban Ghana in the second stage vary for PSUs within each of the three ecological zones of Ghana (Savannah Zone, Forest Zone and the Coastal Zone).

The first stage involve identifying a parsimonious model that best describes pregnancy planning behaviour and delivery care uptake in Ghana, with a random-effect term describing the inequalities that exist between PSUs *(Model One)*. This process was carried out via a stepwise backward regression procedure. The fit of the model was tested after the elimination of each variable using the likelihood-ratio test to ensure that the model fits the data adequately.

The second stage of the model building process was aimed at identifying whether the inequalities identified between PSUs in *Model One* varies between rural PSUs and between urban PSUs. To achieve this aim, the random-effect terms of *Model One* were allowed to vary for rural PSUs and for urban PSUs *(Model Two)*. The significance of the separate random variance terms for Rural PSUs and Urban PSUs compared to a common variance term for all PSUs was then tested using the likelihood-ratio test.

The third stage of the modelling process continues from the second stage and is aimed at identifying if the inequalities identified between and within rural-urban PSUs in *Model Two* varies within and across the three ecological zones of Ghana *(Model Three)*. Where *Model Two* was not significantly different from M*odel One, Model Three* was fitted to vary by the ecological zones only and its significance compared to *Model One*. Again, the significance of the separate random variance terms for the ecological zones of Ghana compared to a separate rural-urban variance terms was tested using the likelihood-ratio test. The models described below illustrate the model building process.

Model One: *Common variance terms for all PSUs*

Model Two: *Separate variance terms for rural PSUs and Urban PSUs*

Model Three: *Separate (rural-urban) variance terms for the Ecological Zones of Ghana*

Finally, *Model Three* was used to investigate the influence of contextual variables on pregnancy planning behaviour and delivery care uptake in Ghana.

III. Estimating Intra-PSU Correlation Coefficient

The intra-PSU correlation coefficient represents the proportion of the total variance between PSUs after taking into account the effects of different covariates. Thus, the higher the coefficient the more likely that women living in the same PSU will have similar exposures or opt for the same delivery care. For a two level multilevel model the intra-PSU correlation coefficient is computed as the ratio of the PSU variance to the sum of the PSU level variance (level 2) and the individual level variance (level-1). However, the level-1 residuals of the multinomial multilevel logistic model are constrained to follow a logistic distribution. Thus, the level-1 variance can be set equal to the variance of the logistic distribution given by $\pi^2/3$, where π is a mathematical constant of 3.142 (MacCullagh and Nelder 1989, Maddala 1983, Snijders and Bosker 1999, Hedeker 2003). Therefore for a two level multilevel multinomial logit model, the intra-PSU correlation coefficient can be computed using equation 3.4 below:

$$r_s = \frac{\hat{\sigma}_u^2}{(\hat{\sigma}_u^2 + \pi^2/3)} \qquad 3.4$$

where $\hat{\sigma}_u^2$ is the estimated level-2 variance assuming normally distributed random intercepts.

IV. Estimating Probabilities

The effects of the predictor variables on the response categories were presented based on the multinomial multilevel models in the form of estimated probabilities (Retherford and Choe 1993). For the classical approach of estimating probabilities, the probabilities are estimated based on an average person (woman). However, the characteristic of the average woman is not known. Nonetheless, estimated probabilities will be more understood and more appreciated if the characteristics of the average woman are known. Thus, the probabilities estimated in this study were computed based on the characteristics of a selected reference woman. The estimated probability of the reference woman was then varied by the other categories of the explanatory variables to investigate how they change by changing the characteristics of the reference woman. In reality, a woman may have a combination of these characteristics, thus adjusting the value of the covariates and comparing to the reference woman. For realistic comparison extreme and less popular categories were not chosen to describe the reference woman (see Chapters Four and Five).

V. Estimating Inequalities on the Probability Scale

The 1998 and 2003 GDHS PSUs were derived from censal EAs (PSUs). It is imperative that individuals within a PSU maybe affected by characteristics of their shared environment and similar health access due to geographical proximity (Madise et al. 2003). It is therefore important to identify the extent of inequalities between these PSU.

To illustrate the extent of inequalities between PSUs, values of μ_{0j} can be varied to reflect varying levels of exposure to contraceptive use versus that of unintended pregnancies and uptake of institutional versus non-institutional (public and private) delivery care. This variation characterises how the estimated probabilities

underpinning pregnancy planning and delivery care options vary depending on the PSU in which a woman lives. Since the μ_{0j}'s have a multivariate normal distribution, constant values say K (-1.5, -1, -0.5, 0, 0.5, 1.0. 1.5) can be used to vary the values of μ_{0j} (K multiplied by μ_{0j}) to reflects a PSUs position on the lower tail of the normal distribution (negative values of μ_{0j}) and PSUs on the upper tail of the normal distribution (positive values of μ_{0j}). If the product of K and μ_{0j} is given by G, values of G corresponding to the lower and upper tails of normal distribution are substituted in equation 3.2 and 3.3 to estimate the corresponding probabilities. The status of a PSU on the normal distribution depends on the chosen base category. For example, the base category chosen for modelling pregnancy planning is "current contraceptive use". Thus, negative values of G represent PSUs where contraceptive use is high and exposure to unintended pregnancies is low and vice versa. For uptake of delivery care, the chosen reference category is home delivery, thus negative values of G represents PSUs where home deliveries are high and institutional deliveries are low and vice versa.

3.4 SMALL AREA ANALYSIS

Sample surveys, such as the Demographic and Health Survey (DHS), Living Standard Survey (LSS) and Labour Force Survey (LFS), in the past few decades, have become very popular and have taken the place of total enumeration as a cost effective means of obtaining more detailed information on a regular basis. Although these surveys can provide reasonably accurate national or regional-level estimates, they cannot provide relevant small area estimates (Platek et al. 1987; Gonzalez and Hoza 1978). The use of direct estimators which data from the small areas have been acknowledged to yield unacceptably large standard errors due to the small sample size from the small area (Ghosh and Rao, 1994 and Suciu et al, 2001).

Demographic and Health Surveys collect relatively small samples for each district and does not allow for reliable district-level estimates to be undertaken. Therefore, most

studies using DHS data has focused on country and regional level estimates. However, to enact and implement effective demographic and health policy initiatives at the district-level, the importance of demographic and health statistics at the district-level cannot be over emphasised. Recent developments in small area estimation techniques and computer software for analysing small area data and the availability of relevant demographic and health data provide an opportunity to investigate the derivation of district-level estimates of demographic and health indicators which has not received much attention in demographic research. This will aid identifying risk groups warranting intervention. It will aid district and central government decision making, allocation of resources, implementation, monitoring and evaluation of demographic and health activities.

3.4.1 Small Area Estimators

The existence of small area data can be traced as far back as the eleventh century parish churches recordings of baptisms, marriages and burials in England. The 1666 Canadian census and the census of New France in 1667 were very rich sources of small area data at the time. A familiar feature of these early small area data is that they have been based on complete enumeration. Although the production of small area data has existed for a very long time, resource and financial constraints have allowed this to be done on a less regular basis and to collect less detailed information. In most countries, censuses are designed to be conducted every ten years. In most countries of sub-Saharan Africa, this has not been realised. In Ghana, there was a sixteen-year time lag between the most recent censuses. On the other hand, surveys collect more detailed information on a vast number of issues and are conducted on a more regular basis. However, they cannot be used to generate reliable small area statistics due to the small samples from small areas.

In the past five decades, survey statisticians have explored the possibility of generating efficient small area estimators. The importance and the growing demand for reliable small area statistics by policy makers, local governments, planners and businesses

have led to several empirical studies on both the theoretical and practical application of small area techniques. This has led to the proposition of different small area estimators. Small area estimators have been categories into two main groups; (1) design based and, (2) model based (Sarndal 1984). The efficiency of the design-based approach relies heavily on the number of observations in the small area (Barrios (1996), whilst the model-based estimators "*borrow strength*" from related or similar small areas through explicit or implicit models via supplementary data such as census and administrative records (Farrell, 2000, Ghosh and Rao, 1994). This has been acknowledged to improve sample estimates of small areas by lowering the mean square error (Farrell, 2000, Ghosh and Rao, 1994). The small area estimators discussed in the literature include demographic estimators, synthetic estimators, regression model estimators (mixed effect and discrete measurement models) and time series models. For more details on small area estimators and recent developments in the field see Rao (2003). The preceding section describes some of the previous small area statistics that have been generated from survey and the challenges in deriving small area statistics.

3.4.2 Previous Applications of Small Area Estimation Techniques

There have been several applications of small area estimation techniques in the field of health, agriculture, income and poverty studies to aid both central and local government planning and resource allocation. The availability of small area statistics have aided both local and central government decision making, resource allocation and planning, particularly in more developed countries such the United Kingdom and the United States of America. Small area statistics highlights small geographic and domain level social and economic problems that cannot be easily identified from national surveys. It also keeps civil societies informed of their immediate environment. Thus, helping central and local governments' as well local residents to deal with acute social and economic problems including health, housing, unemployment, crime and drug abuse. Small area statistics also aid assessing a countries developmental process and deriving effective monitoring and evaluation of policies and activities. Small area

statistics also aid policy makers and target areas with prioritised needs. In the field of public health:

- The U.S. National Centre for Health Statistics (1968) developed state estimates of disability and utilisation of medical services from the Health interview Survey.
- Namekata et al (1975) combining local data on population with national data estimated the complete and partial work loss disability for each state and the District of Columbia.
- Folson et al (1999) produced estimates of drug use for the 50 U.S. states and the District of Columbia by age-sex-race group, using data from the National Household Survey on Drug Abuse (NHSDA) and auxiliary information from administrative records.
- DiGaetano et al (1980) derived estimates for 40 key health indicators by age-sex-race groups for 365 primary sampling units in the National Health Interview Survey.
- The American Lung Association (2005) assessed the magnitude of lung diseases (lung cancer, emphysema, chronic bronchitis, adult asthma and paediatric asthma) at the state and county levels.
- Malec, Davis and Cao (1999) estimated the overweight prevalence for adults by states, using the Third National Health and Nutrition Survey (NHASES III).
- Chattopadhyay, Lahiri, Larsen and Reimnitz (1999) derived state-wide prevalence of alcohol consumption, marijuana and cocaine use among civilian non-institutionalised adults and adolescents in the United States.
- Clayton and Kaldor (1987) estimates of lip cancer rates in 56 counties of Scotland.
- Datta, Ghosh and Waller (2000) estimates of stomach cancer mortality rate in small areas of Missouri.
- Ghosh et al (1999) estimated the leukaemia incidence rate for 281 census tracts in eight counties of New York State.

In the field of agriculture, some of the applications of Small Area Estimation techniques include:

- Battese, Harter and Fuller (1988) using farm interview data and LANDSAT satellite data to estimate the areas under corn and under soybeans for 12 counties of north-central IOWA.
- The U.S. National Agriculture Statistical Services derived county level estimates of crop acreage using remote sensing satellite data as auxiliary information.
- Singh and Goel 2000 using remote sensing satellite data and crop surveys of in India produced district level estimates of crop yield.

In recent times, the high wealth differentials between small areas have been a major concern in most programme initiatives, leading to an increasing demand for small area statistics on wealth indicators. Small Area Estimation techniques have been used in developed countries such Australia, United States and United Kingdom to identify poor and low-income areas. For income estimates for small areas the following are some of the applications of Small Area Estimation techniques:

- In Australia, Purcell and Linacre (1976) produced synthetic estimates of income and work force status for Australian Census Statistical Division.
- In the United States, the U.S Bureau of the Census estimated per capita income for small places.
- The United Kingdom Office of National Statistics using data from the Claimant Count and Labour Force Survey estimated the unemployed proportion of the 16+ populations by age and sex within Unitary Authorities and Local Authority Districts.
- The National Research Council (2000 derived county estimates of poor-school age children in the United States of America using data from the Current Population Survey, 1990 Decennial Census, Food Stamp Program

Administrative Records and Federal Income Tax Returns Administrative Records.

- Datta, Fay and Ghosh (1991) derived estimates of current median income of four-person households in the 51 states of the United States of America.
- Gonzalez (1973) estimated the number of dilapidated households with all plumbing facilities for all the states in the United States of America using the 1960 USA Census.

3.4.3 Challenges in Small Area Estimation Analysis

I. Data Sources

There are three main data sources for small area analysis: censuses, administrative records, and sample surveys. Although these sources of data have been used to generate relevant small area estimates, there are some challenges associated with them especially in developing countries.

A. Censuses

In most countries of sub-Saharan Africa, censuses constitute the most comprehensive source of information for policy enactment and initiatives, particularly at the small geographic domain. As stated earlier, censuses in sub-Saharan Africa have not been regular. The content has also been limited to only a few population characteristics and housing information due to cost and lack of the needed technology. For example, there was a 16-year time lag between the two most recent censuses in Ghana.

B. *Administrative Records*

Administrative records have been used for decades to derive small area information on births, deaths, marriages and school enrolment among others, particularly for inter-censal years. In some European countries census statistics have been derived solely from administrative records. However, in sub-Saharan Africa, administrative records are highly affected by incomplete coverage.

C. *Sample Surveys*

In recent times sample surveys have taken the place of census as a cost effective means of obtaining more detailed information on a regular basis. The primary limitation of this source of data is that although it can provide reasonably accurate national or regional-level estimates, they cannot provide relevant small area estimates on their own (Platek et al. 1987; Gonzalez and Hoza 1978).

II. Small Area Boundaries

Sample frames used for surveys are usually derived from censal enumeration areas. Censal Enumeration boundaries are changed from one census to another. Government administrative unit and district boundaries are also changed from time to time. Thus, alignment of survey data to census or other auxiliary data sources to derive small area estimates becomes more difficult and in some cases unrealistic.

III. Data Availability

Census or administrative records to use for the small area analysis are not usually published at the small area level. Access to such data is usually difficult and sometimes the needed information for the small area analysis is not available at the small area or domain level or the available information is not accurate. Five years after the last census in Ghana the administrative report, the district profile reports as well as the final census report are yet to be published.

3.4.4 The EBLUP Extension of the Fay-Herriot Model

In the past few decades survey statisticians have proposed several estimators for deriving reliable small area statistics and assessed the estimation error. One of the recent breakthroughs in small area estimation is the situation where the variables of interest are categorical or discrete and the small area measures of interest are proportions or counts. In this study the aim is to predict the true area proportions and obtain valid measures of error.

The estimation procedure adopted for this study is an extension of the Fay-Herriot Model. This type of model has been used by Heady et al (2000); Ambler et al (2001); Curtis (2005) and Longhurst and Goldring (2005) to estimate unemployment for small area in the United Kingdom. The main reason for choosing the Fay-Herriot Model like approach is because the sample data for this study consists of direct (DHS) estimates and associated age-district covariates from the 2000 GPHC. If i indexes age-group and j indexes district and N_{ij} is the number of women in age group i and district j, with M_{ij} being the number of women of interest in age group i and district j, then the proportion of interest is given by $\theta_{ij} = {}^{M_{ij}}\!/_{N_{ij}}$. Since the sample data for the analysis consist of the direct estimate of the proportion of interest, $\hat{N}_{ij}$ is the direct estimate of

the number of women in age age-group i and district j. $\hat{M}_{ij}$ is the direct estimate of the number of women of interest. Then, the direct estimate of the proportion of women of interest is $\hat{\theta}_{ij} = \hat{M}_{ij} / \hat{N}_{ij}$.

A convenient way to model the proportions allowing for the inclusion of covariates is to use a generalized linear mixed model. Considering a *logit* link function, the generalized linear mixed model of interest can be defined as:

$$Logit(\pi_{ij}) = z'_{ij}\beta \qquad 3.5$$

Where z'_{ij} is a vector of known domain attributes. Within the multilevel modelling framework equation 3.5 can be expressed as:

$$Logit(\pi_{ij}) = z'_{ij}\beta + \mu_{0j} \qquad 3.6$$

Where μ_{0j} is the random effect (district-level variance), assumed to be normally distributed with mean zero and variance ϕ. Estimates of the model parameters are obtained using an iterative procedure that combines maximum quasi-likelihood (MPQL) estimation of β and μ_{0j} with residual/restricted maximum likelihood (REML) estimation of ϕ (Saei and Chambers 2003). Two main modelling estimators have been proposed in the literature – (1) the Battese-Fuller estimator and (2) The Fay-Herriot estimator. The Battese-Fuller estimator assumes that only individual level covariates are available. In the case where area-level data is available the Fay-Herriot estimator could be applied. The Fay-Herriot approach is adopted for this study because only area-level data is available.

If the expected value of $\hat{\theta}_{ij}$ is given by $E(\hat{\theta}_{ij} \mid \theta_{ij}) = p_{ij}$ and the variance of $\hat{\theta}_{ij}$ $\text{var}(\hat{\theta}_{ij} \mid \theta_{ij}) = p_{ij}(1-p_{ij})/n_{ij}$, then equation 3.6 above can be used to specify how the characteristics of an area j influences the value of p_{ij}. This model can be fitted to the sample data using standard regression software that accounts for the area effects (equation 3.7). An estimate $\hat{\beta}$ of β is then estimated from model 3.6 above. An estimator of the proportion of women in age group i in district j is then given by the EBLUP estimator $\hat{p}_{ij} = antilogit(z'_{ij}\hat{\beta} + \hat{\mu}_{0j})$. The problem associated with the EBLUP estimator is the complexity of estimating the mean squared error (Ambler et al 2001). Practically, the variance component of $\hat{p}_{ij}$ constitute a fixed and random part, which are not estimated independently, thus a covariance structure between the fixed part and the random part of the model is needed to estimate the variance of $\hat{p}_{ij}$. The limitation of the software package available for this analysis is that it does not estimate the covariance structure. Ambler et al (2001) adopted a compromise approach, which uses a Taylor series approximation approach to estimate the variance of $\hat{p}_{ij}$

$$\text{var}(\hat{p}_{ij}) \approx ((\hat{p}_{ij}(1-\hat{p}_{ij}))^2[\hat{\sigma}_u^2 + z'_{ij}\hat{V}(\hat{\beta})z_{ij}] \qquad 3.7$$

Since $V(\mu_{0j})$ the prediction variance of μ_{0j} can be estimated from the model, Equation 3.8 below was used as an approximation to derive the variance of $\hat{p}_{ij}$.

$$\text{var}(\hat{p}_{ij}) \approx ((\hat{p}_{ij}(1-\hat{p}_{ij}))^2[\hat{V}(\hat{\mu}_{0j}) + z'_{ij}\hat{V}(\hat{\beta})z_{ij}] \qquad 3.8$$

Once $\hat{p}_{ij}$ has been estimated, for illustration purposes, the proportion of women at risk of unintended pregnancies/home deliveries in district j (weighted average) was estimated from equation 3.9 below.

$$\hat{p}_j = \sum \frac{\hat{p}_{ij} N_{ij}}{N_j} \qquad 3.9$$

where N_j is the number of women aged 15-49 in district j.

3.5 PROCEDURE OF ANALYSIS

The analysis is conducted in two parts. The first part of the analysis involves identifying significant predictors of the response variables, examining spatial inequalities and investigating the contextual factors that mitigate the inequalities. The second part of the analysis involves deriving domain/district estimates of exposures to unintended (mistimed and unwanted) pregnancies and uptake of delivery care.

The first part of the analysis is conducted in three stages. The first stage of analysis involves identifying potential predictors of the response variables using bivariate analysis. The Pearson Chi-Square Test is used to check the significance of the variables. In order to return optimistic results at this stage of the analysis regarding significance of the covariates, the Chi-Square test used was not adjusted to compensate for the clustering effect in the DHS data. At the second stage of the analysis, associations between predictors of the response variables are investigated, estimating the level of heterogeneity using the multilevel models. To identify the spatial inequalities between rural PSUs, urban PSUs and PSUs within an ecological zone, the random effect variance terms are allowed to vary for rural PSUs (villages), urban PSUs (cities) and the three ecological zones of Ghana. For comparative purposes the same predictor variables are controlled for in all the models depending on the response variable. Once a variable is significant in one model or it is of particular interest to the outcome of the analysis, it is controlled for in all the models.

The third stage of the analysis aims to explain the extent of inequality identified in the second stage of the analysis using multilevel models. The third stage of the analysis is limited to the 2003 GDHS since the available contextual data could only be linked to the 2003 GDHS and not the 1998 GDHS. This is because the 2003 GDHS PSUs were sampled from the 2000 Ghana Population and Housing Censal EAs, while the 1998 GDHS PSUs were sampled from the 1984 Ghana Population and Housing Censal EAs. Thus, the contextual data available from the 2000 Ghana Population and Housing Census (GPHC) could only be linked to the 2003 GDHS. Unfortunately, the contextual data from the 1984 GPHC was not available. Also, the fourteen-year time lag between the 1998 GDHS and the 1984 GPHC does not make it appropriate to use the 1984 GHPC as contextual data for the 1998 GDHS.

The second part of the analysis is conducted in two stages. This stage of the analysis is also restricted to the 2003 GDHS. The first stage involves deriving district level estimates using the EBLUP extension of the Fay-Herriot Model. The second stage involves using proposed diagnostics to validate the reliability of the estimates.

3.6 VARIABLE SELECTION

The variables in the final multilevel models are selected based on the variables on which the study is based and also on relevant level-one and group-level variables based on subject matter knowledge and also on findings of previous studies and on their significance in the model (Snijders and Bosker 1999). The significance of variables is assessed using the change in deviance approach (χ^2 test) given by the equation below:

$$\chi^2 = -2(\ln L_i - \ln L_f)$$

where $\ln L_i$ is the initial log likelihood and $\ln L_f$ is the final iteration's log likelihood (Hamilton, 1998). Comparing the resulting test statistic to a χ^2 distribution with degrees of freedom equal to the difference in complexity (number of variables dropped) leads to either accepting or rejecting the null hypothesis that the final iteration model is not significant (Hamilton, 1998). The χ^2 test was preferred to the asymptotic z (standard normal) test, because of its general validity (Hamilton, 1998).

3.7 STATISTICAL PACKAGES FOR DATA ANALYSIS

For data preparation and bivariate analysis, SPSS version 12.0 was used. The statistical package used for the multivariate analysis was MIXNO and MLWin. MIXNO was used in Chapters Four and Five to investigate the significant predictors and spatial inequalities in pregnancy planning and delivery care uptake in Ghana. In Chapter Six, MLWin was used to derive estimation models to estimate the proportion of women in a district by age-group exposed to unintended pregnancies and home deliveries and also to derive the necessary variance components needed to establish the validity of the estimates.

MIXNO and MLwiN are statistical software packages for analysing data with a complex structure. Modelling a categorical response data using the logit link, the estimation procedures involves linearization of the logit function based on first or second order approximated Taylor series (MLn/MLwiN). Greater accuracy is expected if the second order approximation is used. In many applications, e.g. MLwiN, it has been observed that the first and second order Taylor approximation underestimate both the fixed and random parameters or the estimation procedure is less stable and in some cases convergence is never achieved. This is particularly problematic where there are very small numbers of level-1 units per level-2 units (Goldstein 1995).

The parameter estimates from MIXNO is estimated using maximum marginal likelihood method, instead of the quasi-likelihood approximation procedure. This is implemented using multidimensional quadrature to numerically integrate over the distribution of the random effects (Hedeker 1996). This overcomes the overly reported biased results and a Fisher scoring solution provides relatively quick convergence for the model parameters (Hedeker 1996). The major drawback of this statistical software is that it cannot be used to analyse data with more than two levels. Given the number of response categories derived in Chapters Four and Five and the convergence problems experienced using MLWin, MIXNO was preferred. In Chapter Six, MLwiN was preferred to MIXNO because the variance components could easily be derived and used for diagnostics to establish the validity of the estimates.

3.8 CONCLUSION

This Chapter has described in detail the data and methods adopted for this study. The Chapter has also given a description of the procedures used in analysing the data, the model formulation procedure, variable selection and estimation of probabilities. The Chapter has documented previous applications of small area estimation techniques, associated challenges and how it's been used in developed countries to implement and monitor government policies. Finally, the Chapter explains the choice of statistical software packages for the data analysis.

CHAPTER FOUR

4.0 SPATIAL INEQUALITIES IN PREGNANCY PLANNING

4.1 INTRODUCTION

The relationship between pregnancy planning, abortion and its resultant association with maternal deaths and illnesses was evident in the literature (WHO 1995, 2000). The importance of identifying the extent of spatial inequalities in pregnancy planning to aid both central and local government health policy and programme planning, monitoring and evaluation was discussed in Chapter Two. This chapter investigates risks to unintended pregnancies and the extent of inequalities in pregnancy planning behaviour using GDHS data (1998 and 2003). The inequalities that exist between and within rural PSUs (villages), urban PSUs (cities) and PSUs within the three ecological zones of Ghana are investigated. Contextual data from the 2000 GPHC have been used to investigate the areal characteristics that influence the inequalities in pregnancy planning behaviour. Multinomial multilevel logistic regression models have been used for this purpose.

The motivation for adopting this approach is that previous studies in the field of demography and health have established rural/urban (villages/cities) inequalities in demographic and health indicators. Nonetheless, not all villages or cities or PSUs within an ecological zone share the same demographic and health needs. Research has not focused on investigating the inequalities that exist between and within these units. Identifying the inequalities that exist between and within these units is of immense importance to policy and programme planning, evaluation and monitoring of demographic and health activities, particularly in recent times when the dominance of urban settlements has been highly disputed.

4.2 EXPOSURE TO UNINTENDED PREGNANCIES: OPERATIONAL DEFINITION

Attitudinal measures employed in studying pregnancy planning behaviour include 'ideal' or 'desired' family size, number of wanted children, the wantedness of the last birth and the wantedness of a child. The shortcomings of these measures have been documented in the literature (Bongaarts 1997). This has led to lack of consensus in identifying a suitable measure in the study of pregnancy planning behaviour. The major drawbacks identified in the literature are; (1) the inability of these measures to reflect changes over time; (2) they are more likely to be representative in the social context rather than the individual context; and (3) they can bias (upwards or downwards) estimates of unwanted and mistimed births. Bongaarts (1990) documented that the wantedness of a child is the least biased measure compared to other intention measures of fertility. It is believed that women are less likely to misreport their future fertility preference. Nonetheless, this attitudinal measure also assumes that all births preceding the survey were wanted.

To overcome the drawbacks identified in the literature, this study links women's desire for a child and their contraceptive practices at the time of the survey to identify possible risk groups to unintended pregnancies. Thus, the operational definition of exposure to unintended pregnancy adopted for this study is – *a fecund married woman not desiring a child in the next two years or more and not contracepting to avoid conception.* This measure is free of misreporting of previous unintended births.

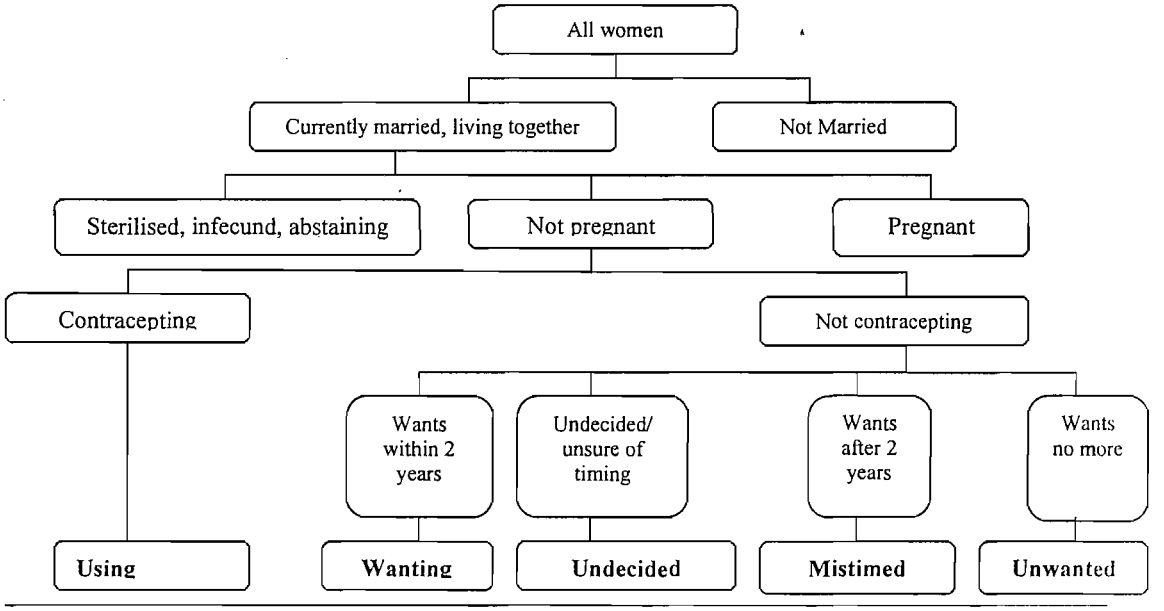
4.3 MULTI-CATEGORY CLASSIFICATION OF RESPONSE VARIABLE

Categorisation of exposure groups is based on women's intentions towards their next child, the timing of the next child and contraceptive practices. Five categories of pregnancy planning groups were derived:

Category 1: Using	*women using contraception at the time of the survey*
Category 2: Wanting	*non-users wanting a child in the next two years of the survey*
Category 3: Undecided	*non-users wanting a child but are undecided or unsure of the best timing of their next child*
Category 4: Mistimed	*non-users wanting their next child after two years*
Category 5: Unwanted	*non-users wanting no more children*

The last two of the five groups identified are considered as exposure (risk) groups to unintended pregnancies. Non-users desiring to postpone childbearing are exposed to mistimed pregnancies, while non-users who desire to limit childbearing are exposed to unwanted pregnancies. Although women who were not contracepting and were undecided or unsure of the timing of their next birth could be exposed to either mistimed or unwanted pregnancies, they were not categorised as a risk group. This is due to the ambiguity of their exposure status. Figure 4.1 is a flowchart illustrating the categorisation of risk groups. The separate categorisation of exposure to unintended pregnancies (mistimed and unwanted) is to identify areas with prioritised need for unmet need for spacing and limiting and also to aid implementing effective and efficient interventions at the local level. If the two groups are put together, it will be difficult identifying which areas to tackle in terms of addressing unmet needs.

Figure 4.1: Multi-Categorisation of Risk Groups



In a setting like Ghana, where exposure to sexual intercourse and its resultant effect of conception could also occur outside marriage it would be interesting to examine non-marital pregnancy planning behaviour. However, to avoid the ambiguity in non-marital fertility practices, these women were excluded from the analysis. Thus, the analysis is restricted to fecund married women sampled in the third and fourth series of DHS in Ghana.

4.4 SAMPLE SIZE AND STRUCTURE OF DATA

The DHS data for the analysis have a hierarchical structure with two levels. The women about whom information on contraceptive use and fertility intentions was collected (level 1) were nested within PSUs (villages and cities - level 2). Although it would have been interesting to investigate inequalities between households, the degree of nesting of women in households was very low and not very different from the degree of nesting at the individual level. Table 4.1 below summarises the sample size and extent of nesting in the datasets. Note that for the 2003 GDHS the number of Urban PSUs sampled was higher than that sampled for the 1998 GDHS. This resulted in an increase in the number of women sampled from Urban Ghana and consequently an increase in the number of ineligible women for the analysis. However, with a higher proportion of women per PSU, the sample size of eligible rural women remains relatively high.

Table 4.1: Hierarchical Structure of the GDHS Data

Year of Survey	Locality	All women in survey	Eligible women in sample	Ineligible women in sample	PSUs	Range of women per PSU
1998 GDHS	National	4843	3073	1770	400	1 – 27
	Rural	3104	2215	889	262	2 – 27
	Urban	1739	858	881	138	1 – 14
2003 GDHS	National	5691	3502	2189	412	1 – 25
	Rural	2936	2332	604	238	1 – 25
	Urban	2755	1170	1585	174	1 – 17

4.5 POTENTIAL EXPLANATORY VARIABLES

The GDHS and Census used in the analysis are presented in Table 4.2 below. The selection of variables was based primarily on subject matter knowledge and their importance to the study. Some variables were excluded due to their strong correlations (multicollinearity) with other variables. For example, a women's current age was strongly correlated with duration and type (monogamous/polygamous) of marriage. Ethnicity was highly correlated with religion and region of residence. Although evidence suggests that gender discrimination still exists in some societies in Ghana (Adongo et al 1998; Nyarko et al. 2003), a strong correlation was identified between preference for boys and girls. A correlation coefficient of 0.98 was identified between preference for boys and girls. Magadi and Curtis (2003) identified similar correlations and effects in Kenya. The effects of attitudinal/behavioural and cultural norms and traditional practices were not investigated directly since such information was not available. However, the influence of these potential unobservable factors is investigated through the random effects and other factors that mitigate attitudinal and behavioural factors.

The household wealth status was derived via Asset Index Analysis using Principal Component Analysis (Filmer and Pritchett 2001). The upper 20 percent were categorised as rich, the middle 60 percent as moderately rich, and the lower 20 percent were categorised as poor. Detailed description of the derivation of the composite indices (contextual variables) was discussed in Chapter Three.

Table 4.2: Variable Used in the Analysis

DHS Data	
Geographic variables	**Categories**
Rural-urban residential status	Rural, urban
Ecological zone of residence	Savannah zone, forest zone, coastal zone
Individual-level variables	
Current age	<20 years, 20-34 years, 35+ years
Maternal education	None, Primary, Secondary or higher
Access to media messages	Don't have access, Have access
Time since last sex	<1 week, 1-4 weeks, 4+ weeks
Number of surviving children	<2 children, 2-4 children, 5+ children
Time since last birth	Less than 2 years, 2 or more years
Spousal/household variables	
Spousal communication on contraceptives	Never, once or twice, more often
Partner's approval of contraception	Disapprove, approve, don't know
Wealth Status	Poor, Moderate, Rich
Census Data	
PSU-level composite index of socio-economic development	Continuous
District level composite index of access to health services (nearest distance to health services)	Continuous
District level Total Fertility Rate	Continuous

Source: 1998, 2003 GDHS and 2000 GPHC

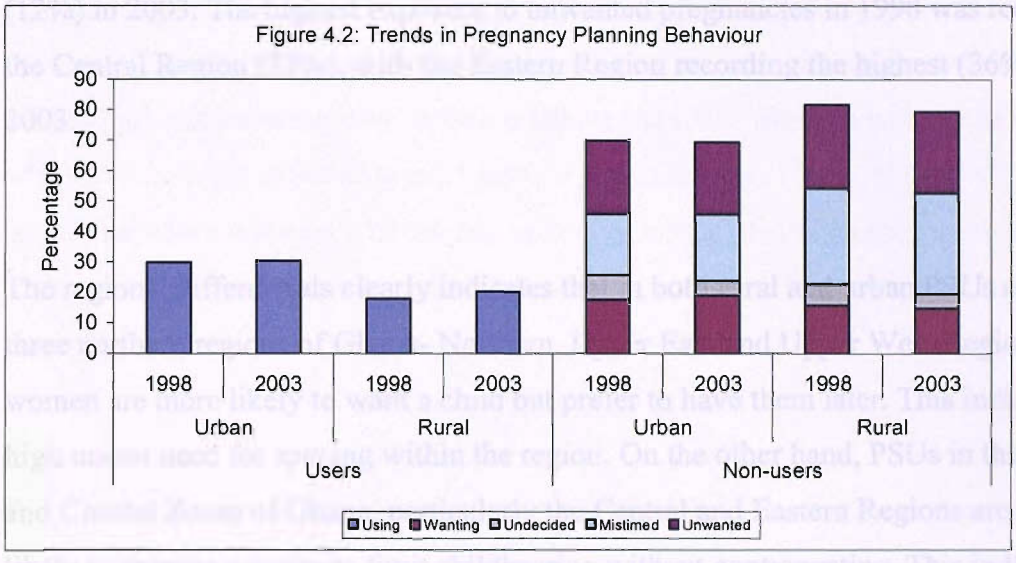
4.6 RESULTS

4.6.1 Trends in Individual Pregnancy Planning Behaviour

Figure 4.2 below shows the percentage distribution of rural/urban differentials in pregnancy planning behaviour in Ghana. Without accounting for any factors associated with pregnancy planning behaviour, the graph depicts that there exist rural/urban

differentials in pregnancy planning. There is a clear indication from Figure 4.2 that contraceptive use is higher in urban (cities) Ghana than rural (villages) Ghana. Exposures to unintended pregnancies are higher in rural than urban Ghana. In both urban and rural Ghana, there seem to be no major changes in pregnancy planning behaviour between the two successive surveys. The proportion of women in both urban and rural Ghana expose to mistimed and unwanted pregnancies has remained almost constant between the two surveys.

Figure 4.2: Trends in Pregnancy Planning Behaviour



4.6.2 Regional Differentials in Pregnancy Planning

In rural Ghana the proportion of women using contraception in 1998 varies from 7% in the Northern Region to 27% in the Eastern Region increasing to 9% in the Northern Region and 31% in the Brong-Ahafo Region in 2003. Exposures to mistimed pregnancies were highest in rural Northern Ghana (52%) and continued to remain highest in the same region in 2003 (54%). Exposure to unwanted pregnancies was lowest in the Upper East Region (17%) in 1998 and lowest in the Northern Region (13%) in 2003, but highest in both surveys in the Central Region (36% and 39% for 1998 and 2003 respectively).

In urban Ghana, contraceptive use for women in the sample range from 20% in the Northern Region in 1998 to 35% in the Greater Accra Region. In 2003 contraceptive use declined in urban Ghana ranging from 15% in the Central and Upper East Regions to 34% in the Brong-Ahafo region. The proportion of women exposed to mistimed pregnancies in urban Ghana was lowest in the Volta Region (15%) in 1998 and the Western and Greater Accra Region (14%) in 2003. The Northern and Upper East Regions recorded the highest exposure to mistimed pregnancies in the two surveys (39%). Considering exposures to unwanted pregnancies, the Upper East recorded the lowest exposures (10%) in 1998, whilst the Northern Region recorded the lowest (12%) in 2003. The highest exposure to unwanted pregnancies in 1998 was recoded in the Central Region (37%), with the Eastern Region recording the highest (36%) in 2003.

The regional differentials clearly indicates that in both rural and urban PSUs of the three northern regions of Ghana- Northern, Upper East and Upper West Regions, women are more likely to want a child but prefer to have them later. This indicates a high unmet need for spacing within the region. On the other hand, PSUs in the Forest and Coastal Zones of Ghana, particularly the Central and Eastern Regions are more likely to express a desire to limit childbearing without contracepting. This indicates a high unmet need for limiting in these areas. The proportions also show that there was not much improvement in exposures to mistimed and unwanted pregnancies between the two successive surveys.

4.6.3 Risk Groups by Background Characteristics

Table 4.3 below shows the percentage distribution of women exposed to mistimed and unwanted pregnancies for the 1998 and 2003 GDHS by background characteristics of individual women and their households. The significance of the variables was tested using the Pearson chi-squared test. The variables presented in Table 4.3 below are significant at $p<0.10$. Table 4.3 shows that more than 6 in every 10 women sampled

from rural Ghana are exposed to unintended pregnancies. In urban Ghana, almost 1 in every 2 is exposed to unintended pregnancy. In the Savannah Zone of Ghana almost 1 in every 2 women is exposed to mistimed pregnancy but less than 1 in every 5 are exposed to unwanted pregnancies. This clearly shows that there is high desire for children in the Savannah Zone compared to the Coastal and Forest Zones. It is important to note that despite the high desire for children in the Savannah, a high proportion of women have an unmet need for spacing.

Considering women's individual level characteristics, unsurprisingly women in the younger age cohorts are more exposed to mistimed pregnancies, while their older counterparts are more exposed to unwanted pregnancies. Women with no formal education are more exposed to mistimed pregnancies. The 1998 and 2003 GDHS both reveal that about 4 in every 10 women with no access to media messages are exposed to mistimed pregnancies, while slightly less than 3 in every 10 are exposed to unwanted pregnancies.

Considering women's reproductive history, Table 4.3 shows that as number of surviving children increases exposure to unwanted pregnancies increases, while exposure to mistimed pregnancies increases with declining parity. The results further reveals that recent mothers have a desire to have more children but with a high unmet need for spacing. Almost 1 in 2 is not contracepting.

Spousal effects on pregnancy planning behaviour were investigated using inter-spousal communication on contraception and partner's approval of contraception. Women who discuss contraception more often with their partners and whose partners approve contraceptive use were slightly less exposed to unintended pregnancies. However, it is very important to note that almost 4 in 10 women who discus contraception more often with their partners and 1 in every 2 whose partners approve contraception were exposed to unintended pregnancies. This clearly portrays that, although spousal effects are very important in pregnancy planning, proper pregnancy planning goes beyond just

family planning discussion and approval. Women from poor households are more likely to be exposed to unintended pregnancies; the differences are wide in the 2003 GDHS.

Table 4.3: Exposure Groups by Background Characteristics (%)

Background characteristics	1998 GDHS			2003 GDHS		
	Mistimed	Unwanted	N	Mistimed	Unwanted	N
Rural-urban residential status						
Rural	34.8	25.7	2215	34.8	25.3	2332
Urban	21.0	23.3	858	22.5	23.4	1170
Ecological zone of residence						
Coastal Zone	23.3	29.8	942	23.1	29.0	896
Forest Zone	25.9	26.5	950	24.1	28.5	1472
Savannah Zone	45.6	17.6	1181	45.1	16.3	1134
Current age						
Less than 20 year	56.3	3.2	126	61.4	4.8	145
20-34 years	41.5	13.7	1801	41.8	13.5	2002
35 year or above	11.6	45.3	1146	11.0	43.3	1355
Educational status						
No education	38.4	25.1	1331	38.2	23.9	1566
Primary	26.8	27.7	512	27.0	27.5	666
Secondary or higher	24.6	23.9	1230	23.3	24.2	1270
Access to media messages						
No access	36.8	28.0	1151	43.3	24.1	506
Have access	27.4	23.3	1921	28.5	24.8	2996
Time since last sex						
Less than 1 week	24.7	19.7	791	23.0	16.0	996
1 - 4 weeks	22.0	24.4	903	22.7	24.5	1033
4+ weeks	40.2	28.7	1369	41.4	30.8	1473
Number of surviving children						
Less than 2 children	42.2	3.0	888	42.4	4.0	947
2 - 4 children	32.8	22.8	1471	32.8	21.8	1694
5+ children	13.0	57.0	714	13.6	53.1	861
Time since last birth						
Less than 2 years	47.5	19.6	1205	46.1	22.4	1514
2 or more years	20.3	28.6	1868	18.9	26.5	1988
Frequency of spousal communication on contraception						
Never	36.6	24.5	1586	35.9	26.7	1529
Once or twice	29.1	26.7	767	30.5	24.5	1284
More often	20.4	24.5	717	19.4	20.5	689
Partners approval of contraception						
Don't know	38.3	25.2	992	39.5	24.4	602
Disapprove	31.4	24.3	524	29.4	26.8	683
Approve	26.1	25.2	1557	28.6	24.1	2217
Household wealth status						
Poor	34.2	23.6	602	45.1	19.3	698
Moderate	33.4	26.2	1857	29.9	27.3	2099
Rich	20.4	23.1	614	18.6	22.1	705

N – Sample size

4.6.4 Determinants of Pregnancy Planning Behaviour

The effect of the predictor variables on the response variable were presented based on the multinomial multilevel models in the form of estimated probabilities of the characteristics of the reference[1] woman (see Chapter Three). To identify the rural/urban disparity of the effect of the predictor variables on pregnancy planning, the estimated probabilities were computed conditioned on residential status. The rural/urban estimated probabilities for all five categories are shown in Appendix II, Tables 2.1 – 2.4. Their corresponding parameter estimates (standard errors shown in parentheses) are shown in Tables 4.4 and 4.5 below. Interaction effects were investigated but none was found significant. Before the interpretation of the multivariate models, the assumption of normality and constant variance (see Chapter Three) were investigated. The diagnostic plots shown in Appendix II, Figure 2.1 indicate that the assumption of normality and constant variance are not violated.

[1]Resides in the Forest Zone of Ghana, aged 20-34 years, has primary education, had sex between 1- 4 weeks to the survey, has 2 - 4 children, had last birth less than two years to the survey, discussed contraception with partner once or twice, does not know if partner approve contraception

Table 4.4: Estimated Coefficients for Pregnancy Planning Behaviour – 1998 GDHS

Background characteristics	Wanting vs. Contracepting	Undecided vs. Contracepting	Mistimed vs. Contracepting	Unwanted vs. Contracepting
Constant	1.05	-0.31	1.83	2.38
Ecological zone of residence				
Savannah [B]				
Coastal	-0.82 (0.24)***	0.67 (0.31)**	-0.90 (0.25)***	0.68 (0.25)***
Forest	-1.08 (0.26)***	0.92 (0.34)***	-0.85 (0.25)***	0.42 (0.24)*
Rural urban residence				
Rural [B]				
Urban	-0.28 (0.18)	-0.07 (0.25)	-0.79 (0.18)***	-0.40 (0.15)**
Age				
15 - 19 years	-1.16 (0.50)**	-0.12 (0.54)	0.81 (0.41)**	-1.11 (0.74)
20 - 34 years	-0.47 (0.21)**	-0.19 (0.24)	1.06 (0.20)***	-0.69 (0.17)***
35+ years [B]				
Educational status				
No formal education [B]				
Primary	0.11 (0.27)	-0.03 (0.31)	-0.30 (0.22)	-0.06 (0.22)
Secondary or higher	-0.22 (0.22)	-0.72 (0.27)***	-0.47 (0.20)**	-0.20 (0.19)
Time since last sex				
Less than 1 week [B]				
1 - 4 weeks	-0.15 (0.17)	0.45 (0.28)	0.04 (0.18)	0.10 (0.17)
4+ weeks	-0.27 (0.19)	1.15 (0.26)***	0.97 (0.17)***	0.98 (0.17)***
Number of surviving children				
Less than 2 children	2.83 (0.33)***	0.83 (0.35)**	1.12 (0.26)***	-2.22 (0.31)***
2 - 4 children	1.60 (0.29)***	0.48 (0.28)*	0.83 (0.22)***	-0.59 (0.18)***
5+ children [B]				
Time since last birth				
less than 2 years [B]				
2+ years	0.27 (0.20)	-0.20 (0.24)	-0.97 (0.15)***	-0.38 (0.17)**
Frequency of spousal communication on contraception				
Never [B]				
Once or twice	-1.52 (0.22)***	-1.07 (0.29)***	-1.11 (0.21)***	-1.03 (0.20)***
More often	-2.45 (0.23)***	-1.76 (0.31)***	-1.83 (0.22)***	-1.48 (0.22)***
Partners approval of contraception				
Don't know [B]				
Don't approve	0.45 (0.31)	-0.27 (0.35)	-0.02 (0.30)	-0.19 (0.30)
Approve	-1.21 (0.27)***	-1.74 (0.31)***	-1.10 (0.25)***	-0.97 (0.24)***

B – Base category *Significant at p<0.10, **p<0.05; ***p<0.01

Table 4.5: Estimated Coefficients for Pregnancy Planning Behaviour – 2003 GDHS

Background characteristics	Wanting vs. Contracepting	Undecided vs. Contracepting	Mistimed vs. Contracepting	Unwanted vs. Contracepting
Constant	-0.27	-1.26	0.54	1.04
Ecological zone				
Savannah [B]				
Coastal	-0.15 (0.22)	0.00 (0.42)	-0.47 (0.18)**	0.96 (0.22)***
Forest	0.08 (0.19)	0.26 (0.36)	-0.35 (0.16)**	0.93 (0.20)***
Rural urban residence				
Rural [B]				
Urban	-0.32 (0.16)**	-0.27 (0.33)	-0.40 (0.15)***	-0.27 (0.16)*
Age				
15 - 19 years	-0.81 (0.45)*	0.16 (0.67)	1.32 (0.38)***	-0.25 (0.57)
20 - 34 years	-0.57 (0.17)***	-0.43 (0.28)	1.07 (0.16)***	-0.64 (0.15)***
35+ years [B]				
Educational status				
No formal education				
Primary	-0.29 (0.20)	-0.18 (0.33)	-0.52 (0.18)***	-0.04 (0.18)
Secondary or higher	-0.70 ()***	-0.63 (0.32)*	-0.74 (0.16)***	-0.23 (0.16)
Time since last sex				
Less than 1 week [B]				
1 - 4 weeks	-0.32 (0.18)*	0.59 (0.33)*	0.22 (0.15)	0.36 (0.16)**
4+ weeks	0.24 (0.19)	1.86 (0.34)***	1.50 (0.16)***	1.69 (0.16)***
Number of surviving children				
Less than 2 children	2.90 (0.29)***	1.24 (0.49)***	1.25 (0.24)***	-1.85 (0.28)***
2 - 4 children	1.23 (0.24)***	0.60 (0.33)*	0.64 (0.20)***	-0.66 (0.16)***
5+ children [B]				
Time since last birth				
Less than 2 years [B]				
2+ years	1.21 (0.18)***	0.16 (0.28)	-0.50 (0.13)***	-0.03 (0.14)
Frequency of spousal communication on contraception				
Never [B]				
Once or twice	-1.13 (0.18)***	-1.16 (0.30)***	-0.94 (0.16)***	-0.94 (0.17)***
More often	-1.82 (0.21)***	-1.83 (0.39)***	-1.74 (0.18)***	-1.43 (0.20)***
Partners approval of contraception				
Don't know [B]				
Don't approve	0.30 (0.29)	-0.11 (0.35)	-0.01 (0.27)	-0.01 (0.29)
Approve	-1.15 (0.26)***	-1.26 (0.33)***	-0.67 (0.22)***	-0.75 (0.25)***

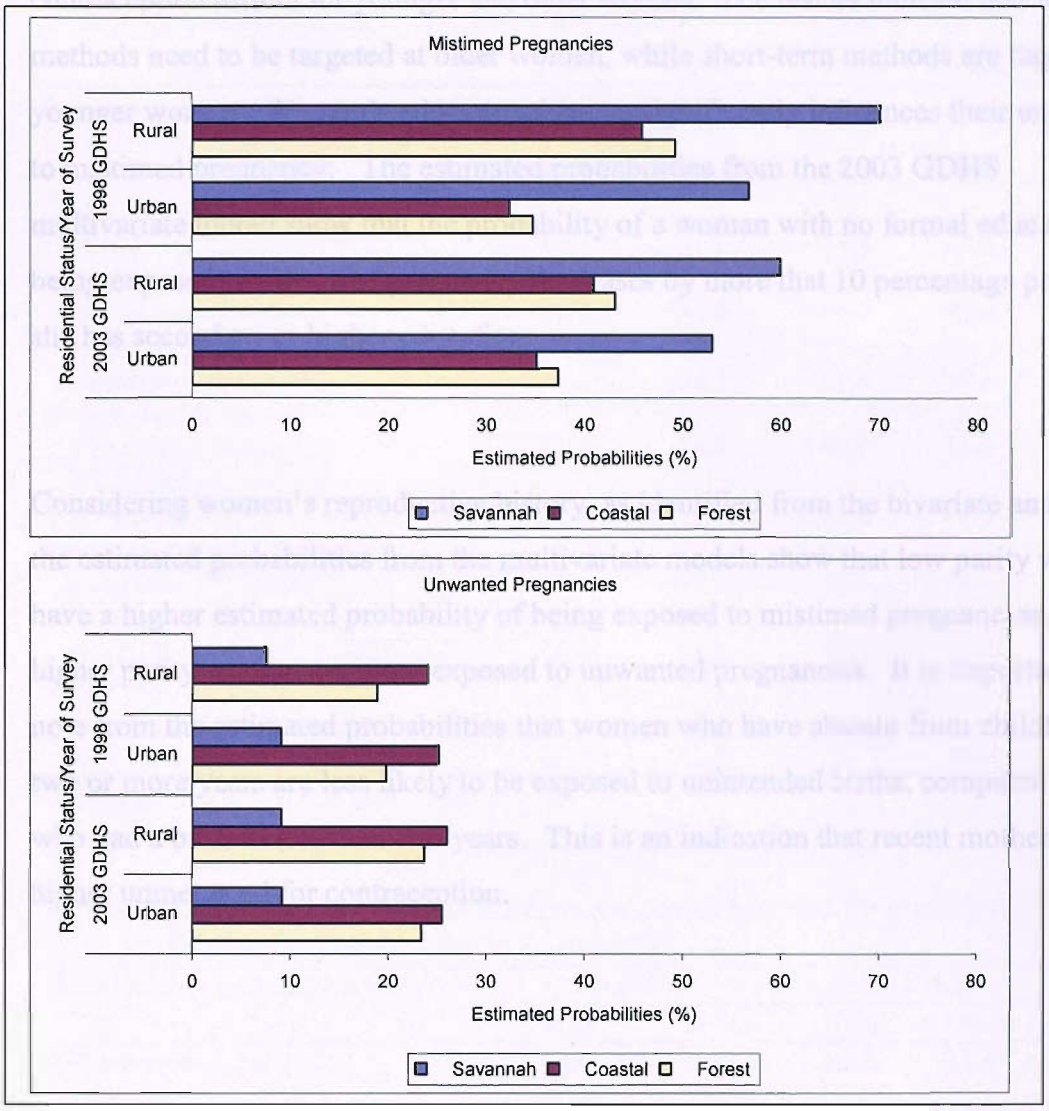
B – Base category *Significant at p<0.10, **p<0.05; ***p<0.01

I. Geographical Effects

The results show marked zonal differentials in pregnancy planning behaviour. The estimated probabilities (Figure 4.3 below) show that both rural and urban women residing in the Savannah Zone of Ghana are more exposed to mistimed pregnancies, while those residing in the Coastal and Forest Zones of Ghana are more exposed to unwanted pregnancies. This clearly depicts that women residing in the Savannah Zone of Ghana have an unmet need for spacing, while those residing in the Coastal and Forest Zones have unmet need for limiting.

A plausible explanation for the zonal differentials in pregnancy planning behaviour may be due to the high disparity in the distribution of resources between the Savannah and Forest/Coastal Zones of Ghana. Also, the differentials in fertility rate, maternal/child health and maternal education may also explain the zonal divide in pregnancy planning behaviour. The Savannah Zone of Ghana is noted for very high fertility, short birth intervals, high infant and child deaths as well as low maternal education (GSS 1998, 2004).

Figure 4.3: Estimated probabilities of Exposure to Unintended Pregnancies by Residential Status



II. Individual-Woman Effects

There was evidence of association between pregnancy planning behaviour and women's age, educational status and sexual exposure. The number of surviving children and the duration since last birth were also identified as important predictors. The estimated probabilities (Tables 4.6 and 4.7) show that younger women are more exposed to mistimed pregnancies, while their older counterparts are more exposed to unwanted pregnancies. This is due to the fact that older women are more likely to have achieved their desired fertility, while younger women will like to have more

children to fulfil their fertility intentions. This demonstrates that unmet need for contraception differs for younger and older women. The results indicate that long-term methods need to be targeted at older women, while short-term methods are targeted at younger women. Women's educational status significantly influences their exposure to mistimed pregnancy. The estimated probabilities from the 2003 GDHS multivariate model show that the probability of a woman with no formal education being exposed to mistimed pregnancy decreases by more that 10 percentage points if she has secondary or higher education.

Considering women's reproductive history, as identified from the bivariate analysis, the estimated probabilities from the multivariate models show that low parity women have a higher estimated probability of being exposed to mistimed pregnancies, while higher parity women are more exposed to unwanted pregnancies. It is important to note from the estimated probabilities that women who have abstain from childbirth for two or more years are less likely to be exposed to unintended births, compared to those who had a birth in less than two years. This is an indication that recent mothers have a higher unmet need for contraception.

Table 4.6: Estimated Probabilities of Exposures to Mistimed Pregnancies by Individual Woman Characteristics (%)

Background characteristics	1998 GDHS		2003 GDHS	
	Rural	Urban	Rural	Urban
Reference woman	**49.2**	**34.7**	**43.1**	**37.3**
Current age				
15 - 19 years	47.7	32.5	44.3	38.9
20 - 34 years [r]				
35+ years	18.2	11.4	14.8	12.4
Educational status				
No formal education	56.2	41.4	54.4	48.6
Primary [r]				
Secondary or higher	51.2	36.7	41.4	35.2
Time since last sex				
Less than 1 week	51.2	36.7	40.9	35.0
1 - 4 weeks [r]				
4+ weeks	57.6	43.6	52.8	48.4
Number of surviving children				
Less than 2 children	53.1	37.5	52.5	47.4
2 - 4 children [r]				
5+ children	28.0	18.5	23.9	20.1
Time since last birth				
Less than 2 years [r]				
2 or more years	29.7	18.6	26.7	22.8

r – characteristics of the reference woman

Table 4.7: Estimated Probabilities for Exposures to Unwanted Pregnancies by Individual Woman Characteristics (%)

Background characteristics	1998 GDHS		2003 GDHS	
	Rural	Urban	Rural	Urban
Reference woman	**18.9**	**19.8**	**23.7**	**23.4**
Current age				
15 - 19 years	15.5	15.7	27.5	27.6
20 - 34 years [r]				
35+ years	40.2	37.2	44.7	42.8
Educational status				
No formal education	17	18.5	18.5	18.9
Primary [r]				
Secondary or higher	20.4	21.7	23.4	22.8
Time since last sex				
Less than 1 week	18.6	19.8	19.5	19
1 - 4 weeks [r]				
4+ weeks	21.3	23.9	30.4	31.8
Number of surviving children				
Less than 2 children	3.0	3.2	4.7	4.9
2 - 4 children [r]				
5+ children	44.6	43.6	48.1	46.1
Time since last birth				
Less than 2 years [r]				
2 or more years	20.6	19.1	23.5	22.9

r – characteristics of the reference woman

III. Spousal/Household Effects

There was evidence of association between spousal effects (frequency of inter-spousal communication and partner's approval of contraception) and pregnancy planning behaviour. The estimated probabilities (Figure 4.4 below) show that women who discuss contraception with their partners more often are less likely to be exposed to unwanted and mistimed pregnancies. The estimated probabilities (Figure 4.5) also show that women whose partner's approve of contraception are less exposed to unintended pregnancies. The direction and strength of association of spousal effects on pregnancy planning indicates that spousal effects influence to a very large extent women pregnancy planning behaviour.

Figure 4.4: Estimated Probabilities of Exposure to Unintended Pregnancies by Spousal Communication on Contraception

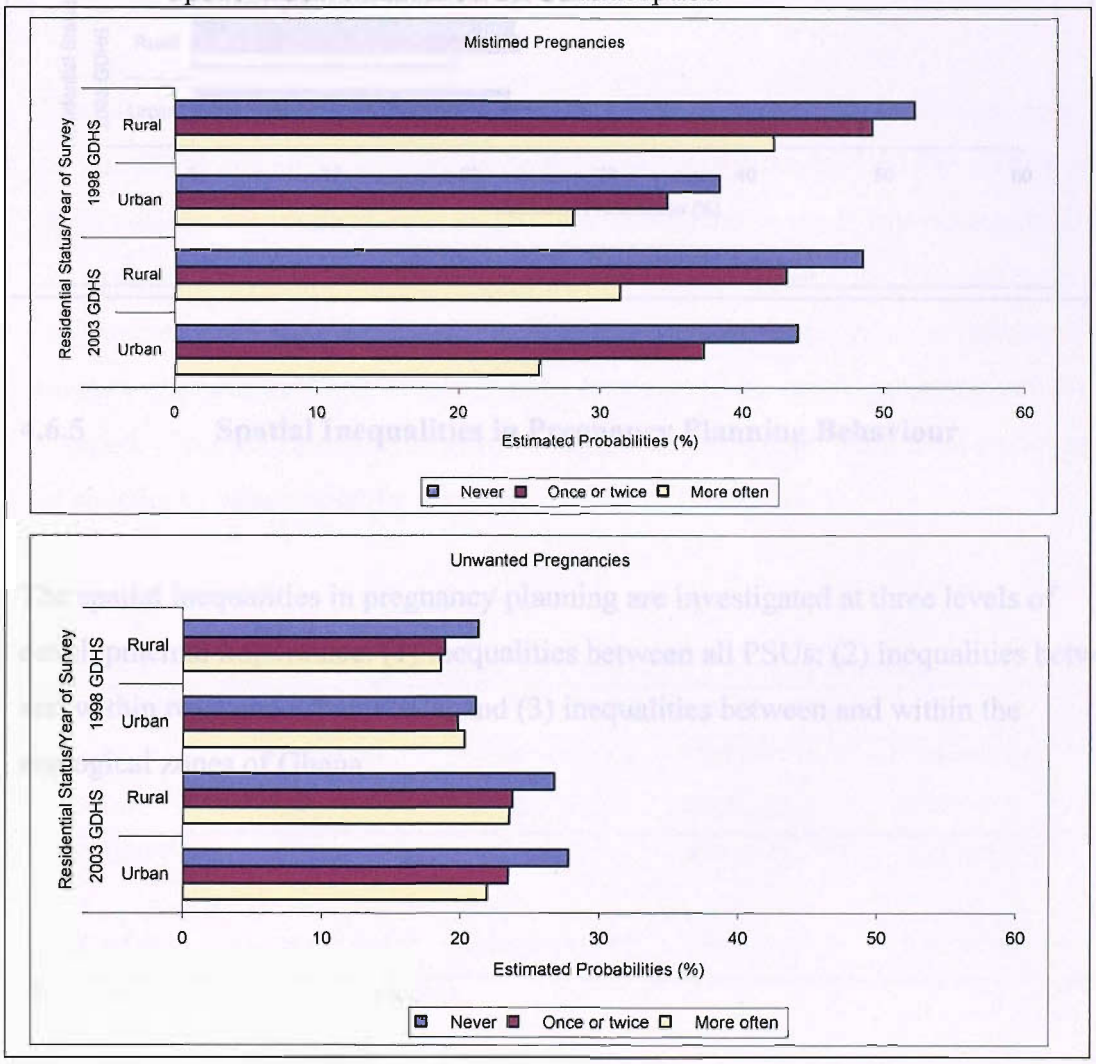
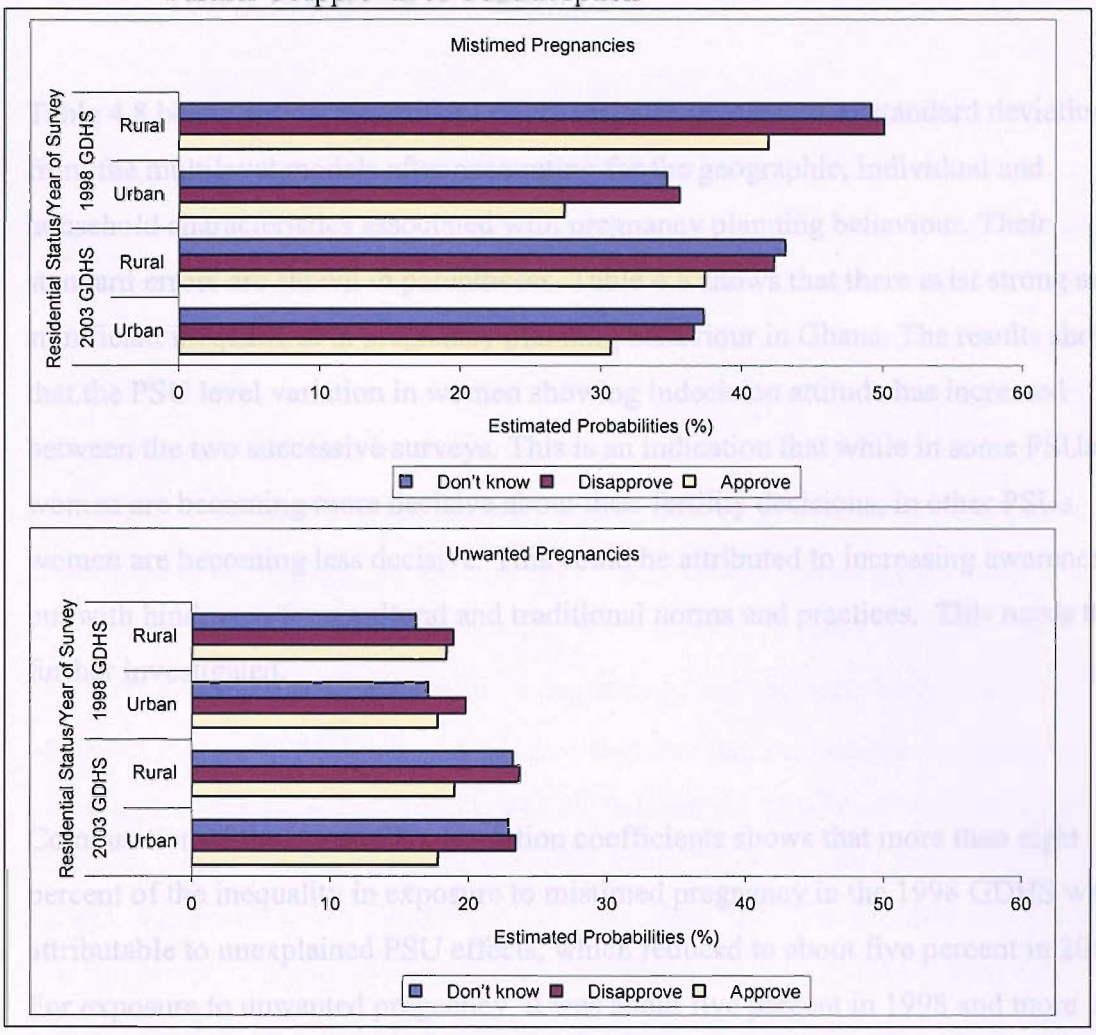


Figure 4.5: Estimated Probabilities of Exposure to Unintended Pregnancies by Partner's Approval of Contraception



4.6.5 Spatial Inequalities in Pregnancy Planning Behaviour

The spatial inequalities in pregnancy planning are investigated at three levels of developmental importance: (1) inequalities between all PSUs; (2) inequalities between and within rural and urban PSUs; and (3) inequalities between and within the ecological zones of Ghana.

I. *Inequalities between PSUs*

Table 4.8 below shows the random effect variance (expressed as standard deviations) from the multilevel models after accounting for the geographic, individual and household characteristics associated with pregnancy planning behaviour. Their standard errors are shown in parentheses. Table 4.8 shows that there exist strong and significant inequalities in pregnancy planning behaviour in Ghana. The results show that the PSU level variation in women showing indecision attitude has increased between the two successive surveys. This is an indication that while in some PSUs women are becoming more decisive about their fertility decisions; in other PSUs women are becoming less decisive. This could be attributed to increasing awareness, but with hindrance from cultural and traditional norms and practices. This needs to be further investigated.

Computation of the intra-PSU correlation coefficients shows that more than eight percent of the inequality in exposure to mistimed pregnancy in the 1998 GDHS was attributable to unexplained PSU effects, which reduced to about five percent in 2003. For exposure to unwanted pregnancy, it was about five percent in 1998 and more than nine percent in 2003. This shows that while inequalities in exposure to mistimed pregnancies have declined, inequalities in exposure to unwanted pregnancies have widened. This indicates that in general there has been a slight shift from unmet need for spacing to unmet need for limiting.

Table 4.8: Random-Effect Variances for Pregnancy Planning Behaviour

Year of Survey	PSU effect (standard deviation)			
	Wanting vs. using	Undecided vs. using	Mistimed vs. using	Unwanted vs. using
1998 GDHS	0.46 (0.14)***	0.22 (0.17) *	0.55 (0.13) ***	0.41 (0.12) ***
2003 GDHS	0.38 (0.14) ***	1.20 (0.18) ***	0.42 (0.11) ***	0.58 (0.10) ***

*Significant at p<0.10, **p<0.05; ***p<0.01

II. Inequalities between Rural PSUs and between Urban PSUs

In section 4.6.4 significant rural/urban (village/city) inequalities were identified in pregnancy planning behaviour. This section investigates if significant spatial inequalities exist between rural PSUs and between urban PSUs. Investigating whether there are significant inequalities between rural PSUs and between urban PSUs, the multivariate models were fitted varying the random effect terms for rural and urban PSUs. The results, using a likelihood ratio test revealed significant separate random effect variance terms for rural PSUs and urban PSUs for the 2003 GDHS multilevel model but not for the 1998 GDHS multilevel model. A $\chi^2 = 6993.3 - 6988.14 = 5.16$ (on 4 degrees of freedom, i.e. the number of extra parameters estimated from the previous model) not-significant at $p<0.10$ was observed for the 1998 GDHS and $\chi^2 = 7889.44 - 7877.06 = 12.38$ (on 4 degrees of freedom) significant at $p < 0.01$ was observed for the 2003 GDHS. This is an indication that inequalities in pregnancy planning between rural PSUs and urban PSUs were not significantly different in 1998. However, the parameter estimates shown in Table 4.9 reveals that from the 2003 GDHS multilevel model, inequalities between urban PSUs has declined and become less important, while it has increased and become more significant between rural PSUs. This is an indication that although local chemists provide most contraceptives in Ghana (Lande, R. E., and R. Blackburn 1989, GSS, NMIMR and ORC Macro 2004), their services may not be available in most rural PSUs.

Table 4.9 reveals a high level of inequality in showing indecision attitude between rural PSUs, an indication of increasing indecisiveness in fertility decision-making within some rural PSUs. The PSU effects suggest that there are high inequalities in exposure to mistimed pregnancies in rural Ghana which has persisted between the two successive surveys. There is also a high and increasing inequality in exposure to unwanted pregnancies in rural Ghana. The intra-PSU correlation coefficient shows that eight percent of the inequalities in exposure to mistimed pregnancies were attributable to PSU differentials in the 1998 GDHS. In the 2003 GDHS it was 14 percent in rural

Ghana. This shows that the shift from unmet need for spacing to unmet need for limiting is more pronounced in rural Ghana.

Considering urban PSUs, Table 4.9 below shows that there is declining and less important inequalities between urban PSUs in pregnancy planning behaviour. The results suggest that while the inequality gap in pregnancy planning between urban PSUs is narrowing and becoming less important, it is widening and becoming more imperative between rural PSUs. This may be due to increasing access to family services in most urban PSUs and only a few rural PSUs. Cultural and traditional practices which are mainly observed in rural PSUs may also play an important part.

Table 4.9: Rural-Urban Random-Effect Variances for Pregnancy Planning Behaviour[2]

Year of Survey	Location	PSUs effect (standard deviation)			
		Wanting vs. using	Undecided vs. using	Mistimed vs. using	Unwanted vs. using
1998 GDHS	All PSUs	0.46 (0.14)***	0.22 (0.17)*	0.55 (0.13)***	0.41 (0.12)***
2003 GDHS	Rural PSUs	0.53 (0.17)***	1.43 (0.22)***	0.55 (0.13)***	0.72 (0.13)***
	Urban PSUs	0.33 (0.24)	0.20 (0.53)	0.18 (0.27)	0.24 (0.25)

*Significant at p<0.10, **p<0.05; ***p<0.01

As discussed in Chapter Three, Section 3.3.1, the μ_{0j}'s are varied by constant values K (-1.5, -1.0, -0.5, 0, 0.5, 1.0, 1.5) to reflect varying levels of contraceptive use versus exposures to mistimed and unwanted pregnancies between PSUs. Estimated probabilities from the 2003 GDHS, varying the μ_{0j}'s, show that the rural reference woman's probability of contraceptive use (22 percent) could be as low as 9 percent and as high as 42 percent depending on the PSU in which she lives. Considering her

[2] Separate rural-urban variances are not shown for the 1998 GDHS multilevel model because they were not significantly different.

exposure to mistimed pregnancy, her estimated probability (43 percent) could range between 36 and 48 percent, while her exposure to unwanted pregnancy (24 percent) could range between 15 and 29 percent. For the urban reference woman, the 2003 GDHS estimated probabilities show that her probability of contraceptive use (29 percent) could range between 23 and 36 percent. Her estimated probability of being exposed to mistimed pregnancy (37 percent) could range between 35 and 39 percent, while her exposure to unwanted pregnancy (23 percent) could range between 21 and 26 percent. The estimated probabilities show that the inequality gap between rural PSUs is wider than that between urban PSUs.

Figure 4.6 below shows the extent of inequalities in pregnancy planning on the probability scale. These probabilities reflect changes in pregnancy planning behaviour as community characteristics changes. The probabilities are estimated based on the characteristics of the reference woman. For descriptive purposes, PSUs with positive community effects (high exposure to unintended) are referred to as "*disadvantaged*" PSUs, while PSUs with negative community effects (high contraceptive use) are referred to as "*advantaged*" PSUs. Figure 4.6 shows an increased probability in contraceptive use. However, the rate of increase is less pronounced in "*disadvantaged*" PSUs. It is evident that exposures to mistimed pregnancies have declined in all PSUs, particularly in "*disadvantaged*" PSUs. However, there has been an increased probability of being exposed to unwanted pregnancies which is more pronounced in "*disadvantaged*" PSUs. This is an indication that there has been a shifted from desiring to space to limiting childbirth, without contracepting, an indication of increasing unmet need for limiting.

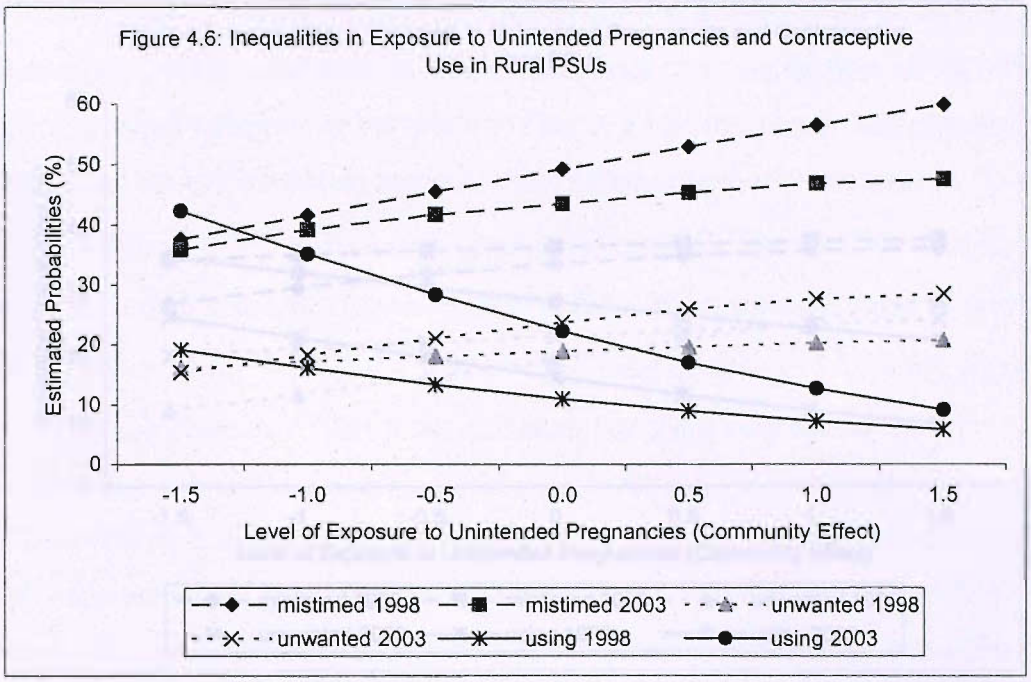
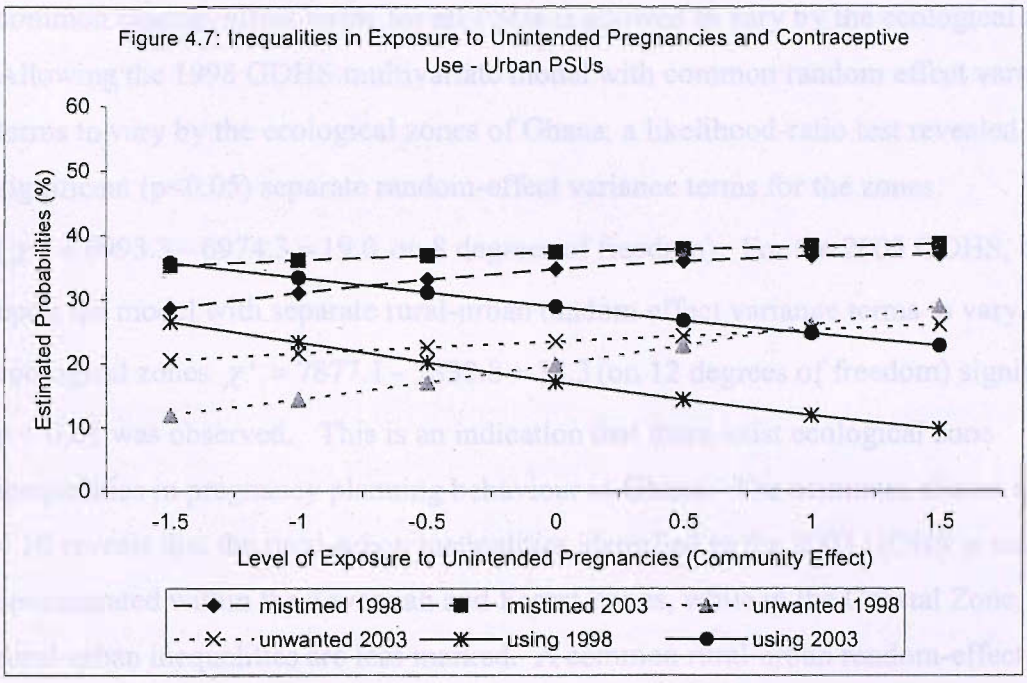


Figure 4.7 illustrates the inequality in pregnancy planning behaviour in urban Ghana, plotted on the probability scale. The 1998 GDHS multilevel model suggests that in 1998 there were significant inequality in pregnancy planning in urban Ghana, which was not significantly different from what pertains between rural PSUs. However, the 2003 GDHS multivariate model indicates that these inequalities are now less important between urban PSUs. Figure 4.7 below clearly shows that the inequality between urban PSUs is lesser than what is shown in Figure 4.6 above. Figure 4.7 shows that there was a substantial increase in contraceptive use across all urban PSUs. Also, there was increased probability of being exposed to mistimed and unwanted pregnancies particularly in "*advantaged*" PSUs. This indicates that in "*advantaged*" urban PSUs more women are having a desire of spacing or limiting childbirth.



IV. Inequalities within Ecological Zones

Studies in Ghana have reported significant inequalities between the ecological zones of Ghana (Songsore 1989 and Vanderpauye-Orgle 2002). The 2000 Ghana Living Standards Survey reported significant income differentials between the ecological zones. Both the 1998 and 2003 GDHS reported high TFR, short birth intervals and high infant and child mortality rates for the Savannah Zone of Ghana. In the previous section significant rural-urban differentials were identified in pregnancy planning behaviour. In Ghana, bridging the inequality gap between and within the ecological zones is focal on the country's developmental agenda. Thus, it is of policy and programme importance to investigate, how the inequalities vary between and within PSUs in each ecological zone of Ghana. This section tests if differentials identified in previous stage of the analysis are marked across PSUs within each ecological zone.

Since the model with separate rural-urban random-effect variance terms for the 1998 GDHS multivariate model was not statistical significant, the multivariate model with

common random effect terms for all PSUs is allowed to vary by the ecological zones. Allowing the 1998 GDHS multivariate model with common random effect variance terms to vary by the ecological zones of Ghana, a likelihood-ratio test revealed significant ($p<0.05$) separate random-effect variance terms for the zones ($\chi^2 = 6993.3 - 6974.3 = 19.0$ on 8 degrees of freedom). For the 2003 GDHS, building upon the model with separate rural-urban random effect variance terms to vary by the ecological zones $\chi^2 = 7877.1 - 7838.8 = 38.3$ (on 12 degrees of freedom) significant at $p < 0.01$ was observed. This is an indication that there exist ecological zone inequalities in pregnancy planning behaviour in Ghana. The estimates shown in Table 4.10 reveals that the rural-urban inequalities identified in the 2003 GDHS is mainly concentrated within the Savannah and Forest Zones, while in the Coastal Zone, the rural-urban inequalities are less marked. A common rural-urban random-effect variance term is therefore estimated for the Coastal Zone.

Considering inequalities within the Savannah Zone, Table 4.10 shows marked rural-urban inequalities within the Zone. The results show that the inequalities in the Urban Savannah Zone have become less important. However, the results reveal strong evolving divide between rural PSUs within the Savannah Zone. This suggest that the level of exposure to unintended pregnancies in urban PSUs within the Savannah Zone is similar across all urban PSUs, while it varies significantly among rural PSUs of the Savannah Zone. The average intra- PSU correlation coefficient for exposure to mistimed pregnancies for the Rural Savannah Zone was about 23 percent, compared to nine percent for the Urban Savannah Zone. For exposures to unintended pregnancies, the average intra- PSU correlation coefficient was 25 percent for the Rural Savannah Zone and only four percent for the Urban Savannah Zone.

The high inequalities identified in indecision attitude in rural Ghana, as shown in Table 4.10 is highly marked within the Rural Savannah Zone. An average intra- PSU correlation coefficient of 54 percent was estimated for the Rural Savannah Zone in showing indecision attitude. This indicates an increasing indecisiveness in fertility decision-making in some rural PSUs of the Savannah Zone. A plausible explanation

for the high inequalities in indecision attitude in the area may be due to growing awareness of family planning but cultural norms and social pressures may be preventing women from making the decision to contracept. As indicated earlier, there is the need for a study in the area to investigate the causes of this increasing indecisiveness among women.

The estimates from the 2003 GDHS multivariate model (Table 4.10) shows that the inequalities in exposure to unintended pregnancies in the Urban Forest Zone have declined and their effects are less significant. However, the inequalities in exposure to mistimed and unwanted pregnancies within rural PSUs in the Forest Zone remain highly significant. An average intra- PSU correlation coefficient of 10 percent and seven percent was estimated for exposure to mistimed and unwanted pregnancies respectively for the Rural Forest Zone and 0.003 percent and 0.1 percent for the Urban Forest Zone. This is an indication that exposures to unintended pregnancies are very similar across all urban PSUs in the Forest Zone, while for the Rural Forest Zone exposures vary substantially. PSUs with high exposures within the zone therefore need to be identified and targeted with the appropriate intervention.

Considering the Coastal Zone, the 1998 GDHS multivariate model revealed non-significant inequalities in exposure to unintended pregnancies which does not vary for rural and urban PSUs. The 2003 GDHS results show that inequalities in exposure to unintended pregnancies within the Coastal Zone have declined. Across rural and urban PSUs of the Coastal Zone the inequalities in exposure to unintended pregnancies are less important. A plausible explanation to this result may be that contraceptives have become highly accessible in PSUs within both Rural and Urban Coastal Zones of Ghana and are relatively affordable compared to services such as obstertric care. The 2003 GDHS average intra- PSU correlation coefficient for exposure to mistimed pregnancies for the Coastal Zone was 0.1 percent and one percent for exposures to unwanted pregnancies.

Table 4.10: Ecological Zone Random-Effect Variances for Pregnancy Planning Behaviour

Year of survey	Ecological Zone	PSU Effect (standard deviation)			
		Wanting vs. Using	Undecided vs. Using	Mistimed vs. Using	Unwanted vs. Using
1998 GDHS	Savannah	0.57 (0.24)**	0.80 (0.51)	0.55 (0.23)**	0.18 (0.29)
	Forest	0.53 (0.30)*	0.41 (0.31)	0.48 (0.25)**	0.67 (0.20)***
	Coastal	0.36 (0.23)	0.23 (0.22)	0.57 (0.20)*	0.59 (0.17)***
2003 GDHS	Rural Savannah	0.97 (0.31)***	1.95 (0.42)***	0.99 (0.28)***	1.04 (0.26)***
	Urban Savannah	0.14 (0.60)	0.49 (1.33)	0.57 (0.75)	0.39 (1.49)
	Rural Forest	0.44 (0.32)	0.77 (0.31)**	0.60 (0.25)**	0.48 (0.17)***
	Urban Forest	0.68 (0.31)**	0.13 (0.74)	0.01 (0.43)	0.06 (0.85)
	Coastal	0.42 (0.29)	0.79 (0.50)	0.08 (0.28)	0.19 (0.20)

*Significant at p<0.10; **p<0.05; ***p<0.01

Again, to clearly understand the extent of inequalities that exist between PSUs within the ecological zones of Ghana, the random effect terms for the 1998 and 2003 GDHS are plotted on the probability scale based on the characteristics of reference woman. Figure 4.8 shows the plot of inequalities in pregnancy planning behaviour for PSUs within the Savannah Zone of Ghana. The plots clearly show a widening inequality gap in pregnancy planning behaviour in the Savannah Zone, particularly between rural PSUs. The 2003 GDHS plot shows an increased use of contraceptives and decline in exposures to mistimed and unwanted pregnancies in "*advantaged*" PSUs in the Savannah Zone.

In the previous sections, it was identified that exposures to mistimed pregnancies are very high in the Savannah Zone. The low and insignificant inequalities identified in the Urban Savannah Zone indicate that the level of exposure to unintended pregnancies is very similar for all urban PSUs within the Savannah Zone. Considering the wide inequalities identified for rural PSUs within the Savannah Zone, it is important to note that this is an area with high exposures to mistimed pregnancies that is higher than any part of Ghana. Therefore, although the inequalities are high, "*advantaged*" PSUs may still have very high exposures to mistimed pregnancies. Therefore, interventions to reduce exposures to unintended pregnancies in the Savannah Zone needs to target a wider audience from both the rural and urban populations, but with particular emphasis

on high risk areas. The identified inequality in the Rural Savannah Zone of Ghana is more pronounced between the contraceptive uptake and unmet need for spacing.

Figure 4.8: Inequalities in Exposures to Unintended Pregnancies and Contraceptive Use in the Savannah Zone of Ghana

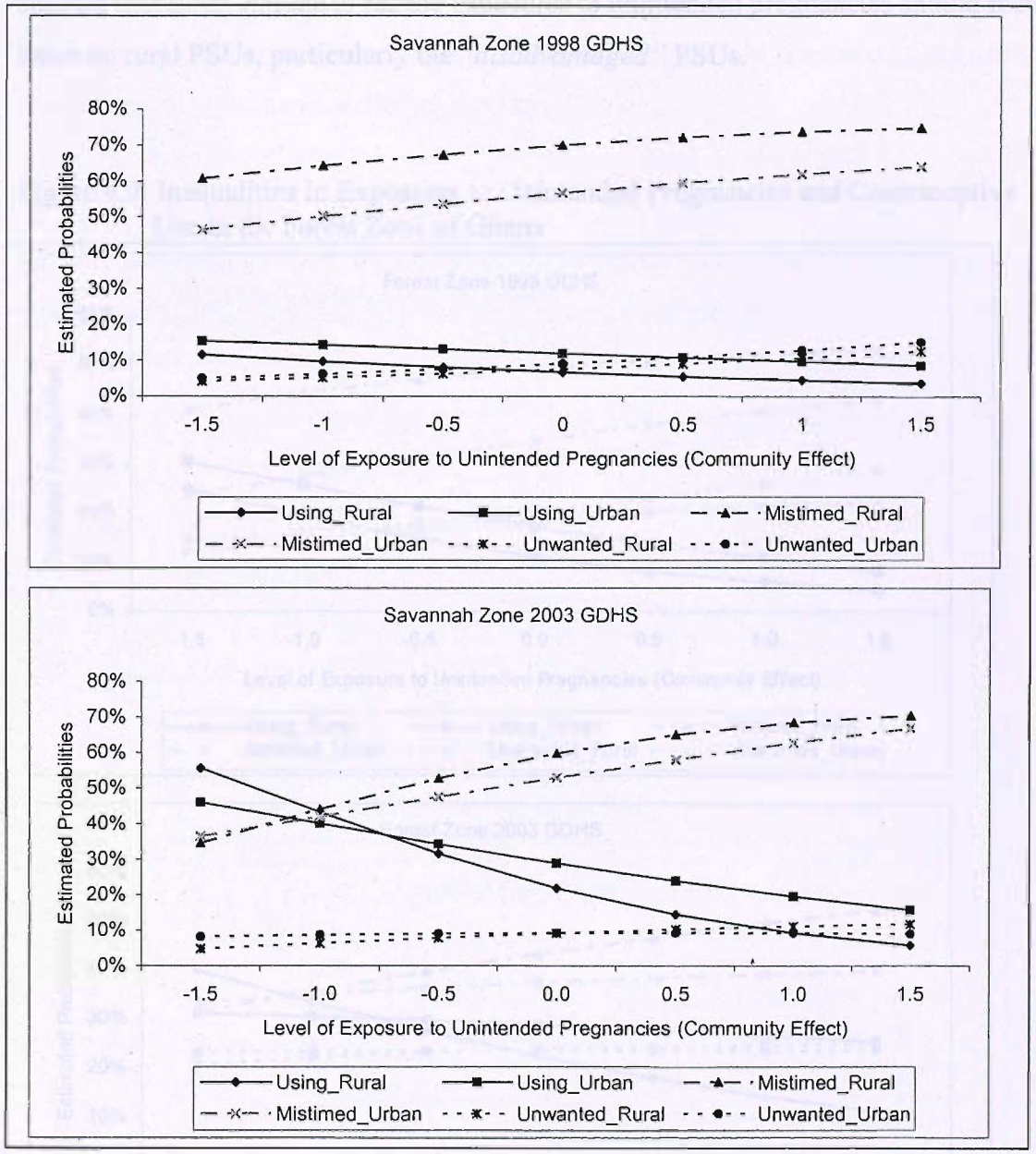


Figure 4.9 below shows the extent of inequality in pregnancy planning behaviour for rural and urban PSUs within the Forest Zone of Ghana. Figure 4.9 clearly depicts higher inequalities in rural PSUs of the Forest Zone. The 2003 GDHS plot shows that

contraceptive uptake has increased in most "*disadvantaged*" PSUs in the Urban Forest Zone of Ghana. On the other hand, in most "*disadvantaged*" PSUs in the Rural Forest Zone of Ghana contraceptive uptake remains very low. The plot also shows that exposures to unintended pregnancies has declined in "*advantaged*" rural PSUs of the Forest Zone, but remains very high in rural "*disadvantaged*" PSUs. The results suggest that interventions to reduce exposures to unintended pregnancies should focus more on rural PSUs, particularly the "*disadvantaged*" PSUs.

Figure 4.9: Inequalities in Exposures to Unintended Pregnancies and Contraceptive Use in the Forest Zone of Ghana

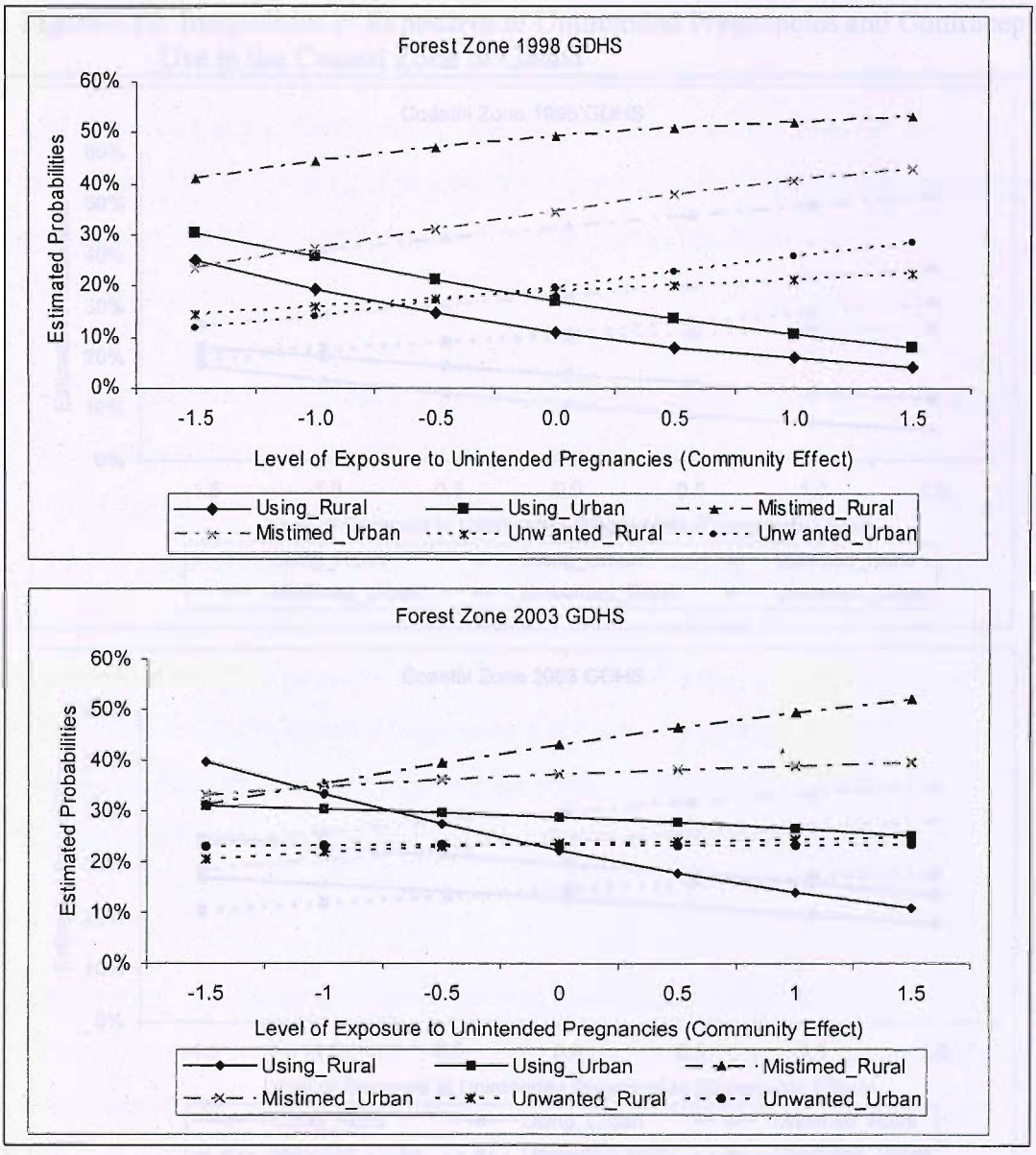
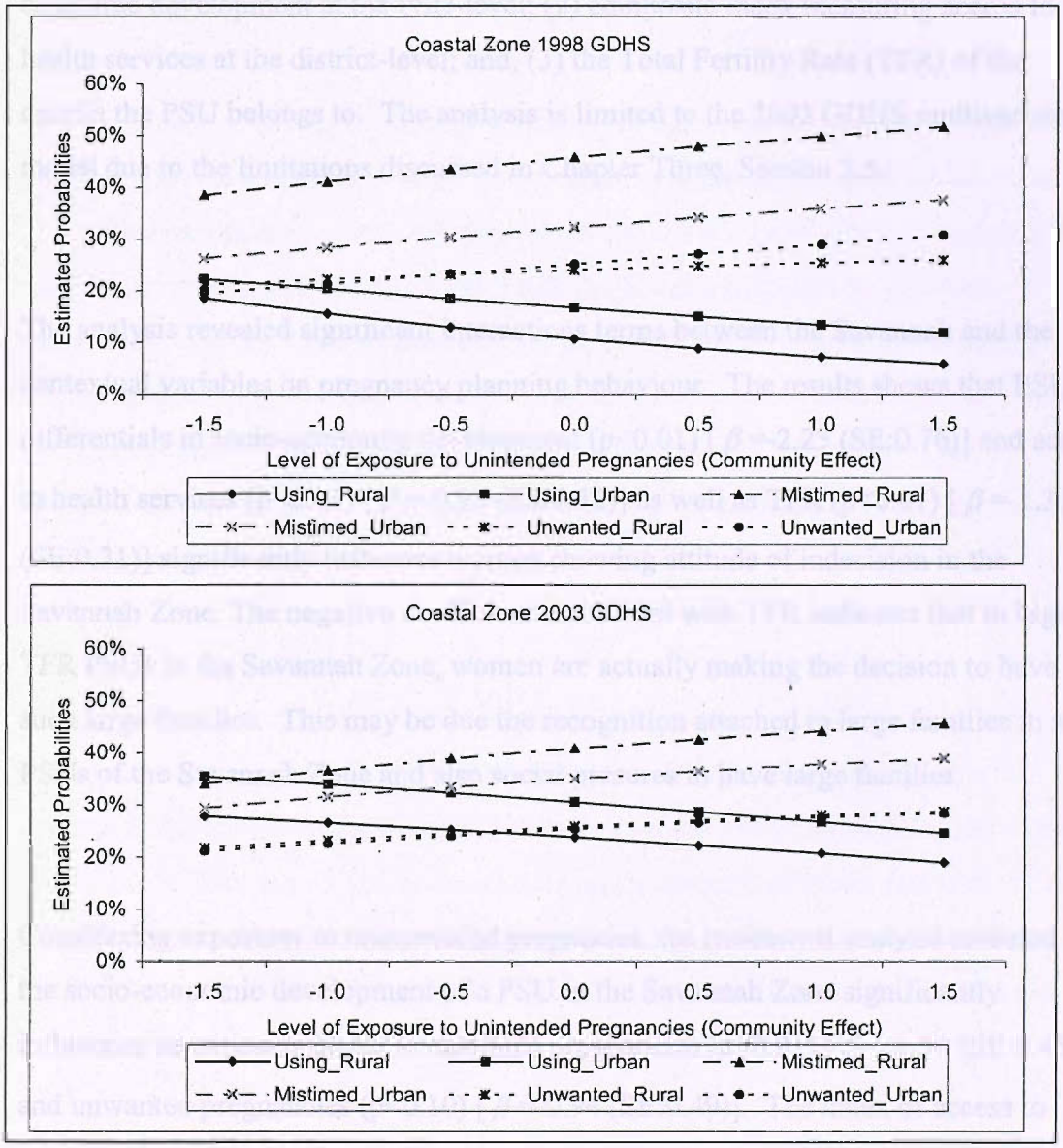


Figure 4.10 below shows the extent of inequality in pregnancy planning behaviour for rural and urban PSUs of the Coastal Zone of Ghana. Although the 1998 plot depicts some measurable inequalities in contraceptive uptake and exposures to unintended pregnancies, the 2003 plot depicts a weak inequality for both rural and urban PSUs of the Coastal Zone. Nonetheless, it is important to note that, similarly to the Forest Zone, the Coastal Zone is characterised with high exposures to unwanted pregnancies. This indicates that the high exposure to unwanted pregnancies is relatively high across all PSUs of the Coastal Zone being rural or urban.

Figure 4.10: Inequalities in Exposures to Unintended Pregnancies and Contraceptive Use in the Coastal Zone of Ghana



4.7 EXPLAINING THE INEQUALITIES IN PREGNANCY PLANNING

In the previous sections significant spatial inequalities were identified in pregnancy planning behaviour after controlling for spatial effects, individual and household characteristics. To explain the factors mitigating these inequalities in pregnancy planning behaviour, the effects of contextual covariates were examined using data from the 2000 GPHC and the 2003 GDHS multivariate model. The contextual effect were investigated using the model with varying random effect variance terms for the rural-urban ecological zones, since it explains most of the variability identified in the data. The contextual variables used were: (1) composite index measuring socio-economic development at the PSU-level; (2) composite index measuring access to health services at the district-level; and, (3) the Total Fertility Rate (TFR) of the district the PSU belongs to. The analysis is limited to the 2003 GDHS multivariate model due to the limitations discussed in Chapter Three, Section 3.5.

The analysis revealed significant interactions terms between the Savannah and the contextual variables on pregnancy planning behaviour. The results shows that PSU differentials in socio-economic development ($p<0.01$) [β=-2.23 (SE:0.76)] and access to health services ($p<0.01$) [β=-0.95 (SE:0.32)] as well as TFR ($p<0.01$) [β=-1.31 (SE:0.31)] significantly influence women showing attitude of indecision in the Savannah Zone. The negative coefficient associated with TFR indicates that in high TFR PSUs in the Savannah Zone, women are actually making the decision to have such large families. This may be due the recognition attached to large families in some PSUs of the Savannah Zone and also social presures to have large families.

Considering exposures to unintened pregnacies, the contextual analysis revealed that the socio-economic development of a PSU in the Savannah Zone significantly influences its exposure status to mistimed pregnancies ($p<0.01$) [β=-1.34 (SE:0.45)] and unwanted pregnancies ($p<0.10$) [β=-0.94 (SE:0.49)]. The index of access to health facilities ($p<0.05$) [β=-0.61 (SE:0.29)] and the TFR of the district ($p<0.05$)

[β =-0.77 (SE:0.29)], proxy variables for distribution of health services and birth rate in the Savannah Zone were identified to influence exposures to unwanted pregnancies within the zone. The estimated coefficients show that PSUs with high socio-economic status in the Savannah Zone are less exposed to mistimed and unwanted pregnancies. Also, PSUs which belongs to districts with less inequalities in access to health services and low TFR are less exposed to unwanted pregnancies. None of the contextual variables could significantly explain the high inequalities in contraceptive uptake versus the desire for children in the Savannah Zone (for socio-economic development: [β =-0.62 (SE:0.42)]; access to health facilities: [β =-0.21 (SE:0.22)]; and TFR: [β =-0.43 (SE:0.28)]. Also, none of the contextual varaibles for the Forest Zone could significantly explain the inequalities within the zone.

Having accounted for the contextual variables for the Savannah Zone in the multilevel model, there still remain significant unexplained inequalities in the Rural Savannah Zone. The results shows that only four percent of the PSU variation in wanting a child versus contracepting in the Rural Savannah Zone was attributable to the three contextual variables. On the otherhand, 41 percent of the PSU variation in showing an attitute of indecision versus contracepting is attributable to the the contextual variables. The contextual variables also explain about 18 percent and 29 percent of the PSU variation in exposures to mistimed pregnancies versus contracepting and exposures to unwanted pregnancies versus contracepting respectively in the Rural Savannah Zone.

It is important to note that, attitudinal/behavioural factors, cultural practices and traditional beliefs, access to health facilities and quality of care including cost of services at the PSU level, which could help explain the remaining inequalities were not available. Efforts were made to obtain data on distribution of health facilities for the selected EAs from the Ministry of Health, Ghana, but the data was not available. There is the need for an in-depth field research to explain the inequalities that exist in pregnancy planning behaviour in Ghana.

4.8 DISCUSSION AND CONCLUSIONS

The aim of this chapter was to examine risks to unintended pregnancies and the extent of inequality in pregnancy planning behaviour in Ghana. The study finds substantial evidence that a high proportion of women in Ghana are exposed to unintended pregnancies. Thus, unmet need for contraception is high. An important revelation from this study is that there has been a shift in demand for children (from high to low) in Ghana. Despite the shift in demand, there has not been a significant change in pregnancy planning behaviour. More than half of all married women in Ghana are exposed to unintended pregnancies. This revelation suggests that family planning interventions in Ghana may have been successful in educating women to desire to limit or space childbearing, without encouraging them to contracept. There is a clear indication from this study that there exist rural/urban differentials in pregnancy planning behaviour in Ghana. Contraceptive uptake is higher in urban Ghana than in rural Ghana. Women residing in rural PSUs of Ghana are more exposed to unintended pregnancies than their urban counter parts.

Determinants of fertility planning behaviour identified in this chapter corresponds with previous studies into fertility intentions and contraceptive use (Nortman 1982, Njogu 1991, Guilkey and Jayne 1997, Magadi et al. 2003, Blanc and Grey 2002, Lutalo et al. 2000, Mroz et al. 1999, Dow and Werner 1982, Zaky 1995, Stash 1996, Casterline et al 1996, Rutenberg and Watkins 1997, Schuler et al 1994, Parveen et al. 1995, Mbizvo and Adamchak 1991, Ezeh 1993, Lasee and Becker 1997, Biddlecom and Fapohunda 1998). The multilevel models revealed significant rural/urban as well as zonal spatial inequalities in pregnancy planning behaviour. A woman's age, her educational status, sexual exposure, number of living children, frequency of spousal communication on contraception and her partner's approval of contraception were also identified to be strong predictors of pregnancy planning behaviour.

Previous studies into women's pregnancy planning behaviour have restricted their attitudinal measures to fertility intentions without considering what is being done to achieve the perceived intentions. Linking fertility intentions and contraceptive practices, this study has identified different patterns of exposures to mistimed and unwanted pregnancies. For example this study has confirmed that younger women are highly exposed to mistimed pregnancies, whilst older women are highly exposed to unwanted pregnancies. Also, most studies in Ghana on contraception have concluded that the Savannah Zone is prone to unintended pregnancies. This study has evidently shown that while women in the savannah are high exposed to mistimed pregnancies, those in the Forest and Coastal zones are exposed to unwanted pregnancies. This is an indication of high unmet need for spacing in the Savannah Zone and high unmet need for limiting in the Forest and Coastal Zones.

The strength and direction of association of spousal effects on pregnancy planning behaviour attest to the need for male involvement in family planning programmes. Nonetheless, it is important also to note that there are still a substantial proportion of women whose partners have a positive attitude towards contraception but are exposed to mistimed and unwanted pregnancies. This shows that awareness and acceptance does not necessarily guarantee use. Wealth status, which might be expected to affect fertility planning behaviour, does not have a strong significant effect when other socio-economic factors are controlled. Part of the explanation for this may be that educational effects and parity may be more important in pregnancy planning behaviour than wealth status.

After accounting for the characteristic measures that influence pregnancy planning behaviour, the analysis shows that there are significant inequalities in pregnancy planning behaviour in Ghana. The results show increasing inequalities in women showing attitude of indecision. This is an indication that more women are becoming more aware of planning their pregnancy but unable to make definite fertility decisions to contracept to avert conception. As stated earlier, cultural barriers and traditional practices may be hindering women's decision making, irrespective of their level of

awareness. Inequalities in exposures to unintended pregnancies have declined substantially in urban Ghana but remain relatively high in rural Ghana. The analysis further reveals that the declining inequality in exposure to unintended pregnancies in urban Ghana is more pronounced in the Coastal Zone, while the increasing inequality is more pronounced in the Savannah Zone. The results show that although the inequalities in Forest Zone have declined slightly, it remains important.

With the exception of the Coastal Zone, significant inequalities exist within ecological zones of Ghana. In the presence of spatial, individual and household characteristics, contextual variables from the 2000 GPHS could not explain all the inequalities that exist in pregnancy planning behaviour. The socio-economic development of a PSU, access to health services and TFR were identified to explain some of the inequalities within the Savannah Zone. The results of this study show that there is the need for in-depth research to investigate the attitudinal/behavioural and cultural and traditional practices that influence pregnancy planning behaviour. Data on access to services, cost and quality of care at the PSU level – factors associated with health care seeking behaviours were not available.

The extent of the spatial inequalities that has been identified to exist in pregnancy planning behaviour calls for investigations to identify high exposure areas and the type of exposures in order to aid targeting risk groups with the appropriate interventions. Small area estimation techniques developed in recent times will be employed in Chapter Six to identify areas with high exposures. This will also help identify some of the contextual factors that explain exposures to unintended pregnancies. The analysis will be conducted at the district level, since all districts are sampled in the GDHS and are the pivot of decision-making. This will further aid implementation, monitoring and evaluation of maternal health activities.

CHAPTER FIVE

5.0 SPATIAL INEQUALITIES IN DELIVERY CARE UPTAKE

5.1 INTRODUCTION

There is evidence in research studies that uptake of delivery care has significant impact on the outcome of pregnancy and the health of the mother as well as the child. Inequalities in access to health services (geographical accessibility and economic inequality) greatly dictate a woman's choice of health care and health care seeking behaviour. Strong spatial inequalities have been reported from several demographic and health studies in sub-Saharan Africa, with urban and more industrialized areas having better demographic indicators and access to services. However, there are inequalities between rural areas, between urban areas and also within ecological zones that has received little or hardly any research attention.

The most recent GDHS (2003) shows that more than half of all deliveries in Ghana take place at home (70 per cent in rural Ghana and 20 percent in urban Ghana) under unhygienic surroundings in the presence of unskilled birth attendants. Given the high levels of home deliveries in Ghana, it is important to investigate the spatial inequalities that exist in delivery care uptake. In Ghana, little evidence exists regarding spatial inequalities in uptake of delivery care and the factors that mitigate these inequalities. This chapter investigates delivery care services available to women in rural (villages) and urban (cities) Ghana and the extent of inequalities in uptake of delivery care. Multinomial multilevel logistic regression models have been used for this purpose.

5.2 OPERATIONAL DEFINITION OF SKILLED ATTENDANT

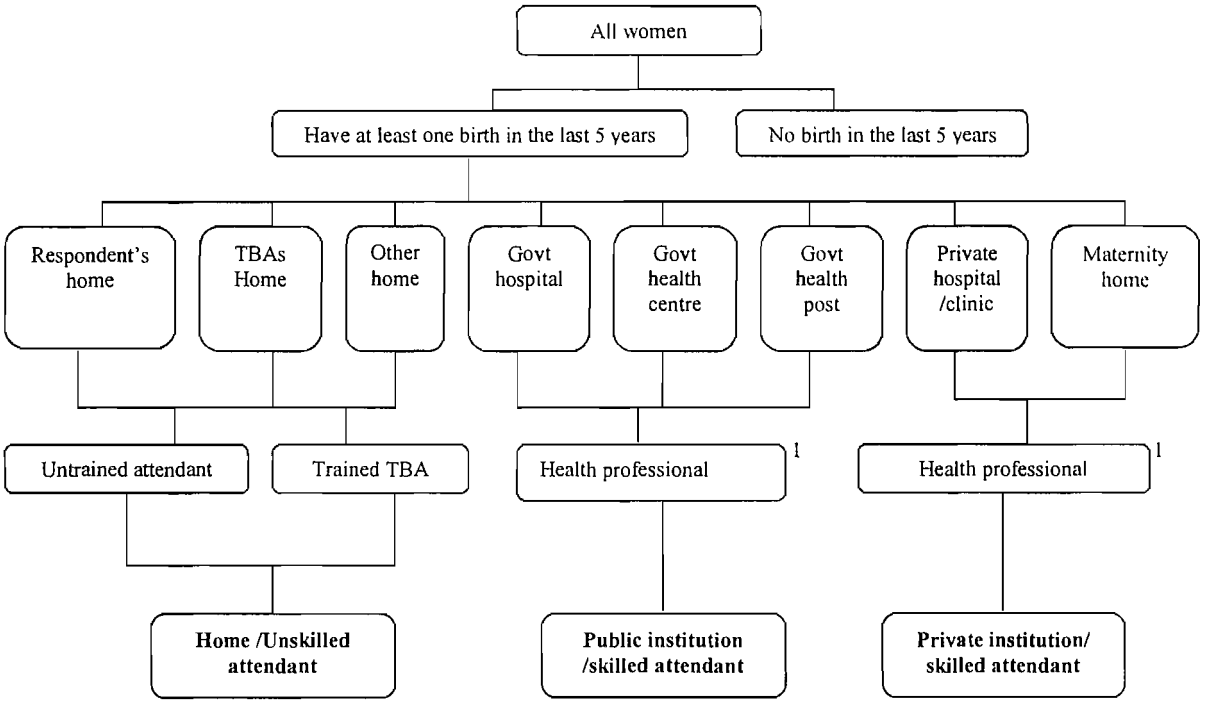
There has been a lack of clear definition on the role and potential of skilled attendants for delivery care. "Trained attendant" until the mid 1990s was used to refer to both professional and non-professional health workers (e.g. Trained Traditional Birth Attendants) as long as they have received some training in delivery care (De Brouwere and Van Lerberghe 2001). However, Starrs (1997) argued that someone who has been trained is not necessarily skilled. The WHO/UNFPA/UNICEF/World Bank (1999) and Ronsmans et al (2002) defined the term "skilled attendants" to refer exclusively to people with midwifery skills (e.g. doctors, midwives, nurses) who have been trained to proficiency in the skills necessary to manage normal deliveries, diagnosis, management of complications and referral services. SMIAG (2000) emphasised in the definition of skilled attendants the inclusion of an enabling environment in which adequate medical supplies, equipment and infrastructure as well as efficient and effective system of communication for referral can be undertaken.

From the criteria specified above the operational definition adopted for skilled attendant for this study is - *a person with midwifery skills who have been trained to proficiency in the skills necessary to manage normal deliveries, diagnosis, management of complications and referral services and works in an enabling environment in which adequate medical supplies, equipment and infrastructure as well as efficient and effective system of communication for referral can be undertaken.*

5.3 MULTI-CATEGORY CLASSIFICATION OF RESPONSE VARIABLE

The categorisation of delivery care uptake in this study is based on the definition of skilled attendant specified in section 5.2. Figure 5.1 is a flowchart illustrating the categorisation of delivery care services in Ghana.

Figure 5.1: Multi-Categorisation of Delivery Care Services



Health professionals operating in the public and private sector are considered skilled attendants, while untrained attendants and trained TBAs are considered unskilled attendants. Previous research studies point out that women who deliver in non-institutionalised facilities (home) under the care of unskilled attendants are highly exposed to complications and case fatalities (Hogberg and Wall 1986; Rooney 1992; Loudon, 1992; WHO 1994; WHO 1996; McDonagh 1996; WHO 1997; Koblinsky et al 1999; Graham and Bell 2000; AbouZahr and Wardlaw 2001; Bergsjø 2001; Graham et al. 2001; Robinson and Wharrad 2001; Kausar 2001; Ronsmans et al 2002).

Although it would have been of interest to investigate the differentials that exist between home deliveries under untrained attendants and trained TBAs, the 2003 GDHS did not distinguish between the two categories. The World Health Organisation has also indicated that the skills of TBAs are not proficient to conduct safe and efficient deliveries. The WHO/UNFPA/UNICEF/World Bank (1999) and SMIAG (2000) definition of skilled attendant also indicates that the skill and environment in

[1] Health professionals comprise doctors, nurses and midwives

which TBAs operate is not proficient for safe delivery. Three categories of delivery care services were investigated in this study:

Category 1: Home	*Deliveries at home under the supervision of an unskilled attendant*
Category 2: Public facility	*Deliveries in government owned health facilities under the supervision of a skilled attendant*
Category 3: Private facility	*Deliveries in privately owned health facilities under the supervision of a skilled attendant*

The public/private categorisation is aimed at identifying the public/private share of delivery care provision in Ghana.

5.4 SAMPLE SIZE AND STRUCTURE OF DATA

The data has a hierarchical structure with two levels. The women about whom information on place of delivery was collected (level 1) were nested in PSUs (villages and cities - level 2). Although it would have been interesting to investigate inequalities between households, the degree of nesting of women in households was very low and not very different from the degree of nesting at the individual level. In the 1998 GDHS there were only 5.8 percent of households with more than one woman with a birth in the 5 years preceding the survey. In the 2003 GDHS it was 7.5 percent. Table 5.1 below summarise the extent of nesting in the dataset. The effect of the changes in the sample design of the 1998 and 2003 GDHS discussed in Chapter Four, Section 4.4 is again reflected in Table 5.1 below.

Table 5.1: Hierarchical Structure of the Data

Year of survey	Location	All women in the survey	Eligible women in sample	Ineligible women in sample	PSUs	Range of women per PSU
1998 GDHS	National	4843	2342	2501	397	1 – 23
	Rural	3104	1794	1310	262	1 – 23
	Urban	1739	548	1191	135	1 – 8
2003 GDHS	National	5691	2757	2934	410	1 – 20
	Rural	2936	1945	991	238	1 – 20
	Urban	2755	812	1943	172	1 – 16

Source: 1998 and 2003 Ghana Demographic and Health Survey

5.5 MODELLING PLACE OF DELIVERY

Griffiths et al (2004) indicated that modelling a complete set of repeated observations such as delivery care uptake without controlling for the clustering effect is inappropriate. This is because the decision to opt for a particular place of delivery may not be an independent decision from a previous choice, which is influenced by a number of individual mother's and household characteristics. The 1998 and 2003 GDHS shows that 85 and 83 percent of women with at least 2 births respectively, utilised the same delivery care for both births. This suggests that a woman's decision to use a particular delivery care for a pregnancy may not be independent of any previous decision to use the service. Thus, modelling the place of delivery for all births recorded in the survey would not be necessary. The analysis is limited to place of last delivery from the five years preceding the survey.

5.6 EXPLANATORY VARIABLES

Table 5.2 below shows the variables used in the analysis and their categorisation. The variables were selected based on subject matter knowledge and their importance to the analysis. Multicollinearity of variables was checked and where necessary one of such

variables was omitted based upon importance and level of significance in the analysis. The household wealth status was derived using Assert Index Analysis via Principal Component Analysis. The upper 20 percent were categorised as rich, the middle 60 percent as modestly rich, and the lower 20 percent were categorised as poor. The computation of the composite indices for the contextual variables from the census was described in Chapter Two.

Table 5.2: Variables Used in the Analysis

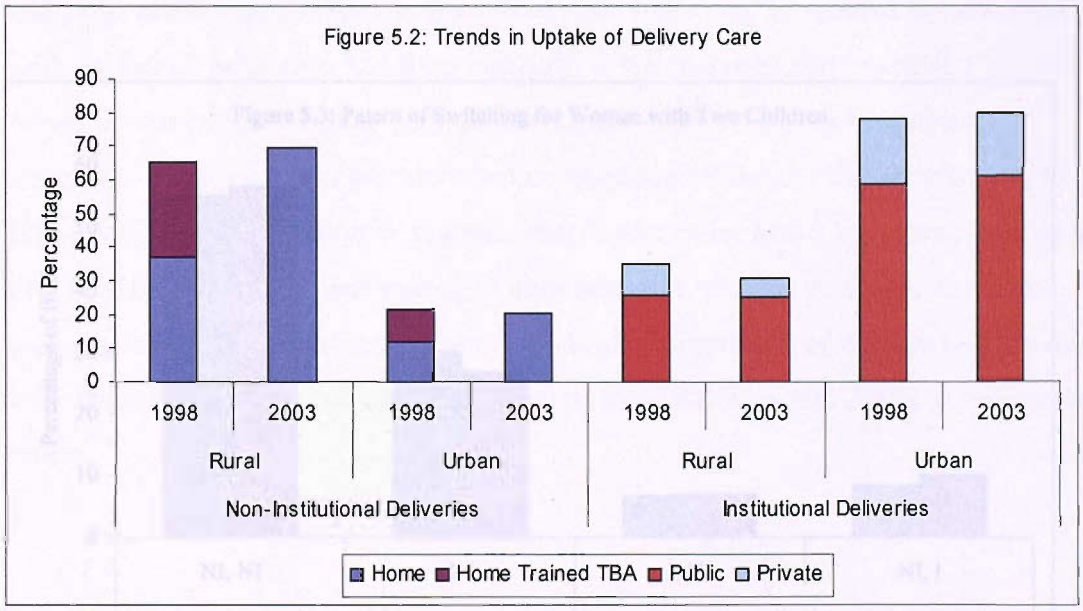
DHS Data	
Geographic variables	*Categories*
Residential status	Rural, urban
Ecological zone of residence	Coastal, Forest, Savannah
Individual-level factors	
Year of birth	1998 GDHS: 1994, 1995, 1996, 1997, 1998 2003 GDHS: 1999, 2000, 2001, 2002, 2003
Current age	<20 years, 20-34 years, 35+ years
Maternal education	None, Primary, Secondary or higher
Religious affiliation	Christian, Moslem, Other
Birth order number	First, second – third, fourth or higher
Timing of first antenatal care visit	Within first trimester, after first trimester
Number of antenatal care visits	None, 1-3 visits, 4-6 visits, 7+ visits
Ever experienced a child death	No, yes
Birth by caesarean section	No, yes
Household level variables	
Partner's educational status	None, Primary, Secondary or higher
Household wealth status	Poor, Modest, Rich
Census Data	
PSU-level Index of socio-economic development	Continuous
District level Index of access to health services	Continuous
District level Total Fertility Rate	Continuous

5.7 RESULTS

5.7.1 Trends in Choice of Place of Delivery

Figure 5.2 below shows the percentage distribution of rural/urban differentials in uptake of delivery care in Ghana. In the absence of any spatial, demographic or socio-economic factors, Figure 5.2 indicates that there exist an institutional/non-institutional divide in the uptake of delivery care in Ghana. A clear public/private divide is also depicted in the uptake of institutional delivery care in Figure 5.2. The uptake of non-institutional delivery care is predominant in rural Ghana, while in urban Ghana public health care dominates uptake of delivery care. The graph suggest that overall, there has not been much shift in uptake of delivery care. The graph further shows that a substantial proportion of home deliveries recorded in the 1998 GDHS were attended by trained TBAs. Note that the 2003 GDHS did not distinguish between untrained attendants and trained TBAs.

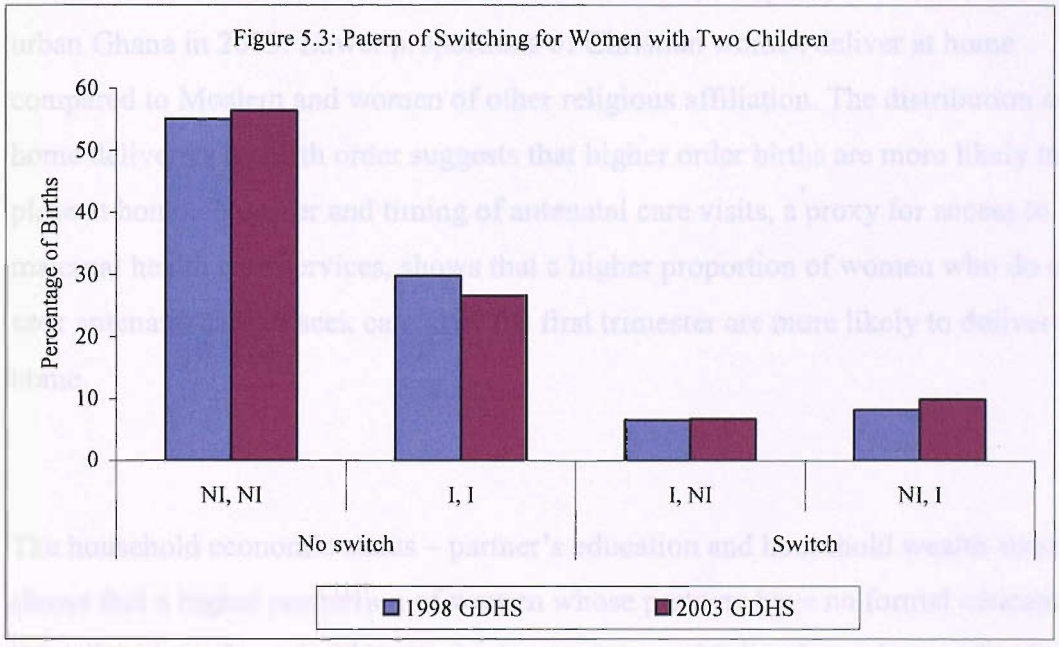
Figure 5.2: Trends in Uptake of Delivery Care



5.7.2 Switching Dynamics in the Utilisation of Delivery Care

Figure 5.3 below highlight the pattern of switching in delivery care seeking behaviours in Ghana for the 1998 and 2003 GDHS. Figure 5.3 shows the place of delivery for the last two births in the five years preceding the survey. Refer to Appendix Three, Tables 3.1 and 3.2 for the pattern of switching for all births recorded in the survey. Figure 5.3 reveals that without accounting for any other factors associated with delivery care uptake, the choice of a particular delivery care for a previous birth is most likely to continue for subsequent births. However there are a small percentage of women who experience switching behaviour in uptake of delivery care. More than 85 percent of women with at least two births in the 1998 GDHS and 83 percent in the 2003 GDHS continued to adopt the same place of delivery care. Out of 866 women with more than one birth recorded in the 1998 GDHS, 85 percent did not switch place of delivery for all births in the five years preceding the survey. From the 2003 GDHS 82 percent did not switch place of delivery. The results suggest that seeking a particular delivery care by a woman for a particular pregnancy might not be an independent decision from a previous decision to use that service.

Figure 5.3: Patern of Switching for Women with Two Children



NI = Non-institutional I = Institutional

5.7.3 Home Deliveries by Background Characteristics

Prior to the multivariate analysis, bivariate analysis using cross-tabulations was conducted to assess the distribution of the data and to identify potential predictors in explaining uptake of delivery care in Ghana. The significance of the predictors was tested using the Pearson Chi-Squared test statistic. As indicated in Chapter Three the test was not adjusted to compensate for the clustering effect. The predictors presented in Tables 5.3 and 5.4 are significant at $p<0.10$. Table 5.3 and 5.4 below shows the percentage distribution of home deliveries by background characteristics for rural and urban Ghana. In all, about 7 out of every 10 births recorded in rural Ghana occurred at home. In urban Ghana it was about 2 in 10. There is also a clear zonal differential in uptake of delivery care. In both rural and urban Ghana, the Savannah Zone has a high uptake of home delivery care, while the Forest Zone has the highest uptake of institutionalised delivery care. In Rural Savannah almost 9 in every 10 deliveries were at home compared to 4 in every 10 in Urban Savannah.

Considering women's background characteristics, higher proportions of older and less educated women delivered at home. More than 8 in every 10 women in rural Ghana with no formal education had their last birth at home, compared to about 4 in 10 in urban Ghana in 2003. Lower proportions of Christian women deliver at home compared to Moslem and women of other religious affiliation. The distribution of home deliveries by birth order suggests that higher order births are more likely to take place at home. Number and timing of antenatal care visits, a proxy for access to maternal health care services, shows that a higher proportion of women who do not seek antenatal care or seek care after the first trimester are more likely to deliver at home.

The household economic status – partner's education and household wealth status shows that a higher proportion of women whose partners have no formal education and those from poor household have a higher tendency of delivering at home. In rural

Ghana more than 8 out of every 10 women whose partners have no formal education had their last birth at home compared to less than 6 in 10 for those who partner's have secondary or higher education. In urban Ghana it was about 3 in 10 for those whose partner's have no education compared to less than 2 in 10 for those whose partner had secondary or higher education. Also, about 9 in out of every 10 women from poor households in rural Ghana had their last birth at home, compared to about 4 in 10 for their counterparts from rich households. In urban Ghana about 4 in 10 women from poor households delivered at home compared to less than 1 in 10 for those from rich households.

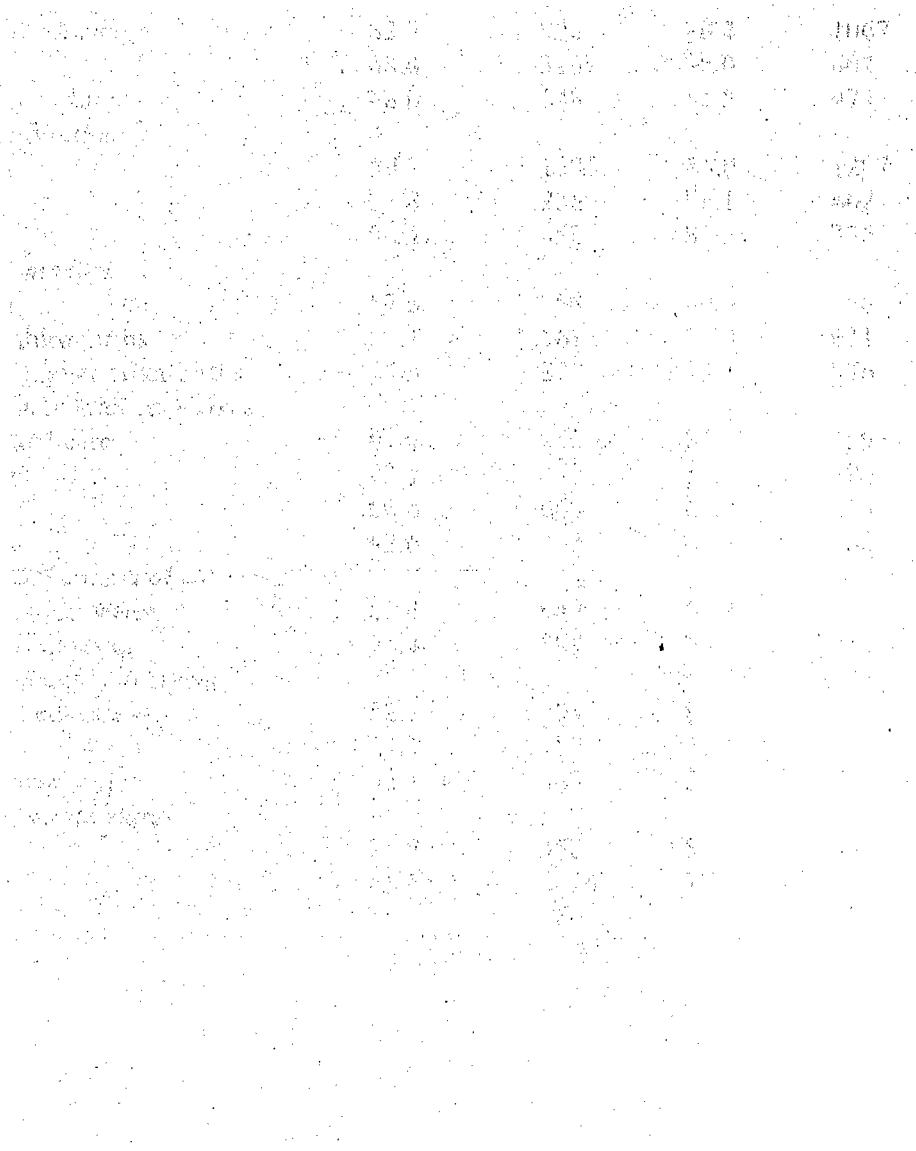


Table 5.3: Percentage of Home Deliveries in Rural Ghana by Background Characteristics

Background characteristics	1998 GDHS		2003 GDHS	
	Percent	N	Percent	N
Overall	69.5	1794	71.2	1945
Ecological zone of residence				
Savannah zone	87.1	637	83.6	794
Coastal zone	65.4	583	66.4	509
Forest zone	54.2	574	59.7	642
Year of birth				
1994[1] / 1999[2]	66.3	163	59.5	222
1995[1] / 2000[2]	71.9	249	66.3	312
1996[1] / 2001[2]	65.3	337	71.1	429
1997[1] / 2002[2]	70.3	468	73.8	557
1998[1] / 2003[2]	71.3	577	77.6	425
Maternal age				
Less than 20 year	61.0	164	68.2	173
20 - 34 years	68.4	1061	71.2	1263
35 years or older	74.4	569	72.3	509
Maternal education				
No formal education	82.7	920	80.4	1067
Primary	68.4	326	70.0	404
Secondary or higher	48.0	548	51.5	474
Religious affiliation				
Christian	59.1	1106	64.0	1207
Moslem	81.8	236	79.1	402
Other	88.5	452	87.5	336
Birth order number				
First birth	57.6	356	60.9	358
Second - third births	68.1	561	74.0	611
Fourth or higher order births	75.3	877	73.3	976
Number of antenatal care visits				
No antenatal care	91.0	256	87.6	259
1 - 3 visits	83.1	490	86.3	490
4 - 6 visits	66.8	665	67.2	814
7+ visits	42.6	383	49.2	382
Timing of first antenatal care visit				
Within first trimester	58.4	649	62.2	772
After first trimester	71.4	889	74.2	914
Partner's educational status				
No formal education	82.7	794	81.8	1034
Primary	74.5	157	75.4	179
Secondary or higher	56.1	843	55.2	732
Household wealth status				
Poor	86.8	358	85.2	392
Moderate	66.5	1076	72.2	1167
Rich	35.3	360	44.8	386

[1]Corresponds to 1998 GDHS [2]Corresponds to 2003 GDHS N – Sample size

Table 5.4: Percentage of Home Deliveries in Urban Ghana by Background Characteristics

Background characteristics	1998 GDHS		2003 GDHS	
	Percent	N	Percent	N
Overall	23.0	548	20.9	812
Ecological zone of residence				
Savannah zone	40.3	72	44.1	118
Coastal zone	18.8	271	18.2	357
Forest zone	22.4	205	15.7	337
Year of birth				
1994[1] / 1999[2]	14.7	68	22.7	128
1995[1] / 2000[2]	25.0	76	21.2	146
1996[1] / 2001[2]	21.3	108	17.9	168
1997[1] / 2002[2]	23.3	159	18.7	230
1998[1] / 2003[2]	27.0	137	26.4	140
Maternal age				
Less than 20 year	21.2	52	23.9	71
20 - 34 years	22.7	409	20.5	576
35 years or older	25.3	87	21.2	165
Maternal education				
No formal education	45.7	127	38.9	214
Primary	33.0	103	26.5	170
Secondary or higher	10.7	318	11.1	449
Religious affiliation				
Christian	17.8	405	17.5	640
Moslem	40.2	87	43.6	159
Other	33.9	56	23.1	13
Birth order number				
First birth	14.2	148	14.2	218
Second - third births	23.0	226	19.1	325
Fourth or higher order births	30.5	174	28.6	269
Number of antenatal care visits				
No antenatal care	44.4	45	29.6	54
1 - 3 visits	52.1	71	44.3	79
4 - 6 visits	26.1	157	24.2	273
7+ visits	10.2	275	13.1	406
Timing of first antenatal care visit				
Within first trimester	16.3	245	15.6	424
After first trimester	25.6	258	26.3	334
Partner's educational status				
No formal education	39.5	124	32.1	215
Primary	36.7	30	38.2	34
Secondary or higher	16.8	394	15.6	563
Household wealth status				
Poor	38.1	134	45.1	162
Moderate	23.4	303	18.0	490
Rich	3.6	111	6.2	162

[1]Corresponds to 1998 GDHS [2]Corresponds to 2003 GDHS N – Sample size

5.7.4 Determinants of Uptake of Delivery Care

The estimated probabilities for home deliveries from the multivariate models are shown in this section. The estimated probabilities for all three categories are shown in Appendix III, Tables 3.3 and 3.4. Their parameter estimates are shown in Table 5.5 below. Interaction effects were investigated but none was found significant. Before the interpretation of the multivariate models, the model assumptions of normality and constant variance were checked. The residual diagnostic plots shown in Appendix Three, Figure 3.1 indicate that the assumption of normality and constant variance are not violated. The estimated probabilities were computed based on the characteristics of a reference woman[2], adjusting for the values of the other covariates. To identify the rural/urban disparity of the effect of the background characteristics on uptake of delivery care, the estimated probabilities were computed conditioned on residential status.

[2] Resides in the Forest Zone of Ghana, had last birth in 1996 or 2001, aged 20-34 years at time of last birth, had primary formal education, was the second or third birth, had 1-3 antenatal care visits, partner has primary education and belongs to a moderately rich household.

Table 5.5: Estimated Coefficients for Delivery Care Uptake

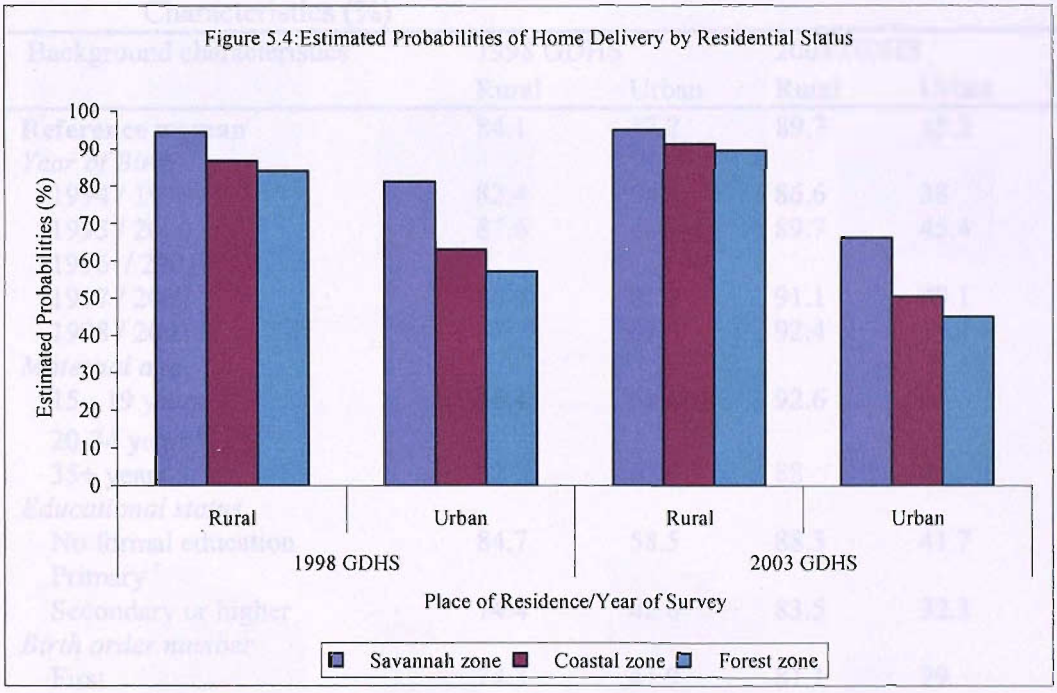
Background Characteristics	1998 GDHS		2003 GDHS	
	Public vs. Home	Private vs. Home	Public vs. Home	Private vs. Home
Constant	-3.67	-5.49	-2.66	-5.33
Spatial effects				
Ecological zone of Residence				
Savannah [B]				
Coastal	0.67 (0.27)**	1.64 (0.31)***	0.42 (0.28)	1.52 (0.36)***
Forest	0.89 (0.27)***	1.91 (0.32)***	0.70 (0.26)***	1.56 (0.36)***
Rural Urban Residential status				
Rural [B]				
Urban	1.48 (0.22)***	1.23 (0.23)***	2.33 (0.21)***	2.43 (0.23)***
Individual level factors				
Year of Birth				
1994[1] / 1999[2] [B]				
1995[1] / 2000[2]	-0.39 (0.29)	-0.45 (0.38)	-0.19 (0.22)	-0.65 (0.33)**
1996[1] / 2001[2]	-0.10 (0.27)	-0.16 (0.34)	-0.24 (0.22)	-0.45 (0.28)
1997[1] / 2002[2]	-0.33 (0.26)	-0.28 (0.34)	-0.42 (0.19)**	-0.53 (0.28)*
1998[1] / 2003[2]	-0.24 (0.26)	-0.53 (0.34)	-0.58 (0.22)***	-0.75 (0.30)**
Maternal age				
15 - 19 years	-0.48 (0.32)	-0.09 (0.43)	-0.63 (0.44)	-0.25 (0.40)
20-34 years	-0.35 (0.20)	0.18 (0.28)	-0.20 (0.17)	-0.10 (0.26)
35+ years [B]				
Educational status				
No formal education [B]				
Primary	0.11 (0.19)	-0.03 (0.28)	-0.09 (0.18)	-0.27 (0.27)
Secondary or higher	0.65 (0.19)***	0.63 (0.26)**	0.43 (0.17)**	0.36 (0.24)
Birth order number				
First	0.97 (0.21)***	0.80 (0.28)***	0.67 (0.19)***	0.75 (0.28)***
Second - third	0.26 (0.17)	0.35 (0.23)	-0.08 (0.16)	0.22 (0.22)
Fourth or higher [B]				
Number of antenatal care visits				
No antenatal care [B]				
1 - 3 visits	0.16 (0.29)	-0.08 (0.42)	-0.37 (0.29)	-0.45 (0.43)
4 - 6 visits	1.27 (0.27)***	0.73 (0.36)**	0.75 (0.27)***	0.69 (0.38)*
7+ visits	2.23 (0.29)***	1.57 (0.38)***	1.31 (0.27)***	1.01 (0.38)***
Household level factors				
Partners educational status				
No formal education [B]				
Primary	-0.20 (0.28)	0.14 (0.41)	0.05 (0.24)	0.19 (0.40)
Secondary or higher	0.29 (0.17)	0.38 (0.27)	0.55 (0.15)***	0.54 (0.22)**
Household wealth status				
Poor [B]				
Modest	0.64 (0.23)***	0.69 (0.37)*	0.44 (0.17)***	1.07 (0.32)***
Rich	1.17 (0.29)***	1.46 (0.43)***	1.08 (0.24)***	1.94 (0.36)***

1 – Corresponds to 1998 GDHS 2 – Corresponds to 2003 GDHS B – Base Category
*Significant at p<0.10, **p<0.05; ***p<0.01

I. Geographical Effects

The multivariate models show that geographical effects are very important in explaining uptake of delivery care. Research evidence in Ghana shows wide and notable differentials in implementation of government policies including education, income generating activities and distribution of health facilities (Songsore 1989; Vanderpauye-Orgle 2002). This is evident from the estimated probabilities shown in Figure 5.4 below. The estimated probabilities show that on average a rural woman is more likely to deliver at home compared to an urban woman. There was also marked zonal differentials in uptake of delivery care, with women residing in the Savannah Zone of Ghana having a higher likelihood of a home delivery.

Figure 5.4:Estimated Probabilities of Home Delivery by Residential Status



II. Individual-Level Effects

Table 5.6 below shows the estimated probabilities of a home delivery by mothers' background characteristics. The estimated coefficients (shown in Appendix Three)

reveal that there was a significant decline in the uptake of institutional (public and private) delivery care in Ghana between 2002 and October 2003. From the multivariate models the significant individual level predictors of uptake of delivery care were maternal education, the birth order number and the number of antenatal care visits for the pregnancy. The estimated probabilities show that women with no formal education and higher parity births are more likely to occur at home. The estimated probabilities also reveal that increasing number of antenatal care visits is associated with a decreased probability of a home delivery. High multicollinearity was identified between number of antenatal care visits and timing of first antenatal visit. Thus, the variable that explains more of the variability (number of antenatal care visits) using a likelihood ratio test was retained in the final model.

Table 5.6: Estimated Probability of Home Delivery by Individual Woman Characteristics (%)

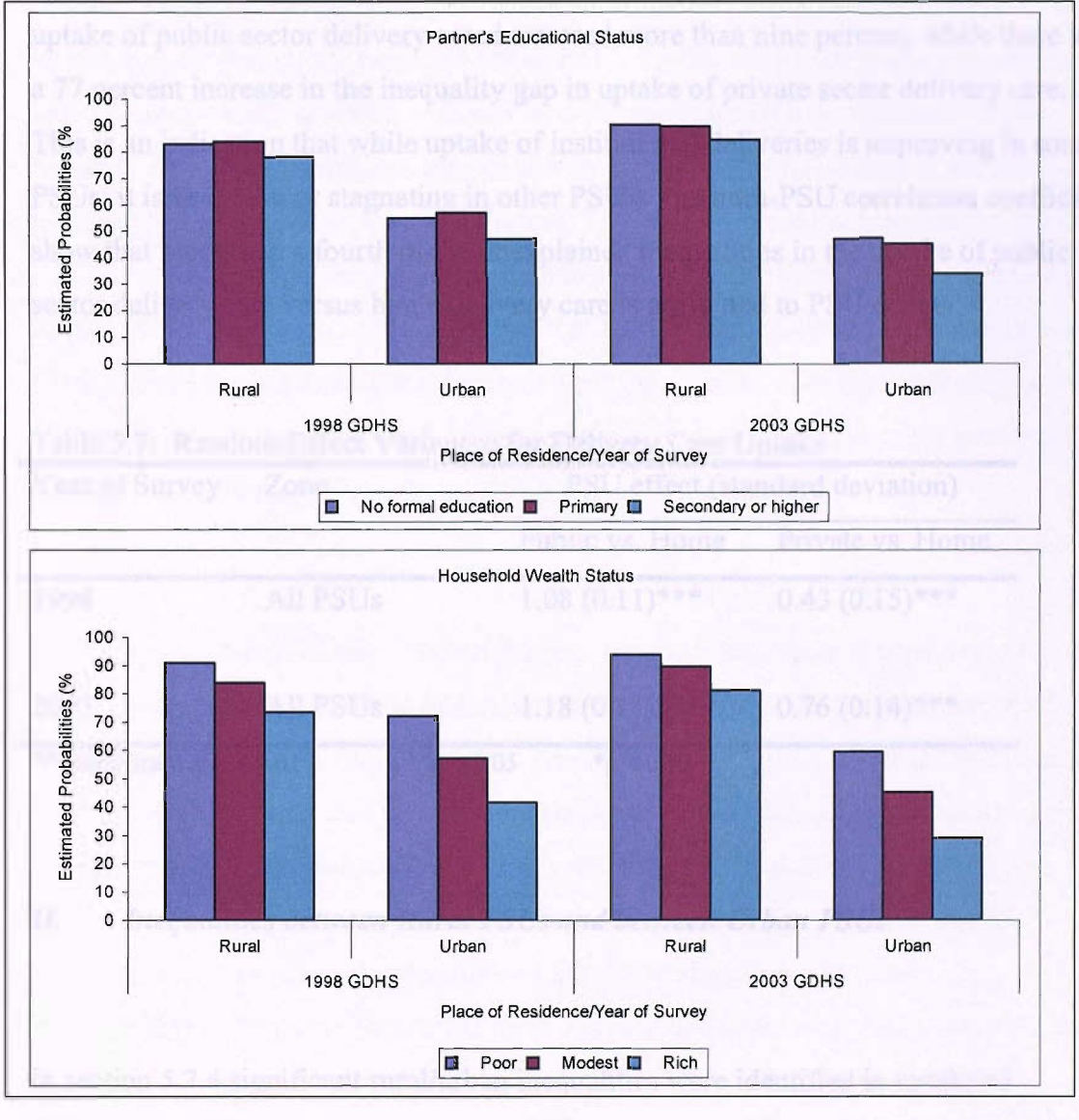
Background characteristics	1998 GDHS		2003 GDHS	
	Rural	Urban	Rural	Urban
Reference woman	84.1	57.2	89.7	45.2
Year of Birth				
1994 / 1998	82.4	54.3	86.6	38
1995 / 2000	87.6	64.1	89.7	45.4
1996 / 2001[r]				
1997 / 2002	86.4	61.8	91.1	49.1
1998 / 2003	87	62.6	92.4	53.4
Maternal age				
15 - 19 years	86.4	61.6	92.6	54
20-34 years [r]				
35+ years	82	52.9	88	41
Educational status				
No formal education	84.7	58.5	88.3	41.7
Primary [r]				
Secondary or higher	74.4	42.6	83.5	32.3
Birth order number				
First	74.3	41.9	81.1	29
Second – third [r]				
Fourth or higher	87.7	64.2	89.5	44.9
Number of antenatal care visits				
No antenatal care	84.7	58.8	85.5	35.8
1 - 3 visits [r]				
4 - 6 visits	66.3	32.9	73.9	21.2
7+ visits	43.9	16.2	62.9	13.9

r – Characteristics of the reference woman

III. Household Effects

There was evidence of association between household characteristics and uptake of delivery care. In both rural and urban Ghana, women whose partners have no formal education or come from poor households have a higher probability of delivering at home. In rural Ghana, the probability of a woman from a poor household delivering at home is more than 90 percent, while in urban Ghana it has declined from about 72 percent in 1998 to 60 percent in 2003.

Figure 5.5: Estimated Probabilities of Home Delivery by Household Characteristics



5.7.5 Spatial Inequalities in Uptake of Delivery Care

I. Inequalities between PSUs

After controlling for the spatial, individual and household level bio-demographic and socio-economic predictors of uptake of delivery care; there were significant PSU effects in both 1998 and 2003 multivariate models (Table 5.7). This suggests that there exist strong inequalities in uptake of delivery care in Ghana. The estimated variances show that the inequality gap between PSUs in the uptake of delivery care has widened between the two successive surveys. The inequality gap between PSUs in the uptake of public sector delivery care increased more than nine percent, while there was a 77 percent increase in the inequality gap in uptake of private sector delivery care. This is an indication that while uptake of institutional deliveries is improving in some PSUs; it is declining or stagnating in other PSUs. The intra-PSU correlation coefficient show that more than a fourth of the unexplained inequalities in the uptake of public sector delivery care versus home delivery care is attributed to PSU effects.

Table 5.7: Random-Effect Variances for Delivery Care Uptake

Year of Survey	Zone	PSU effect (standard deviation)	
		Public vs. Home	Private vs. Home
1998	All PSUs	1.08 (0.11)***	0.43 (0.15)***
2003	All PSUs	1.18 (0.11)***	0.76 (0.14)***

***Significant at $p < 0.01$ **$p < 0.05$ *$p < 0.10$

II. Inequalities between Rural PSUs and between Urban PSUs

In section 5.7.4 significant rural/urban inequalities were identified in uptake of delivery care. This section investigates if there are spatial inequalities in uptake of

delivery care between rural PSUs and between urban PSUs. Fitting a multilevel model with random-effect variance terms varying for rural PSUs and urban PSUs, a likelihood-ratio test revealed a significant rural-urban separate random-effect terms for the 1998 GDHS multilevel model and non-significant random-effect terms for the 2003 GDHS multilevel model. A χ^2 = 3157.7-3145.6 = 12.1 (on 2 degrees of freedom) significant at $p < 0.01$ was observed for the 1998 GDHS multilevel model and χ^2 = 3660.5 – 3656.7 = 3.8 (on 2 degrees of freedom) not-significant at $p < 0.10$ was observed for the 2003 GDHS multilevel model. This results indicates that although institutional deliveries are higher in Urban Ghana, inequalities in seeking institutional delivery care in Urban Ghana has increased between the two successive surveys such that its effect is not significantly different from what pertains in rural Ghana. Table 5.8 below shows the estimated random-effect variance terms (expressed as standard deviation) for rural and urban PSUs for the 1998 GDHS multilevel model and a common random-effect variance term for the 2003 GDHS multilevel model. Separate rural-urban variances are not shown for the 2003 GDHS multilevel model because they are not significantly different. The estimated coefficients shown in Table 5.8 indicate that within rural PSUs and within urban PSUs, there are inequalities in uptake of delivery care. Table 5.8 shows that there is high inequality in the uptake of delivery care in rural Ghana that has remained the same for the two successive surveys. Urban Ghana, on the other hand, has experienced an increased inequality between the two successive surveys.

In Urban settlements of sub-Saharan Africa, geographical access is considered not to be a major barrier in accessing health services (Wyss 2003). In the past, research in development studies showed that urban residents in developing countries have well-off living conditions compared to rural dwellers (Harrison 1982). In recent times the superiority of urban areas has been widely disputed (Magadi 2004, Linden 1996). Most urban centres have been characterised with increasing poverty and social collapse, with a substantial proportion of urban dwellers living in slums. A study by Wyss (2003) in Tanzania found that rural migrants are often poor, slum residents and have difficulties in accessing health services. The 2000 GPHC shows an increasing rural/urban migration in Ghana (GSS 2002), with the main recipients being Accra,

Tema in the Greater Accra Region and Kumasi in the Ashanti Region. This could be a plausible explanation for the high and increasing inequalities in uptake of institutional delivery care in urban Ghana.

The results is also not surprising giving that the level of neonatal mortality in urban Ghana increased from 23 in 1998 to 38 per 1000 live births in 2003, while it remained substantially high in rural Ghana between the two successive surveys (GSS and MI 1999; GSS, NMIMR, and ORC Macro 2004). Rural PSUs in Ghana, remain disadvantaged in access to health services and economic development not only in quantity but also quality (Boakye –Yiadom 2004). This is evident in the high inequality in uptake of institutional delivery care observed in rural Ghana, which has existed throughout the mid 1990s to the early 2000. The results clearly shows that that while access maybe the main decider for use of a service in rural Ghana, the ability to afford maybe the main driving factor in Urban Ghana. This requires further investigation.

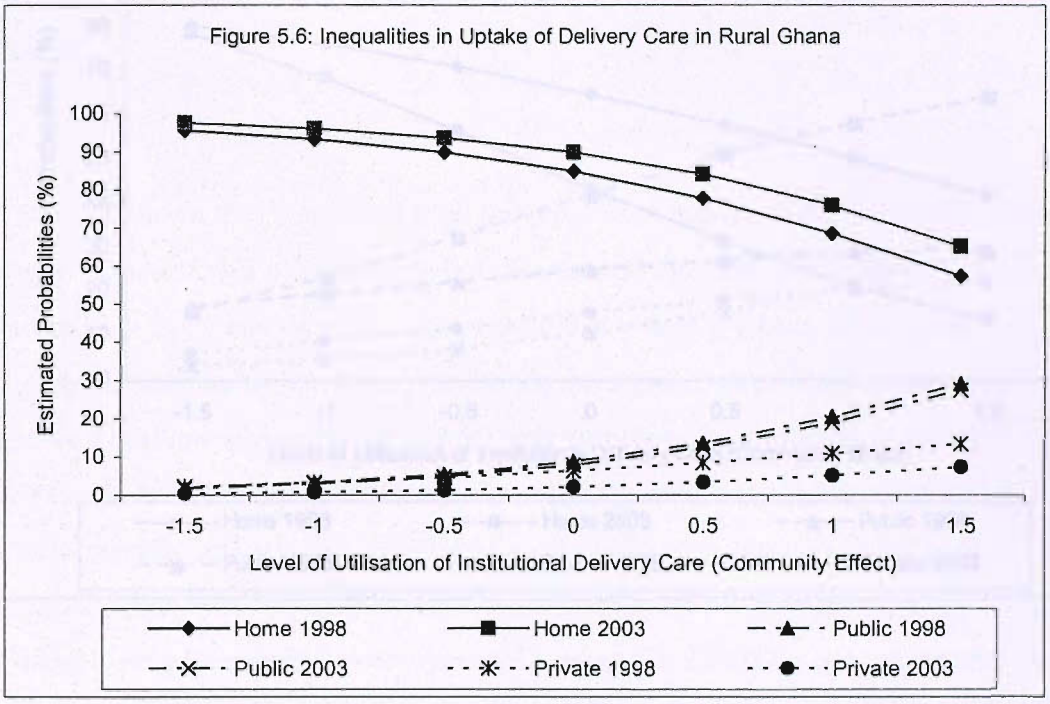
Table 5.8: Rural-Urban Random-Effect Variances for Delivery Care Uptake

Year of Survey	Zone	PSU effect (standard deviation)	
		Public vs. Home	Private vs. Home
1998	Rural	1.06 (0.12)***	0.75 (0.17)***
	Urban	0.41 (0.22)*	0.98 (0.29)***
2003	All PSUs	1.18 (0.11)***	0.76 (0.14)***

***Significant at $p < 0.01$ **$p < 0.05$ *$p < 0.10$

To demonstrate the extent of inequality in delivery care uptake between rural PSUs and between urban PSUs values of μ_{0j} are varied by constant values K (-1.5, -1.0, -0.5, 0, 0.5, 1.0, 1.5) to reflect varying levels of delivery care uptake (See Chapter Three, Section 3.3.1). The base category chosen for the multilevel modelling was home deliveries, thus negative community effects represents PSUs where home deliveries are high and institutional deliveries are low and vice versa. The estimated probabilities were computed based on the characteristics of the reference woman. Again, for

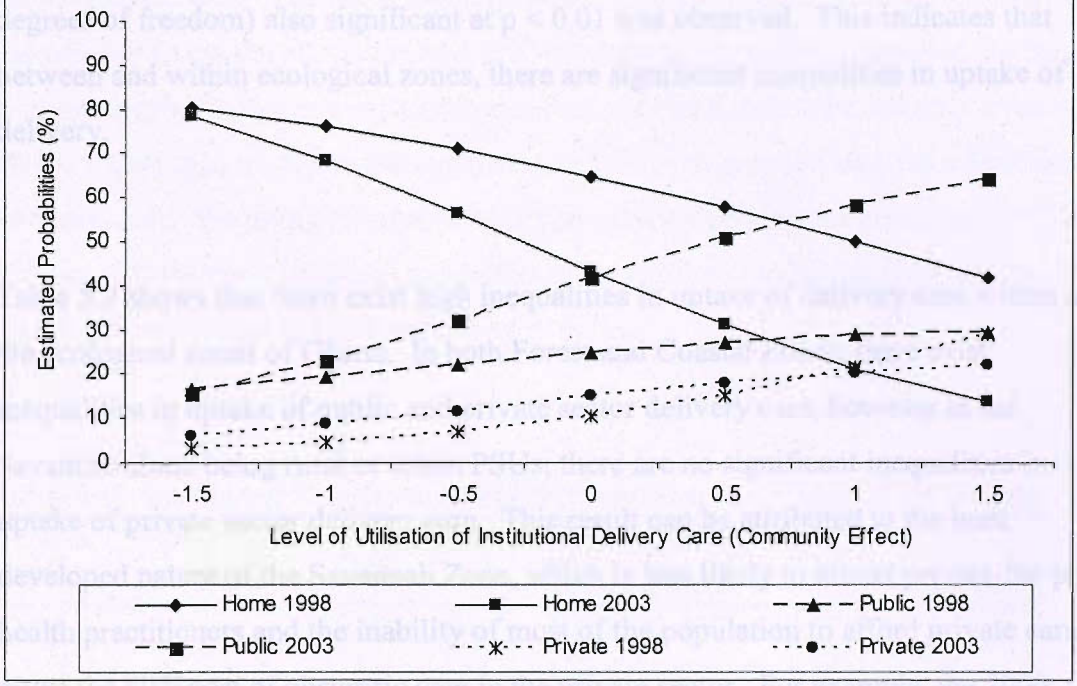
descriptive purposes PSUs with high home (negative values of μ_{0j}) deliveries are referred to as "*disadvantaged*" PSUs, while PSUs with high institutional deliveries (positive values of μ_{0j}) are referred to as "*advantaged*" PSUs. Figures 5.6 below shows on the probability scale the extent of inequalities in uptake of delivery care in rural Ghana. Figures 5.6 reveals that generally home deliveries remain high across all rural PSUs. Nonetheless, "*advantaged*" PSUs have a slightly higher probability of institutional deliveries than "*disadvantaged PSUs.*



Figures 5.7 below shows the extent of inequality in uptake delivery care in urban Ghana plotted on the probability scale. The graph shows that accounting for the spatial effects, there has been a significant shift in the pattern of uptake of delivery care in urban Ghana between the two successive surveys. The estimated probabilities show a significant shift from home deliveries to public sector delivery care. The shift is more pronounced in "*advantaged*" PSUs, while in "*disadvantaged*" PSUs there are hardly any shifts. This shows that while "*advantaged*" PSUs are improving in uptake of delivery care, "*disadvantaged*" PSUs are stagnant. There is a clear indication that controlling for the spatial effects, the level of institutional deliveries in urban Ghana, is

not uniform across all PSUs. The graph also confirms that the inequality gap in uptake of delivery care in urban Ghana has widened overtime. This suggests that the increase in the rate of neonatal deaths in urban Ghana between 1998 and 2003 may be escalating in particular PSUs where maternal health care are poor and deteriorating.

Figure 5.7: Inequalities in Uptake of Delivery Care in Urban Ghana



III. Inequalities within Ecological Zones

In section 5.7.4 significant zonal inequalities were identified in uptake of delivery care. Nonetheless, significant spatial inequalities may also exist between PSUs within an ecological zone. In the previous section, it was identified that inequalities between urban PSUs in uptake of delivery care has increased over time, such that it is not significantly different from what pertains between rural PSUs. It is therefore important to investigate how these inequalities vary within ecological zones. This is very important since the ecological zone divide remains a major concern for the developmental processes of Ghana. This section investigates this hypothesis. Building

upon the 1998 GDHS multilevel model with separate rural-urban random-effect variance terms to varying by the ecological zones of Ghana, a likelihood-ratio test revealed a significant separate random-effect variance terms for the zones. A likelihood ratio test of χ^2 = 3145.6-3121.4 = 24.2 (on 8 degrees of freedom) significant on $p < 0.01$ was observed. For the 2003 GDHS, building upon the multilevel model with common variance terms for all PSUs (rural-urban differentials not significant) to vary by the ecological zones a χ^2 = 3660.5 – 3637.7 = 22.8 (on 4 degrees of freedom) also significant at $p < 0.01$ was observed. This indicates that between and within ecological zones, there are significant inequalities in uptake of delivery.

Table 5.9 shows that there exist high inequalities in uptake of delivery care within all the ecological zones of Ghana. In both Forest and Coastal Zones, there exist inequalities in uptake of public and private sector delivery care, however in the Savannah Zone being rural or urban PSUs; there are no significant inequalities in uptake of private sector delivery care. This result can be attributed to the least developed nature of the Savannah Zone, which is less likely to attract private-for-profit health practitioners and the inability of most of the population to afford private care, given the high cost of obstertric care in the private sector. For example, the 2000 Ghana Living Standards Survey reported a mean per capita household income of ¢206,000 - ¢321,000[3] for the regions of the Savannah Zone compared to ¢415,000 – ¢622,000 for the Forest Zone and ¢527,000 – ¢932,000 for the Coastal Zone (GSS 2000). The GSS (2000) also reported that 41-65 percent of households in the Savannah Zone belong to the poorest wealth quintile compared to 8-10 percent in the Forest Zone and 0.6-18 percent in the Coastal Zone.

Table 5.9 below shows that the Coastal Zone, which is the most urbanised and developed zone of Ghana (GSS 2002) has experienced the highest increase in inequalities in uptake of public sector delivery care. This is more pronounced between

[3] US$ 1.00 = ¢9,150.00 as at August 2005

urban PSUs within the zone. The Forest Zone, which is the next most urbanised zone in Ghana after the Coastal Zone, has also experienced increased inequalities in uptake of institutional delivery care. A plausible explanation for this realisation is that, the Urban Forest and Coastal Zones with high urban development are the main recipients of migrants resulting in high urban slum populations. Urban slum populations as identified from the literature are less likely to be able to afford the high cost of obstetric care, particularly in the private sector irrespective of the high availability of services in the area. The Rural Coastal and Forest Zones also exhibit significant inequalities in uptake of institutional delivery care. A plausible explanation for this finding, maybe that access to institutional care may be concentrated in only a few rural PSUs. It may also be due to the fact that only few women in the area can afford such services, given the high cost of obstertric care, particularly in the private sector. In the Savannah Zone there are high inequalities in the uptake of public sector delivery care, which has existed for the two successive surveys.

Table 5.9: Ecological Zone Random-Effect Variances for Delivery Care Uptake

Year of survey	Rural/Urban residence	Ecological Zone	PSU effect (standard deviation)	
			Public vs. Home	Private vs. Home
1998	Rural	Savannah	1.29 (0.29)***	0.09 (0.37)
		Forest	1.24 (0.21)***	0.64 (0.25)***
		Coastal	0.72 (0.19)***	0.92 (0.26)***
	Urban	Savannah	1.83 (0.66)***	0.24 (0.30)
		Forest	1.12 (0.44)**	0.19 (0.51)
		Coastal	0.21 (0.29)	1.50 (0.49)***
2003	All PSUs	Savannah	1.46 (0.19)***	0.23 (0.66)
		Forest	1.27 (0.19)***	0.52 (0.21)**
		Coastal	0.90 (0.16)**	1.24 (0.28)***

***Significant at $p < 0.01$ **$p < 0.05$ *$p < 0.10$

To get an impression of the extent of inequalities in uptake of delivery care between PSUs within each ecological zone, the effect of the random effect variances were plotted on the probability scale based on the characteristics of the reference woman. Again, for descriptive purposes PSUs with high home deliveries are referred to as "*disadvantaged*" PSUs, while PSUs with high institutional deliveries are referred to as

"*advantaged*" PSUs. Figure 5.8 below shows the extent of inequality in uptake of delivery care in the Savannah Zone. The plots show low uptake of private sector delivery care across all PSUs in the Savannah Zone being rural or urban. However, high inequalities exist between PSUs in the uptake of home and public sector delivery care. This indicates that the alternative delivery care services available within the zone are home and public sector delivery care. Comparing the two plots in Figure 5.8, it can be identified that there has been a decline in uptake of home delivery care, with an increased uptake of public sector delivery care in *"advantaged"* PSUs of the Urban Savannah Zone, while in *"disadvantaged"* PSUs of the Urban Savannah Zone, home deliveries remain very high. Figure 5.8 hardly shows any improvements in uptake of delivery care in rural PSUs of the Savannah Zone, where home deliveries continue to be very high. The results indicate that there are urban PSUs in the Savannah Zone where access to maternal health care remains poor. Almost all rural PSUs in the Savannah Zone have a high need for institutionalised maternal health care.

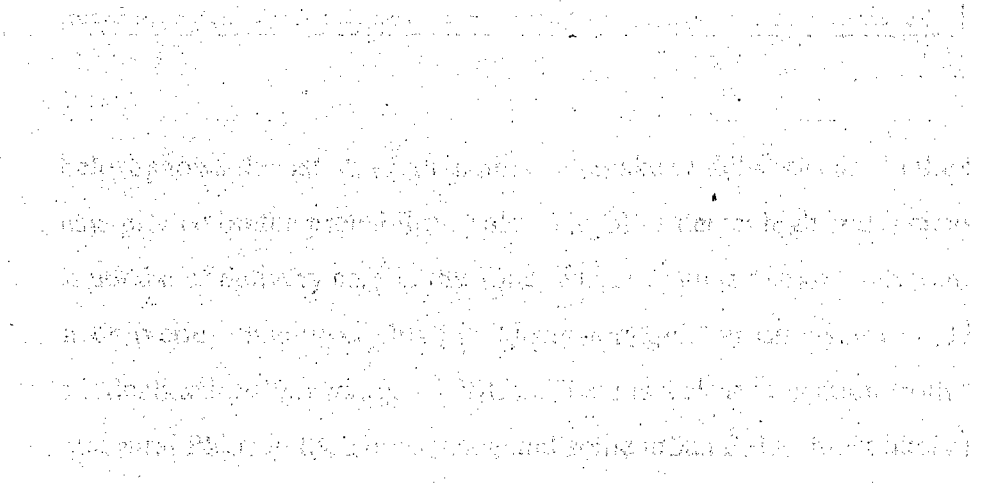


Figure 5.8: Inequalities in Delivery Care Uptake in the Savannah Zone of Ghana

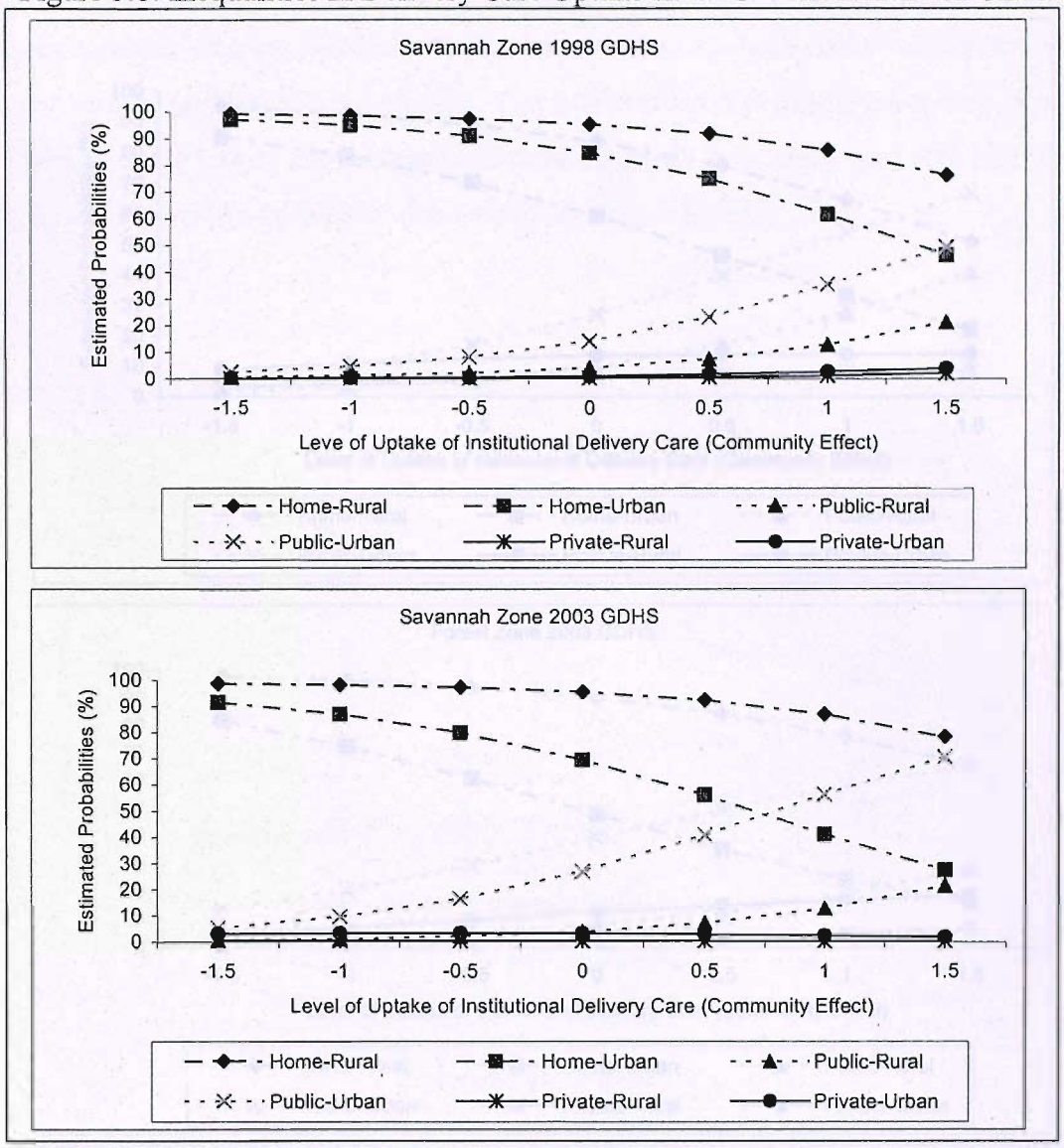


Figure 5.9 below shows the extent of inequality in uptake of delivery care in the Forest Zone of Ghana plotted on the probability scale. The plots depict high and increasing inequality in uptake of delivery care in the zone, which again is marked between urban PSUs. Home deliveries remain very high in "*disadvantaged*" urban PSUs of the Forest Zone, while it declined in "*advantaged*" PSUs. There is a clear indication from the plots that most rural PSUs in the Forest Zone and some urban PSUs, most likely poor slum PSUs remains deprived of maternal health services.

Figure 5.9: Inequalities in Delivery Care Uptake in the Forest Zone of Ghana

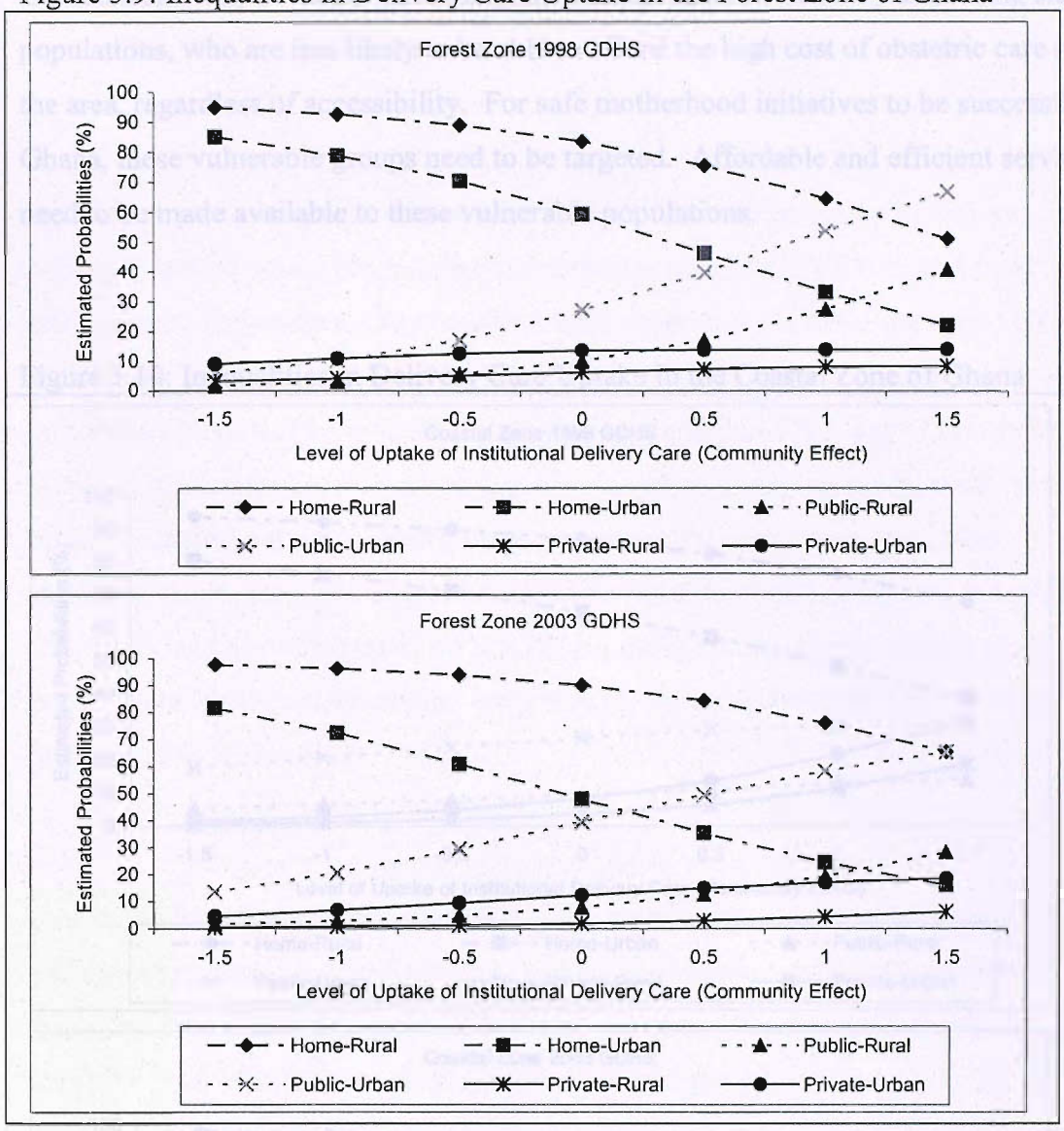
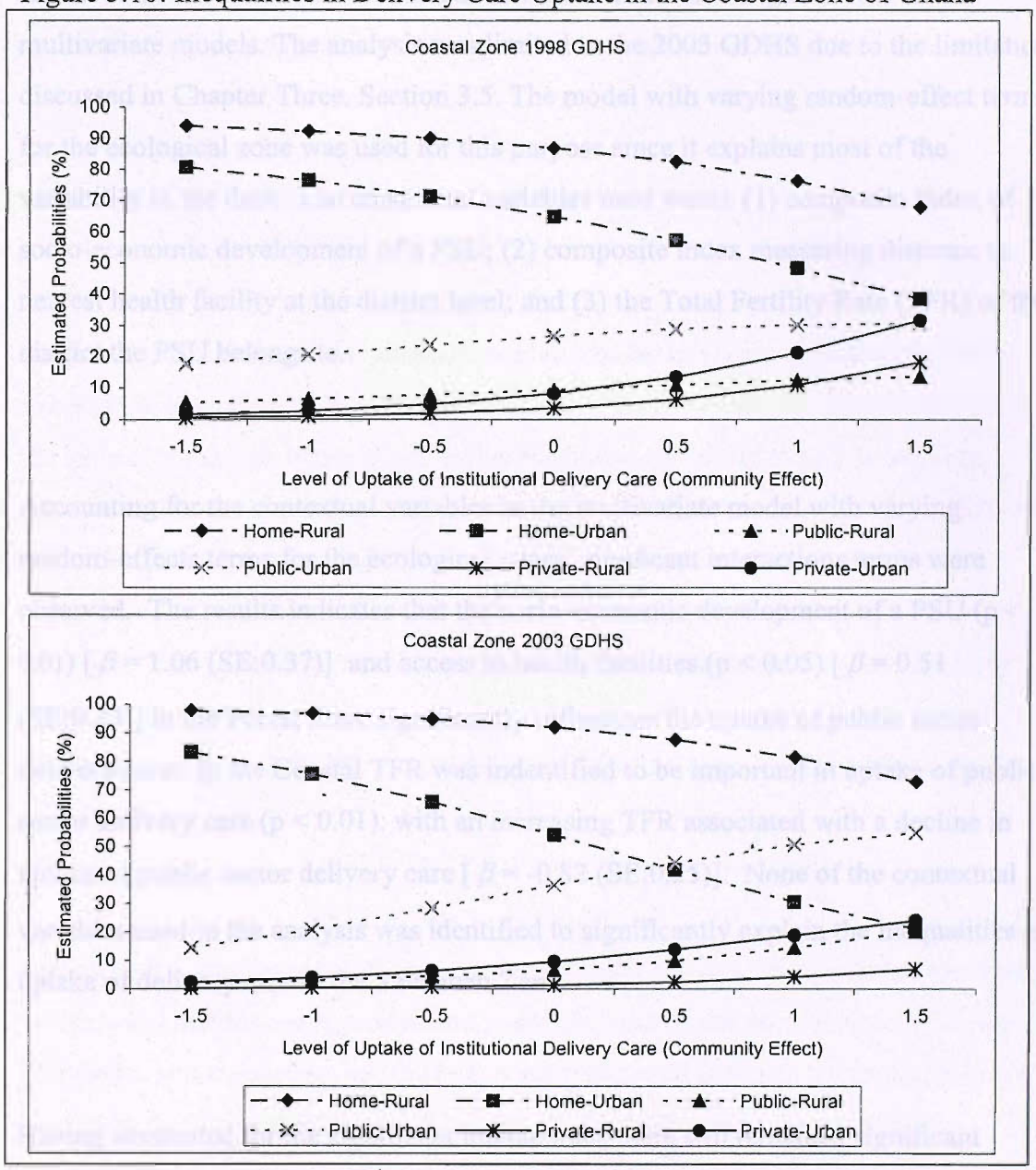


Figure 5.10 showing the extent of inequalities in the Coastal Zone of Ghana on the probability scale also depicts a widening inequality gap between PSUs in the uptake of delivery care, which is more pronounced between urban PSUs. Figure 5.10 shows a momentous decline in the estimated probability of a home delivery in "*advantaged*" PSUs of the Urban Coastal Zone. Nonetheless, the estimated probability of a home delivery remains very high in "*disadvantaged*" PSUs within the Urban Costal Zone. Considering rural PSUs in the Coastal Zone, home deliveries remain relatively high across all PSUs. The graphs also show high inequalities in uptake of institutional (public and private sector) delivery care, which is also marked between urban PSUs of the Coastal Zone. As stated earlier, the high and increasing inequality in the Urban

Coastal Zone may be due to increasing urbanisation characterised by increasing slum populations, who are less likely to be able to afford the high cost of obstetric care in the area, regardless of accessibility. For safe motherhood initiatives to be successful in Ghana, these vulnerable groups need to be targeted. Affordable and efficient services need to be made available to these vulnerable populations.

Figure 5.10: Inequalities in Delivery Care Uptake in the Coastal Zone of Ghana



5.8 EXPLAINING THE SPATIAL INEQUALITIES IN UPTAKE OF DELIVERY CARE

Significant spatial inequalities have been identified to exist in uptake of delivery care in Ghana. It is of policy and intervention importance to identify the factors that mitigate these inequalities. To investigate this, contextual variables from the 2000 GPHC were linked to the 2003 GDHS and their effects investigated with the multivariate models. The analysis was limited to the 2003 GDHS due to the limitations discussed in Chapter Three, Section 3.5. The model with varying random-effect terms for the ecological zone was used for this purpose since it explains most of the variability in the data. The contextual variables used were: (1) composite index of socio-economic development of a PSU; (2) composite index measuring distance to nearest health facility at the district level; and (3) the Total Fertility Rate (TFR) of the district the PSU belongs to.

Accounting for the contextual variables in the multivariate model with varying random-effects terms for the ecological zones, signficant interactions terms were observed. The results indicates that the socio-economic development of a PSU ($p < 0.01$) [$\beta = 1.06$ (SE:0.37)] and access to health facilities ($p < 0.05$) [$\beta = 0.51$ (SE:0.23)] in the Forest Zone significantly influences the uptake of public sector delivery care. In the Coastal TFR was indentified to be important in uptake of public sector delivery care ($p < 0.01$), with an increasing TFR associated with a decline in uptake of public sector delivery care [$\beta = -0.82$ (SE:0.25)]. None of the contextual variables used in the analysis was identified to significantly explain the inequalities in uptake of delivery care in the Savannah Zone.

Having accounted for the significant interactions, there still remained significant unexplained inequalities in uptake of delivery care in Ghana. The results show that about 26 percent of the PSU variation in uptake of public sector delivery care in the Forest Zone is attributable to the contextual variables. In the Coastal Zone it was 23

percent. None of the contextual varaibles were significant in explaing the variation in uptake of private sector delivery care. As discussed in the literature, spatial distrubution of health facilities is very important alongside socio-economic development in the uptake of maternal health care. Data on spatial distribution of health services, cost and quality of care for the 412 PSUs sampled in the 2003 GDHS were not available. Data on attitudinal, cultural and traditional practices which could also inflence uptake of maternal health services were also not avaialable. This indicates the need for a study to investigate fully the contextual factors mitigating the spatial inequalities in uptake of delivery care services in Ghana.

5.9 DISCUSSIONS AND CONCLUSIONS

Pregnancy related deaths and illnesses continue to be an unsolved tragedy in sub-Saharan Africa, although research has indicated that the causes are preventable. Since the launch of the Safe Motherhood Initiative almost two decades ago, it has been difficult to document a measurable decline in pregnancy related deaths in sub-Saharan Africa. Most of the identified causes of pregnancy related deaths and illnesses commence from the onset of labour to the immediate puerperium period. Nonetheless, most deliveries in sub-Saharan Africa takes place at home under the supervision of unskilled attendants. In Ghana, only 44 percent of deliveries take place in institutional health care facilities with the needed ability to identify, treat or refer pregnancy related complication.

Delivery care services available to women in Ghana can be categorised into two main groups – (1) institutional (government hospitals, health centres, health post, private hospitals and maternity homes) and (2) non-institutional (home). Institutional facilities can further be categorised into two groups – (1) public sector (government hospitals/health centres/health post) and (2) private sector (private hospitals/clinics, maternity homes). A clear picture has emerged from this analysis that there are inequalities in uptake of institutional/non-institutional delivery care. There is also a

public/private divide in uptake of delivery care in Ghana. There is also a divide in uptake of delivery care between rural and urban inhabitants.

Non-institutional deliveries are mostly predominant in rural Ghana and occur without a skilled attendant. Non-institutional deliveries are usually supervised by TBAs, friends or relatives. It is documented that the skill and environment in which TBAs operate is not proficient for safe delivery (GSS, Health Research Unit (MoH) and ORC Macro 2003). In Ghana, there have been efforts and funds expended to upgrade the skills of TBAs who operate mainly in rural areas (GSS, Health Research Unit (MoH) and ORC Macro 2003). This may explain the growing dominance of trained TBAs in the area and not necessarily any socio-economic development or improved proximity to services. This suggests that there has not been a change in attitude towards uptake of delivery care in rural Ghana, irrespective of a growing number of trained TBAs in rural Ghana.

The determinants of uptake of delivery care identified in this analysis correspond with findings of previous studies. Spatial effects were identified to be very important in explaining uptake of delivery care in Ghana. Maternal level characteristics identified to be strongly associated with uptake of delivery care include maternal education, religious affiliation, parity and number of antenatal care visits. Women with lower educational status were identified to have a higher likelihood of a home delivery. Higher order births are more likely to take place at home. The number of antenatal care visits, a proxy of access to health care seeking behaviours and access to maternal health care services was identified to be a highly significant predictor of uptake of delivery care. The higher the number of antenatal care visits the higher the likelihood of an institutional delivery. Household effects (partner's educational status and household wealth status) were identified to be strong predictors of uptake of delivery care. An increased educational status of a partner and an increased wealth status increase the probability of an institutional delivery.

After controlling for the geographic, individual and household bio-demographic and socio-economic factors there were significant PSU level variations in uptake of delivery care. This indicates that there exist inequalities in uptake of delivery care in Ghana. The inequalities exist generally between PSUs. There are inequalities between rural PSUs and between urban PSUs. However, the urban inequalities have increased such that it is not statistically different from what pertains between rural PSUs. In each of the three ecological zones of Ghana, there are inequalities in uptake of delivery care.

Generally, there exist high inequalities in uptake of public sector delivery care between PSUs. The inequality gap in uptake of public sector delivery care is high in Rural Ghana and has existed for the two successive surveys. This is an indication that most rural PSUs may be lacking access to public health facilities. However, urban PSUs are experiencing a marked increasing inequality gap in uptake of public sector delivery. The inequality gap in uptake of public sector delivery care between PSUs more than quadrupled between the two successive surveys. This is a confirmation that urban communities are losing their dominant living condition (Magadi 2004, Linden 1996). If physical access to health care services is not a major barrier within urban units as documented by Magadi et al (2003) and Todd (1996), then there is an indication that economic vulnerability is dictating use of services and widening inequality gap in urban Ghana.

At the zonal level, inequalities in uptake of public sector delivery care are higher for the Savannah and Forest Zones and have existed for the two successive surveys, although there was slight decline in the Forest Zone. However, there are no significant inequalities in uptake of private sector delivery care in the Savannah Zone. As indicated earlier, this maybe due to the less developed nature of the zone, which is less likely to attract private-for-profit health practitioners. The inequality gap in uptake of private sector delivery care in the Forest Zone has increased considerably. This is an indication that there might be a growing number of private medical practitioners in some PSUs of the Forest Zone. This may also be due to the fact that in some PSUs of

the Forest Zone there are a growing number of women who cannot afford private sector delivery care. The Coastal Zone is experiencing a growing inequality gap in the uptake of both public sector delivery care, which is more predominant between urban PSUs. The increasing inequality gap identified in the Forest and Coastal zones maybe due to the increasing rural/urban migration and growing slum PSUs, as the two zones are the main recipient of migrants and harbouring most slum PSUs in the country.

In summary, a clear picture has emerged that there exist inequalities in uptake of delivery care in Ghana. There exist inequalities between rural PSUs and between urban PSUs. Although the inequalities are high and has existed in Rural Ghana overtime, Urban Ghana is experiencing marked increasing inequality gap. At the zonal level, there are high inequalities in uptake of public sector delivery care in the Savannah Zone, which has existed overtime. In the Forest Zone, while there are high inequalities in uptake of public sector delivery care, there is also a considerable increasing inequality in uptake of private sector delivery care. The Coastal Zone is experiencing marked increasing inequalities in uptake of public sector delivery care, while there are still high inequalities in uptake of private sector delivery care. The picture emerging from this study indicates that to bridge the inequality gap in access to public health care, interventions targeting rural units need to target the Savannah and Forest Zones, while interventions for urban units target the Coastal Zone (slum areas). The reason for this suggestion is that they are the units with high and or increasing inequalities in access to delivery care. This does not necessarily mean urban units in the Savannah and Forest Zones and rural units in the Coastal zone should be ignored.

This study has identified spatial inequalities in uptake of delivery care that needs to be explained. Contextual variables from the 2000 GPHS, in the presence of spatial, individual and household level bio-demographic and socio-economic factors could not explain all the inequalities that exist in uptake of delivery care in Ghana. There is therefore the need for a study that investigates the attitudinal/behavioural and cultural practices as well as traditional norms that explains these spatial inequalities. Physical

access to services and how economic vulnerability operates to influence maternal health care needs to be investigated.

Since it has been established that spatial inequalities exist in uptake of delivery care, there is the need to identify areas with prioritised needs, warranting interventions. Chapter six will focus on estimating the proportion of home deliveries in each district of Ghana by age domain, using small area estimation techniques. This will also help identify some of the contextual factors that explain uptake of delivery care in Ghana. The analysis will be conducted at the district level, since all districts are sampled in the GDHS and are the pivot of decision-making. This will also help in implementation, monitoring and evaluation of maternal health activities.

CHAPTER SIX

6.0 DISTRICT ESTIMATES OF RISK TO UNINTENDED PREGNANCIES AND HOME DELIVERIES

6.1 INTRODUCTION

There are ongoing efforts in sub-Saharan Africa to improve maternal health. With the merger resources available for improving maternal health in sub-Saharan Africa to reach the fifth Millennium Development Goal, there is the need for research that aid policy makers and health practitioners target high-risk groups and areas with the appropriate interventions. In an era where local governance is considered to be the pivot of decision-making and policy formulation, there is the need for relevant and reliable statistics at the local level to aid decision-making in bridge the inequality gap between communities and regions.

In Chapters Four and Five, significant spatial inequalities were identified in the risk to unintended pregnancies and home deliveries, risk factors concurrent with maternal deaths and illnesses. It is therefore important to identify disadvantaged groups and areas in accessing maternal health services. This chapter using survey data from the 2003 GDHS and auxiliary information from the 2000 Ghana Population and Housing Census (GPHC) aims at deriving age-district domain estimates of exposures to mistimed and unwanted pregnancies and home deliveries in Ghana. Valid measures of error are also used to access the validity of the estimates. This analysis is important in aiding central government allocation of health funds and local government and health practitioners including Non-Governmental Organisations implementation, monitoring and evaluation of maternal health activities.

6.2 ASSEMBLING OF DATA

To derive reliable model-based small area estimates two categories of variables are usually required.

Y variables: variables (dependent variable) recorded in the survey for which small area/domain estimates are required.

Z variables: variables that are recorded in the census or administrative system.

Three *Y* variables – the proportion of women in a district who are exposed to: (1) mistimed pregnancies; (2) unwanted pregnancies; and (3) the proportion of home deliveries in a district, recorded in the 2003 GDHS. The auxiliary variables (*Z*) used for deriving the estimation models are shown in Table 6.1 below. The composite indices were derived via principal component analysis. The derivation of the composite indices was discussed in Chapter Three.

In order to link the survey data (GDHS) to the covariates from the census data, there is the need to make a connection between the locations of the sampled PSUs districts and its spatial location in the hierarchy of the administrative areas (districts). Since the 2000 GPHC was the sample frame for the 2003 GDHS, the spatial co-ordinates of each of the PSUs could be obtained. Using the spatial-coordinates provided by the Ghana Statistical Service the 412 PSUs sampled in the 2003 GDHS were placed within a specified administrative district and the statistics about these areas were linked to the survey data as auxiliary information. The survey information on exposures to unintended pregnancies and home deliveries is restricted to 3,502 fecund married women and 2,757 women who had a birth in the five years preceding the 2003 GDHS. Only place of delivery of the last child was considered in this study due to the high dependence in uptake of delivery care for successive pregnancies (see Chapter Five). Table 6.1 below describes the auxiliary data used in the analysis.

Table 6.1: Auxiliary Information

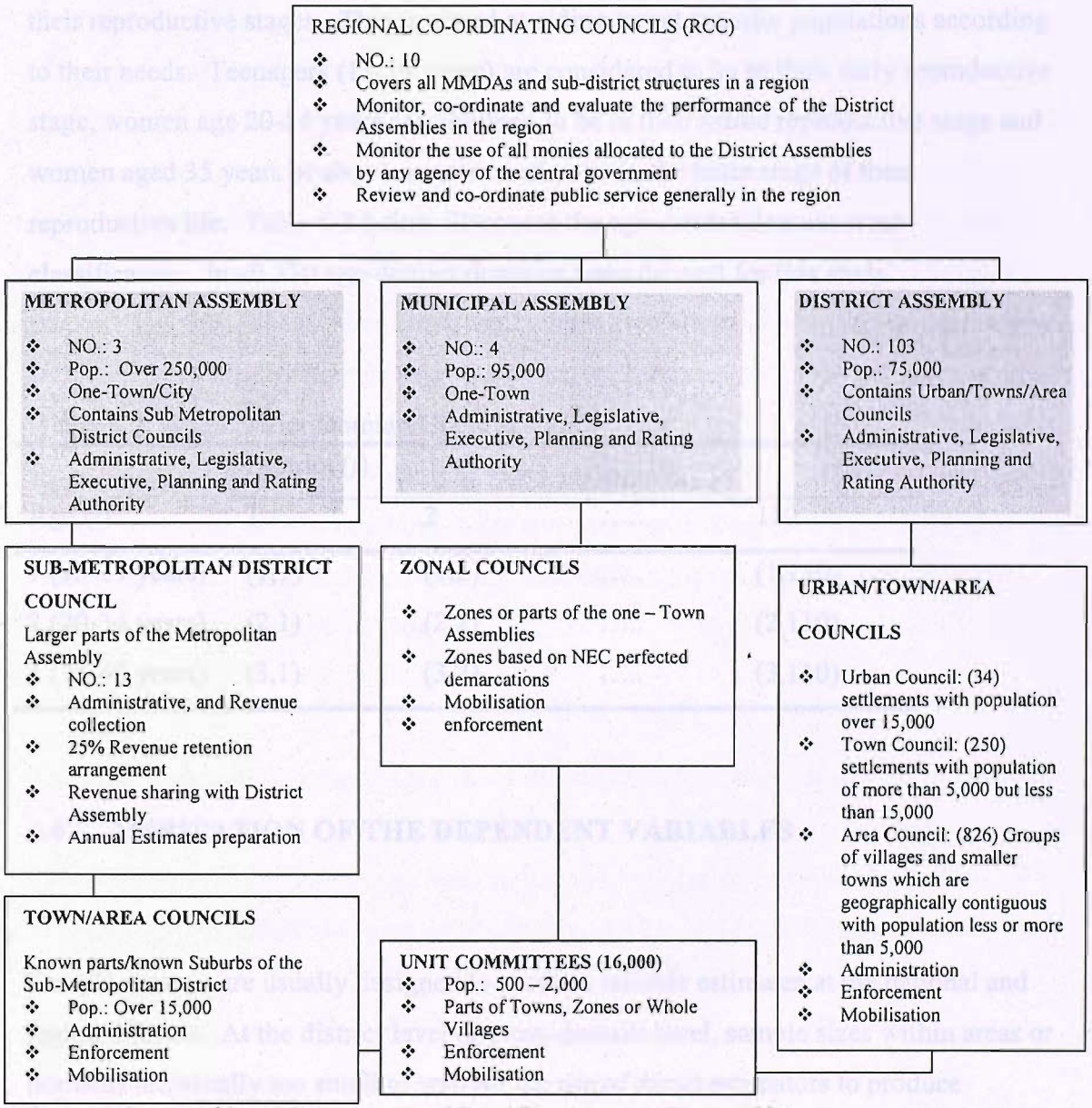
Variables	Categorization	Descriptive statistics
Demographic indicators		
Age category (*i,j*)	Age 15 – 19 years Age 20-34 years Age 35+ years	
Population structure (*j*) *Proportion of women of reproductive age in a district*	Continuous	Min 39.0% Max 57.7% Mean 45.2% SD 0.032
Total fertility rate *(j)*	Continuous	Min 2.18 Max 9.78 Mean 4.44 SD 1.16
Access to health facilities (j)		
Index of access to health services *A composite index of access to traditional health facilities, hospital and clinics derived using principal component analysis*	Continuous	Min -4.629 Max 1.300 Mean 1.000 SD 0.000
Socio-economic development (j)		
Index of socio-economic development *A composite index of level of literacy, employment, educational status, urbanization and proportions employed in the different sectors of the economy*	Continuous	Min -1.747 Max 3.063 Mean 1.000 SD 0.000
Administrative region (*j*)		Number of districts
	Western	11
	Central	12
	Greater Accra	5
	Volta	12
	Eastern	15
	Ashanti	18
	Brong Ahafo	13
	Northern	13
	Upper East	6
	Upper West	5

6.3 DOMAIN CLASSIFICATION

Ghana's local government administrative structure is made up of four structures: the regional coordinating council, a four tier metropolitan authority and a three-tier municipal/district assembly structure and unit committees (Ministry of Local Government and Rural Development, Ghana, 1999). This local government structure

was adopted in 1988, when the Government of Ghana undertook a comprehensive policy to decentralise the then centralised system of government. The aim of the decentralization of the central government was to relegate public sector task and decision from central government, ministries and departments at the national level to districts and municipalities. The decentralization process was intended at ensuring equitable distribution of resources and bridging the developmental gap between communities. Figure 6.1 below illustrates the basic characteristics of the local government administrative structure of Ghana. The shaded portion indicates the level where the analysis is focused.

Fig 6.1: Basic Characteristics of the Local Government Structure



Source: Ministry of Local Government and Rural Development, Ghana, 1999

At the time of conducting the 2000 GPHC and 2003 GDHS Ghana was demarcated into 110 metropolitan, municipal and district assemblies (3 metropolitan authorities, 4 municipal assemblies and 103 district assemblies). Since both census and survey data available for this analysis was based on the 110 districts of Ghana, the analysis is focused on the 110 districts for which data is available. The focus of this analysis is at the district level because it is the level of governance where decision-making and grass roots participation is being encouraged in the decentralization process. Also, all districts were sampled in the 2003 GDHS.

The women in the survey were further categorised into three age-groupings to reflect their reproductive stages. This is aimed at aiding target specific populations according to their needs. Teenagers (15-19 years) are considered to be in their early reproductive stage, women age 20-34 years are assumed to be in their prime reproductive stage and women aged 35 years or above are assumed to be in the latter stage of their reproductive life. Table 6.2 below illustrates the age-district domain cross-classification. In all 330 age-district domains were derived for this study.

Table 6.2: Age-District Domain Classification

	District (j)			
Age (i)	1	2	.....	110
1 (15-19 years)	(1,1)	(1,2)	.....	(1,110)
2 (20-34 years)	(2,1)	(2,2)	.....	(2,110)
3 (35-49 years)	(3,1)	(3,2)	.....	(3,110)

6.4 DERIVATION OF THE DEPENDENT VARIABLES

Sample surveys are usually designed to produce reliable estimates at the national and regional levels. At the district level or cross-domain level, sample sizes within areas or domains are usually too small to warrant the use of direct estimators to produce reliable small area or domain estimates (See Appendices IV, V and VI). Of the 330

age-district domains derived for estimating exposures to unintended pregnancies, 204 (61.8%) had sample sizes less than 10, 101 (30.6%) had samples between 10 and 30, while only 25 (7.6%) had samples greater than 30. Two hundred and twenty seven (68.0%) of the 330 age-district domains derived for estimating home deliveries have sample sizes less than 10, 90 (27.3%) have sample sizes of between 10 and 30 and only 13 (3.9%) have sample sizes greater than 30.

Using the ratio estimator technique the direct estimates of the proportion of women exposed to unintended pregnancies and home deliveries by age and district are computed and shown in Appendices IV, V and VI along with their relative standard error and domain sample size. The estimates and their relative standard errors (RSE) [the ratio of the estimated standard error of the direct estimate to the direct estimate multiplied by 100] shown in Appendices IV, V and VI reveals that the ratio estimator technique is not able to produce reliable estimates at the domain level (high RSEs). Even at the regional level, the relative standard errors are not encouraging. For some domains, the direct estimate is zero because no sample cases were observed for that domain. In some domains also the direct estimates were zero due to that fact that there were small samples from this domain rather to the non-existence of eligible women in these domains. For example, for fecund married women aged 15-19 years, 42 domains had no samples, and 19 and 4 domains for women aged 15-19 years and 35+ years respectively, with at least one birth in the five years preceding the 2003 GDHS also had no samples. This is a clear indication that there is the need to produce local level statistics with adequate precision.

The sample data for this study consists of direct (DHS) estimates of women exposed to unintended pregnancies (mistimed and unwanted pregnancies)/home deliveries and associated age-district covariates from the Ghana Population and Housing Census. If i index age-group and j index district as indicated earlier and N_{ij} is the number of women in age group i and district j, with M_{ij} the number of women in age group i and district j exposed to unintended pregnancies/had a home delivery. Then the proportion of women exposed to unintended pregnancies/home deliveries is given

by $\theta_{ij} = {}^{M_{ij}}\!/_{N_{ij}}$. Since, the sample data for the analysis consist of the direct estimate of the proportion of women exposed to unintended pregnancies/had a home delivery, $\hat{N}_{ij}$ is the direct estimate of the number of women in age age-group i and district j. $\hat{M}_{ij}$ is the direct estimate of the number of women exposed to unintended pregnancies/home deliveries.

6.4.1 Pregnancy Planning

With reference to Chapter Four, five categories of pregnancy planning attitudes were identified – (1) using contraception; (2) not contracepting and want a child within 2 years of the survey; (3) not contracepting and undecided/unsure of timing of next birth; (4) want to space childbearing but not contracepting; and (5) want to limit childbearing but not contracepting. In this chapter, the aim is to estimate the proportion of women in each age-district category exposed to mistimed and unwanted pregnancy. If at the district-level:

Users (M_{ij}^{a}):	the number of women in age-group i and district j who were contracepting at the time of the survey
Wanting (M_{ij}^{b}):	the number of women in age-group i and district j who want a child in the next two years of the survey
Undecided (M_{ij}^{c})	the number of women in age-group i and district j who were undecided or unsure of the timing of their next pregnancy but not contracepting
Mistimed (M_{ij}^{d}):	the number of women in age-group i and district j exposed to mistimed pregnancy; and,
Unwanted (M_{ij}^{e})	the number of women in age-group i and district j exposed to unwanted pregnancy

Then, the total number of women in age group i and district j is given by $M_{ij}^{a} + M_{ij}^{b} + M_{ij}^{c} + M_{ij}^{d} + M_{ij}^{e} = N_{ij}$. The categorisation above is mutually exclusive and exhaustive for married fecund women of sample size n in the GDHS. The direct estimate of the proportion of women in age group i in district j exposed to mistimed pregnancy is given as $\frac{\hat{M}_{ij}^{d}}{\hat{N}_{ij}} = \hat{\theta}_{ij}^{M}$ and the proportion in age group i in district j exposed to unwanted pregnancy is given by $\frac{\hat{M}_{ij}^{e}}{\hat{N}_{ij}} = \hat{\theta}_{ij}^{U}$. Where, M and U denote exposures to mistimed and unwanted pregnancy respectively.

6.4.2 Home Deliveries

Three main delivery care services were identified in Chapter Five – (1) home deliveries under the supervision of unskilled attendants including trained TBAs; (2) public sector health care delivery under the supervision of skilled attendants and (3) private sector health care delivery under the supervision of skilled attendants. At the district level, let:

Home: (M_{ij}^{f}):	the number of births at home to women aged i under the supervision of unskilled attendants in district j
Public health facility (M_{ij}^{g}):	the number of births in public health facilities to women aged i under the supervision of skilled attendants in district j
Private health facility (M_{ij}^{h}):	the number of births in private health facilities to women aged i under the supervision of skilled attendants in district j

The categorisation above is also mutually exclusive and exhaustive for all women who had a birth in the 5 years preceding the 2003 GDHS. The total number of women aged i in district j who had a birth can be defined as $M_{ij}^{f} + M_{ij}^{g} + M_{ij}^{h} = N_{ij}$. Here the aim is to estimate the proportion of home deliveries to women aged i in district j. The direct estimate of the proportions of home deliveries to women aged i in district j is defined as $\frac{\hat{M}_{ij}^{f}}{\hat{N}_{ij}} = \hat{\theta}_{ij}^{H}$ where H denotes home delivery.

6.5 RESULTS

6.5.1 Model Formulation and Performance

A null model (Model 0) controlling for the area effects was initially fitted to determine the basic partitioning of the variability at the district level. Five modelling process were then used to check for the explanatory power of the covariates. Model 1 controlled for the demographic characteristics. The composite score for access to health services was then added to Model 1 to derive Model 2. Model 3 accounted for the score for socio-economic development of the districts in addition to the covariates in Model 2. A dummy indicating the administrative region of the district was added to Model 3 to derive the Model 4. Finally, all possible interactions were investigated. The significant interactions were added to Model 4 to derive Model 5. Where a variable was identified not to be significant except age, it was dropped from the model to avoid introduction of errors in the final model. Below is an illustration of the model building process.

Model 0: $Z_0 = 1$

Model 1: Z_1 = Demographic indicators

Model 2: $Z_1 = 1$, Z_2 = Access to health services

Model 3: $Z_1 = 1$, Z_2, Z_3 = Socio-economic characteristics

Model 4: $Z_1 = 1$, Z_2, Z_3, Z_4 = Administrative region

Model 5: $Z_1 = 1$, Z_2, Z_3, Z_4, Z_5 = Significant interactions

The performance of the models was checked using the values of $\hat{\sigma}_{\mu}^{2}$ as an indication of the explanatory power of the synthetic part of the model. Table 6.3 shows that models 1 – 5 are in general better than model 0 in terms of explaining spatial variability, with models 4 and 5 showing the best results. Model 5 was preferred to model 4 due to the inclusion of interaction effects between some of the covariates. The percentage change in $\hat{\sigma}_{\mu}^{2}$ shown in Table 6.3 reveals that region of residence is very important in pregnancy planning behaviour and uptake of delivery care.

Table 6.3: Values and Percentage Change in $\hat{\sigma}_{\mu}^{2}$

Model	Response variables		
	Mistimed pregnancy	Unwanted pregnancy	Home delivery
0	0.342 (0.073)	0.286 (0.071)	1.254 (0.208)
1	0.241 (0.061)	0.273 (0.068)	1.234 (0.204)
2	0.159 (0.048)	0.273 (0.068)[1]	1.074 (0.182)[1]
3	0.120 (0.042)	0.256 (0.066)	1.074 (0.182)
4	0.055 (0.031)	0.120 (0.047)	0.386 (0.086)
5	0.051 (0.030)*	0.117 (0.045)**	0.346 (0.080)***
Percentage change in $\hat{\sigma}_{\mu}^{2}$ from Preceding Model			
1	29.5	4.5	1.6
2	34.0	0	13.0
3	24.5	6.2	0
4	54.2	53.1	64.1
5	7.3	2.5	10.4

*Significant at p<0.10, **p<0.05; ***p<0.01

6.5.2 Estimation Models

Three estimation models were derived for estimating the age/district proportions – women exposed to mistimed pregnancies (Estimation Model 1), women exposed to unwanted pregnancies (Estimation Model 2) and home deliveries (Estimation Model

[1] Not significant in final model

3). The estimated coefficients are shown in Table 6.4 below. The estimated coefficients were used to derive domain estimates. The reliability of the estimates is investigated in section 6.9.2 below before they are discussed in section 6.9.3.

The district level model for exposures to unintended pregnancies (Table 6.4 below) confirms that age of a woman is significantly associated with her exposure status. Younger women are more exposed to mistimed pregnancies, while their older counterparts are exposed to unwanted pregnancies. The estimated coefficients also reveal that high TFR areas are more exposed to mistimed pregnancies, while low TFR areas are more exposed to unwanted pregnancies. This again is a confirmation to the findings in Chapter Four, where it was identified that high TFR areas such as the Savannah Zone of Ghana is more exposed to mistimed pregnancies compared to unwanted pregnancies. This is due to the desire for large family sizes in the area coupled with the high infant mortality rate.

It is important to note that access to health services and socio-economic development are very important predictors of exposures to mistimed pregnancies. However, in the present study access to health services is found not an important predictor of unwanted pregnancies. This can be attributed to the fact that in most areas where exposures to unwanted pregnancies are high, there is high proximity to health services. This again is a further confirmation to the findings in Chapter Four where it was identified that the Coastal and Forest Zones where geographical proximity to health services are higher tend to have a higher exposure to unwanted pregnancies. Increase in proximity to health services and socio-economic development is negatively associated with exposures to mistimed pregnancies. This is again reflected in the estimated coefficients associated with the administrative regions. The estimated coefficients reveal that district within the three northern regions of Ghana (Savannah zone) have higher odds of exposure to mistimed pregnancies, but lesser odds of exposure to unwanted pregnancies. The central and eastern regions have significantly higher odds of exposure to unwanted pregnancies.

The interaction effects show that younger women residing in highly developed areas have a higher tendency to having a desire to postpone or limit childbearing. A plausible explanation to this finding is that young women within these areas are more likely to desire longer births intervals or delay family formation for educational and or professional qualifications, yet are not contracepting to avoid conception.

In Chapter Five it was identified that maternal age did not predict the choice of delivery care. This finding is also evident in the age-district domain model. There was a significant interaction between age and access to health services. Access to health services influences young women's uptake of delivery care. The high TFR in most regions of Northern Ghana and low access to health services contributes to the high proportion of home deliveries in the area.

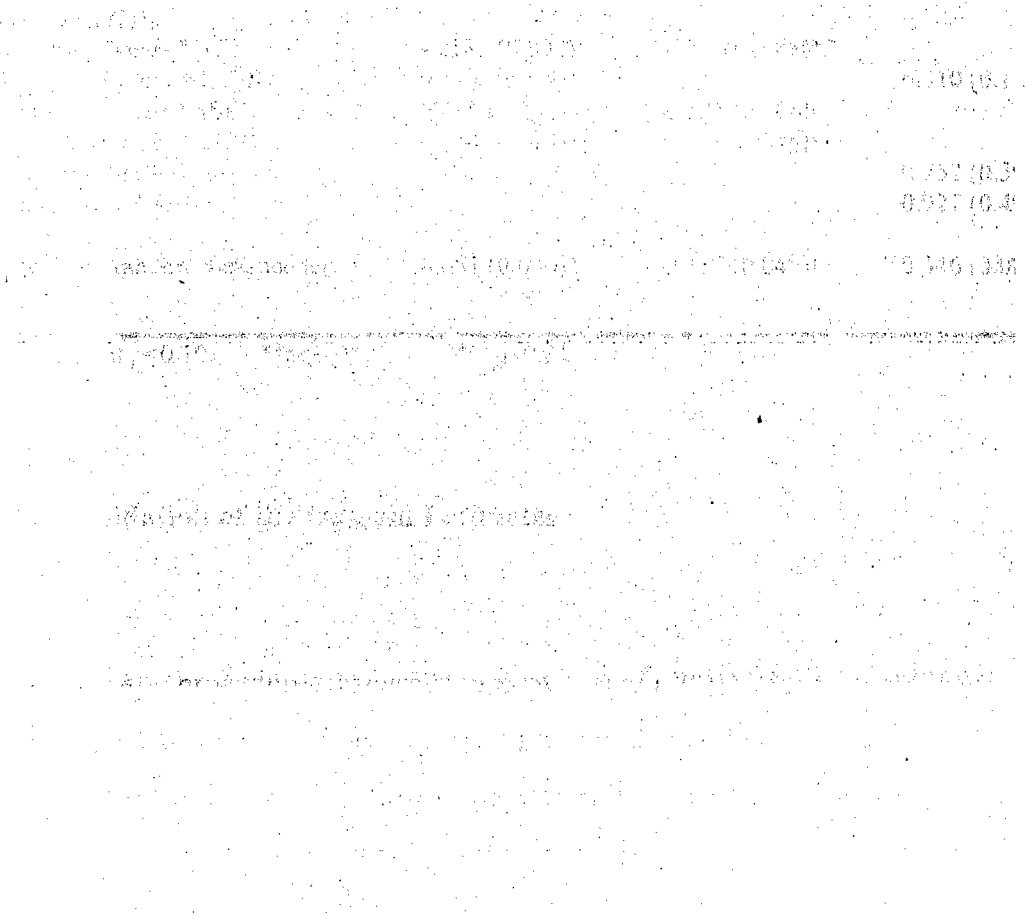


Table 6.4: Estimated Coefficients of the Estimation Models

Background characteristics	Exposures to unintended pregnancies		Place of delivery
	Mistimed	Unwanted	Home
Constant	-1.583	0.362	1.206
Demographic indicators			
Age *(i,j)*[2]			
15 – 19 years	2.796 (0.209)***	-2.906 (0.442)***	-0.129 (0.171)
20 – 34 years	2.768 (0.439)***	-2.742 (0.403)***	-0.108 (0.104)
35+ years[4]			
Proportion of women of reproductive age *(j)*[3]	-3.507 (2.001)*		
Total Fertility Rate *(j)*	0.147 (0.100)	-0.131 (0.079)*	-0.142 (0.092)
Access to health facilities (j)			
Index of access to health services (IAHS)	-0.135 (0.078)**		0.019 (0.110)
Socio-economic development (j)			
Index of socio-economic development (ISED)	-0.357 (0.163) **	-0.283 (0.099)**	
Administrative Region (j)			
Western[4]			
Central	0.292 (0.266)	0.674 (0.264)**	-0.022 (0.336)
Greater Accra	0.172 (0.292)	0.447 (0.317)	-2.401 (0.450)***
Volta	-0.257 (0.273)	0.391 (0.269)	-0.491 (0.335)
Eastern	-0.056 (0.259)	0.547 (0.253)**	-0.511 (0.321)
Ashanti	0.135 (0.220)	0.301 (0.246)	-1.072 (0.312)***
Brong Ahafo	-0.067 (0.215)	-0.158 (0.248)	-0.724 (0.307) **
Northern	0.778 (0.228)***	-0.990 (0.281)***	-2.151 (1.960)
Upper East	0.717 (0.265)***	-0.264 (0.319)	0.767 (0.384)**
Upper West	0.419 (0.247)*	-0.733 (0.310)**	0.701 (0.406) *
Interactions (i,j)			
Age 20-34 years * TFR	-0.182 (0.093)*	0.239 (0.088)**	
Age 15-19 years * IAHS	0.444 (0.223)*		0.310 (0.163)*
Age 15-19 years * ISED	0.606 (0.237)**	0.521 (0.306)*	
Age 20-34 years * ISED	0.254 (0.114)**	0.320 (0.086)***	
Northern * TFR			0.752 (0.395)*
Upper West*IAHS			0.927 (0.496)*
District level random variance terms (μ_{0j})	0.051 (0.030)*	0.117 (0.045)**	0.346 (0.080)***

*Significant at p<0.10, **p<0.05; ***p<0.01

6.5.3 Validation of the Domain Estimates

Four diagnostic procedures discussed in Brown et al (2001), Heady et al (2003), Curtis (2005) and Longhurst and Goldring (2005) for validating domain estimates are used to validate the reliability of the estimates generated from the estimation models. The

[2] *(i,j)* – denotes age-district variables
[3] (j) – denotes district level variables
[4] Base category

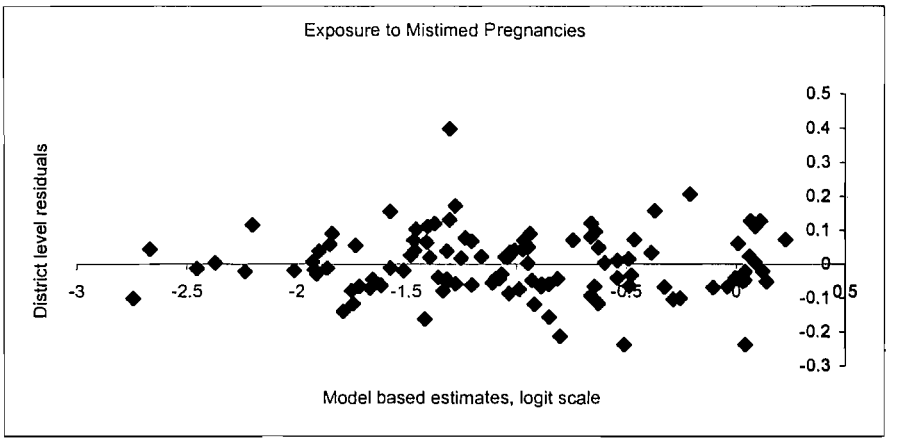
diagnostic methods used are: (1) the model diagnostics, (2) the goodness of fit diagnostic, (3) the coverage diagnostic and (4) the relative standard error diagnostics.

I. Model Diagnostics

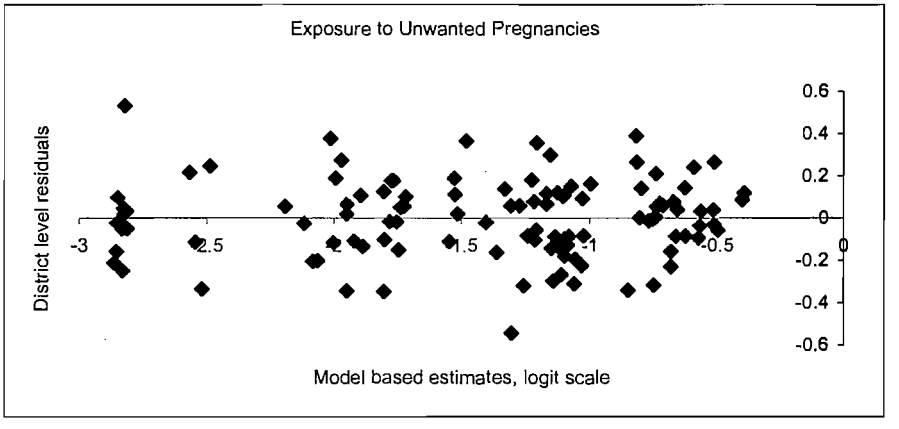
As with all statistical models, a number of assumptions are made about small area models. Using the logit link, the district level residuals were assumed to have a normal distribution with mean zero and variance ϕ. The **model diagnostics** are used to verify that the model assumptions are satisfied. If the model assumptions are satisfied the relationship between the area level residuals and the model estimates is expected not to be significantly different from the regression line $y=0$. Figure 6.2 below shows the plot of the area level residuals against the model base estimates (logit scale) with the relationship shown before each plot. The equations confirm that the regression lines are not significantly different to the line $y=0$ as required.

Figure 6.2: Model Diagnostic Plots

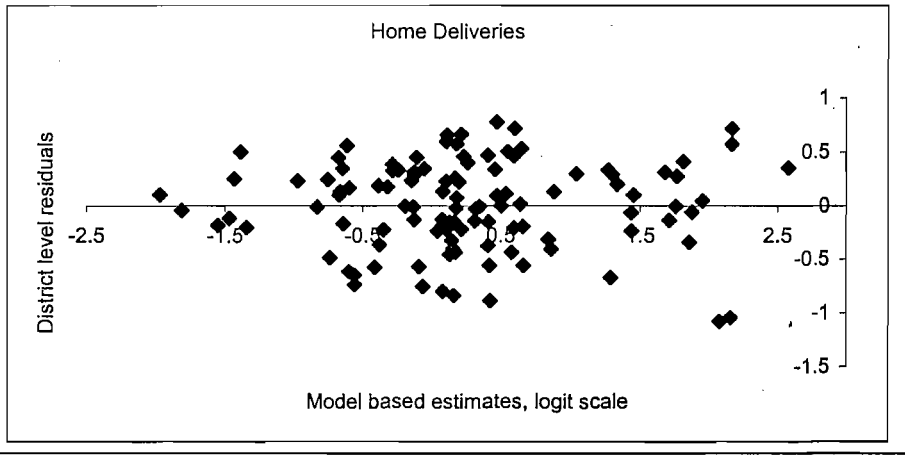
Y=-0.005 (0.016) – 0.005 (0.013)x



y = 0.007 (0.040) + 0.005 (0.025) x



y = 0.001 (0.041) – 0.001 (0.043) x



II. Goodness of fit diagnostics

The **goodness of fit diagnostics** tests if the model-based estimates are close to the direct estimates. Basically, this diagnostics using the Wald goodness of fit statistics test whether there are significant differences between the expected values of the direct estimates and the model based estimates. In order not to over report the reliability of the model based estimates for this diagnostics, the model based estimates are derived using only the fixed part of the model. This diagnostics is carried out by first computing the differences between the model-based and direct estimates. The differences are then squared and then inversely weighted by their variances and summed over all areas. This is then compared to a χ^2 distribution with degrees of freedom equal to the number of domains in the population. This provides a parametric significance test of bias of model-based estimates relative to their precision.

In application to the estimates derived from the estimation models, Table 6.5 below shows the goodness of fit statistics for the three estimation models and their p-values, showing that there is no significant evidence to reject the χ^2 distribution, hence there is no significant difference between the direct estimates and the model based estimates.

Table 6.5: Goodness of Fit Statistics

Model	**Goodness of fit statistic**	**p-value**
Mistimed pregnancies	267.27 on 330 degrees of freedom	0.995
Unwanted pregnancies	258.34 on 330 degrees of freedom	0.999
Home deliveries	286.55 on 330 degrees of freedom	0.960

III. Coverage diagnostics

The **coverage diagnostic** measures the overlap between the 95 per cent confidence intervals of the direct estimates and those of the model-based estimates. This diagnostics is aimed evaluating the validity of the confidence intervals generated by the model-based procedure. Since the direct estimation procedure and model-based procedure measures the same quantity an adjustment is made to adjust for the fact that the degree of overlap between two independent 95 percent confidence intervals for the same quantity will be higher than 95 percent.

Brown et al (2001) indicated that if X and Y are two independent random variables, with same mean but different standard deviations σ_X and σ_Y respectively and $z(\alpha)$ is such that the probability that a standard normal variable takes values greater than $z(\alpha)$ is $\alpha/2$. Then for a probability of α that the two intervals $X \pm z(\beta)\sigma_X$ and $Y \pm z(\beta)\sigma_Y$ does not overlap can be defined as:

$$z(\beta) = z(\alpha)\left(1+\frac{\sigma_X}{\sigma_Y}\right)^{-1}\sqrt{1+\frac{\sigma_X^2}{\sigma_Y^2}} \qquad 6.7$$

To compute $z(\beta)$, $z(\alpha)$ = 1.96, σ_X is the estimated standard error of the model-based estimates and σ_Y is the estimated standard error of the direct estimate. $z(\beta)$ is then used to compute the overlap proportion between the direct estimates and the model-based estimates. Domains with zero direct estimates were filtered out. If L_m represents the lower limit of the model-based estimates, U_m upper limit the upper limit of the model-based estimates and L_D and U_D represents the lower and limits of the direct respectively, then the model-based and direct estimates overlap if $L_M \leq U_D$ or $L_D \leq U_M$. Table 6.6 below shows the non-coverage totals and their corresponding percentages.

Table 6.6: Non-Coverage Totals and Percentages

Model	Non-coverage totals	Non-coverage percentages
Mistimed pregnancies	0 out of 330	0.30
Unwanted pregnancies	3 out of 330	0.91
Home deliveries	2 out of 330	0.60

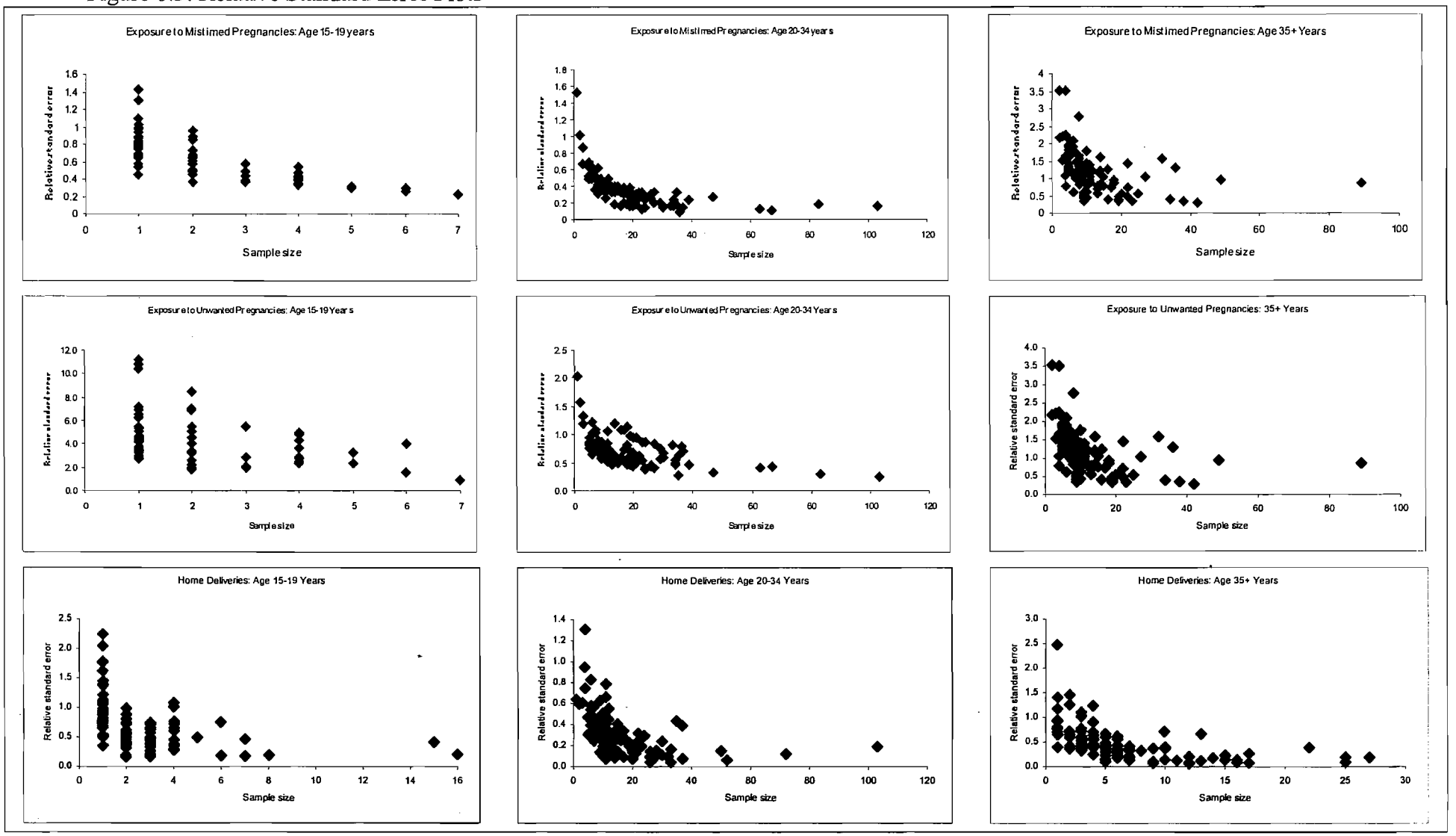
IV. Relative Standard Error Diagnostics

The **relative standard error** (RSE) is a measure of an estimate's reliability. The RSE is obtained by dividing the standard error of the estimate $(SE(\hat{P}))$ by the estimate $\hat{P}$ and expressed as a percentage. Domains with no sample were filtered out.

$$RSE = \frac{SE(\hat{p}_{ij})}{\hat{p}_{ij}} * 100$$

Estimates with large RSEs are considered unreliable. The criterion recommended for publication estimates of local authority unemployment by the Office of National Statistics (ONS), United Kingdom is that the relative standard error is not greater 20 percent (Curtis 2005). Adopting this criterion recommended by ONS to investigate the reliability of the estimates derived in this study, Figure 6.3 below, showing the RSE diagnostic plots for the model-based estimates by age groups and sample size reveals that the results hold for all the models and estimates. The plots generally show that as sample size increases the RSE decreases. However, the RSEs shown in Figure 6.3 are far lower than that shown in Appendices IV, V and VI, indicating the model-based estimates are more reliable than the direct estimates.

Figure 6.3: Relative Standard Error Plots



6.5.4 Mapping Spatial Variations in Exposures to Unintended Pregnancies and Home Deliveries

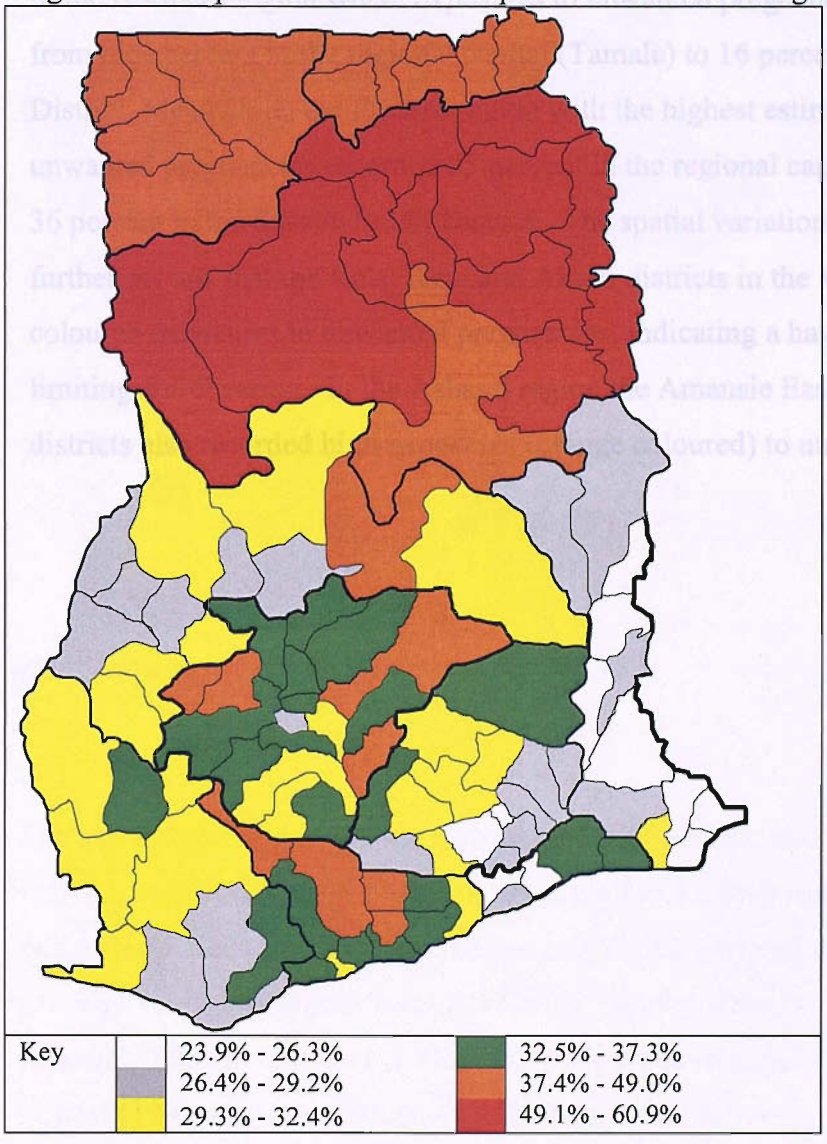
From the previous section of this Chapter, it has been established that the estimates generated from the estimation models are reasonably reliable and representative of the areas to which they belong. The mapping of the spatial variations in exposures to mistimed pregnancies, unwanted pregnancies and home deliveries are shown in Figures 6.4, 6.5 and 6.6 respectively. The range of the estimated proportions and variances was chosen such that 20 percent of districts are included in the ranges for the districts with the highest and lowest proportions. Forty percent of districts are included in the ranges for the second highest and second lowest proportions. The remaining 40 percent of districts are included in the ranges nearest the average values. The white shading represents districts that are in less critical situations, while the orange and red shadings represents critical and very critical districts warranting swift intervention. The regional boundaries are marked with thick lines. Refer to Appendix VII for the estimates.

I. Spatial Variations in Exposures to Mistimed Pregnancies

Figure 6.4 showing the geographical variation in levels of exposures to mistimed pregnancies reveals that the majority of the 10 percent of districts with highest exposures are concentrated in the Northern region of Ghana. Generally, the three Northern regions of Ghana – Northern, Upper East and Upper West regions tend to have highest estimates of exposures to mistimed pregnancies. This clearly confirms that women in the Savannah Zone of Ghana have a high desire to postpone childbearing rather than limit childbearing. This is not surprising given the high reported fertility rate in this region compared to the rest of Ghana. This further confirms the high unmet need for contraception in the region.

The Northern region with the highest exposures to mistimed pregnancies ranges from 41 percent in the Tamale Municipality to 61 percent in the Gushiegu-Karaga district, averaging out to more than 1 in 2 women being exposed in the region. Figure 6.4 below reveals that all districts in the northern region are either orange or red colour coded, indication of a very high unmet need for spacing childbearing. It is again interesting to note from the map that the Ahafo-Ano South district with high fertility rate and its bordering sister district Ahafo-Ano North are also orange colour coded. This further confirms that unmet need for spacing is concentrated more in high fertility areas.

Figure 6.4: Proportion of Women Exposed to Mistimed Pregnancy by District

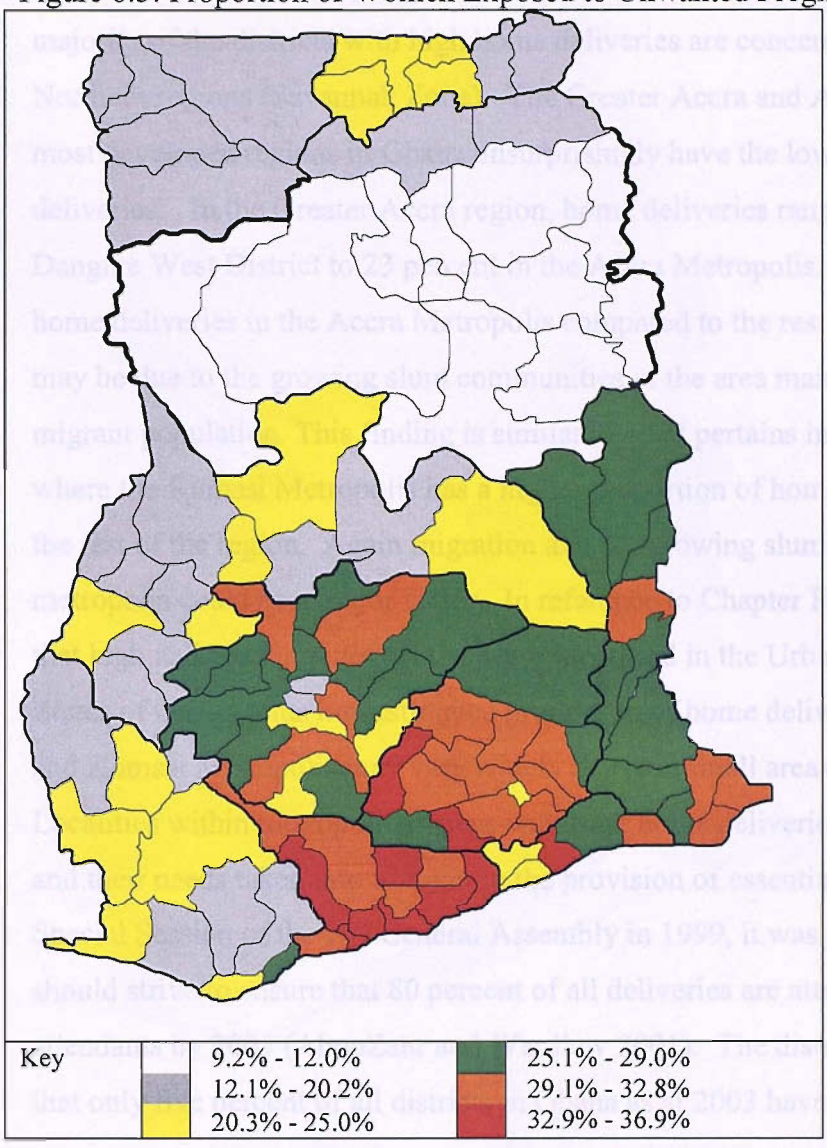


II. Spatial Variations in Exposures to Unwanted Pregnancies

Figure 6.5 below shows the aerial variations in exposures to unwanted pregnancies derived from the small area model. The shadings clearly show that the Central, Eastern and the eastern part of the Greater Accra region have the highest exposures to unwanted pregnancies. The Northern part of Ghana has the lowest exposures to unwanted pregnancies. This reflects the fact that most women in the northern part of Ghana do not have the desire to limit childbearing.

In the Northern region where exposures to unwanted pregnancies are lowest, it ranges from nine percent in the regional capital (Tamale) to 16 percent in the East Mamprusi District. Meanwhile, the Eastern region with the highest estimates of exposures to unwanted pregnancies recorded 25 percent in the regional capital (Koforidua) rising to 36 percent in the Kwahu South District. The spatial variations shown in Figure 6.5 further reveals that the Keta, Ketu and Akasti districts in the Volta region also orange coloured exposures to unwanted pregnancies, indicating a have high unmet need for limiting childbearing. In the Ashanti region the Amansie East and Sekyere West districts also recorded high exposures (orange coloured) to unwanted pregnancies.

Figure 6.5: Proportion of Women Exposed to Unwanted Pregnancy by District

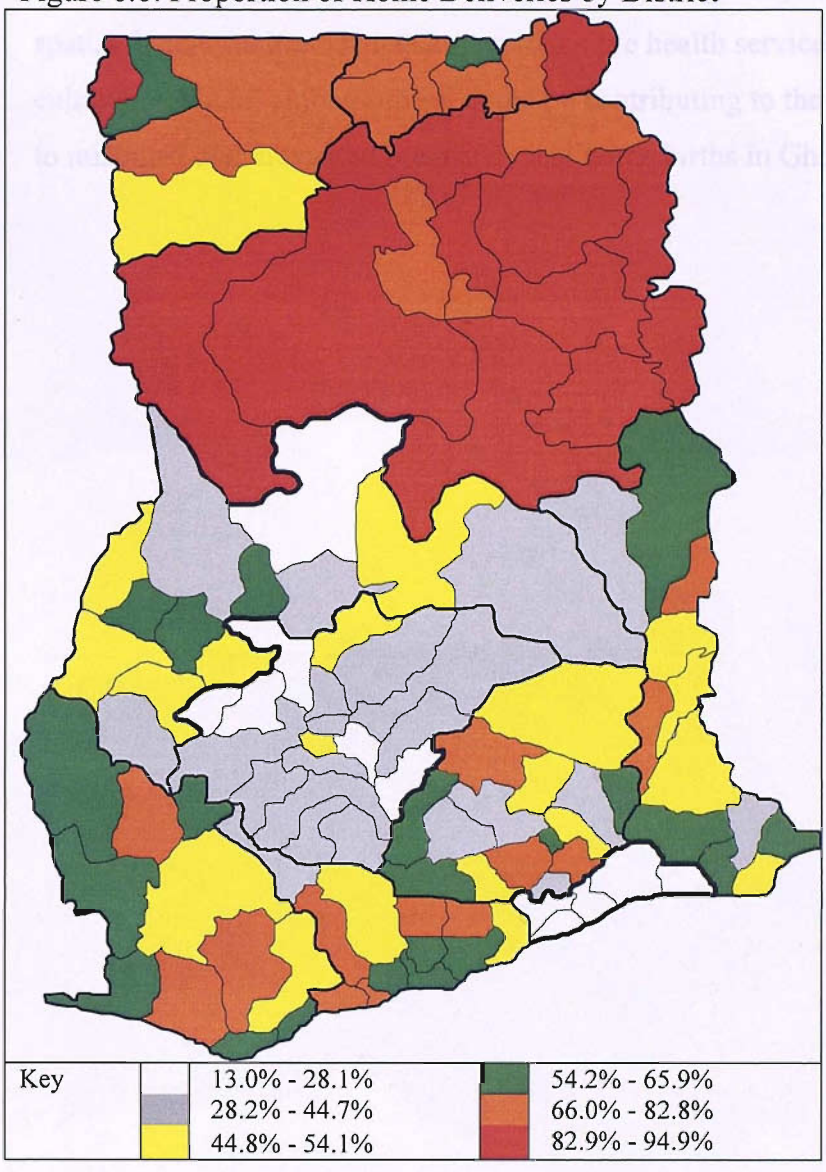


III. Spatial Variations in Home Deliveries

The estimates derived from the small area model confirm high inequalities in choice of delivery care in Ghana. The estimates shows that the proportion of home deliveries ranges from a low 13 percent in the Dangbe West District of the Greater Accra region to a high 95 percent in the Savelugu-Nanton district of the Northern region. The lowest estimate of home deliveries in Northern region was recorded in the East Mamprusi district (75 percent), an indication of the high home deliveries across all the districts of the Northern region of Ghana.

Figure 6.6 showing the spatial inequalities in home deliveries clearly depict that majority of the districts with high home deliveries are concentrated within the three Northern regions (Savannah Zone). The Greater Accra and Ashanti regions, the two most developed regions in Ghana unsurprisingly have the lowest proportions of home deliveries. In the Greater Accra region, home deliveries range from 13 percent in the Dangme West District to 23 percent in the Accra Metropolis. The high proportion of home deliveries in the Accra Metropolis compared to the rest of Greater Accra region may be due to the growing slum communities in the area mainly due to the growing migrant population. This finding is similar to what pertains in the Ashanti region, where the Kumasi Metropolis has a higher proportion of home deliveries compared to the rest of the region. Again migration and the growing slum communities in the metropolis could be a major factor. In reference to Chapter Five, it is important to note that high and growing inequalities were identified in the Urban Coastal and Forest Zones of Ghana, thus low estimated proportion of home deliveries for the Tema, Accra and Kumasi Metropolis may vary widely between small areas within the metropolis. Localities within metropolitan areas with high home deliveries need to be identified and their needs taken into account in the provision of essential obstetric care. At the Special Session of the UN General Assembly in 1999, it was agreed that all countries should strive to ensure that 80 percent of all deliveries are attended by skilled attendants by 2005 (AbouZahr and Wardlaw 2001). The district-level estimates shows that only five percent of all districts in Ghana as at 2003 have achieved this target.

Figure 6.6: Proportion of Home Deliveries by District



IV. Distribution of District Effects

The estimates mapped in Figures 6.4, 6.5 and 6.6 shows that there exists spatial variability in the levels of exposure to mistimed and unwanted pregnancy and home births in Ghana. To reinforce the spatial variability reported in Figures 6.4, 6.5 and 6.6, the district effects were mapped to reveal their spatial distribution (Figure 6.7 below). The categorisation was done on the standard normal scale on six categories (10%, 20%, 20%, 20%, 20% and 10%). The maps show a concentration of blue coded effects for mistimed and unwanted pregnancies and pink coded effects for home births for northern Ghana. Figure 6.7 also show a concentration of dark gray coded effects

for the Central region for exposure to unwanted pregnancy. These results suggest that spatial factors such as inadequate reproductive health services and pro-natalist socio-cultural practices, among others, could be contributing to the inequalities in exposure to mistimed and unwanted pregnancy and home births in Ghana.

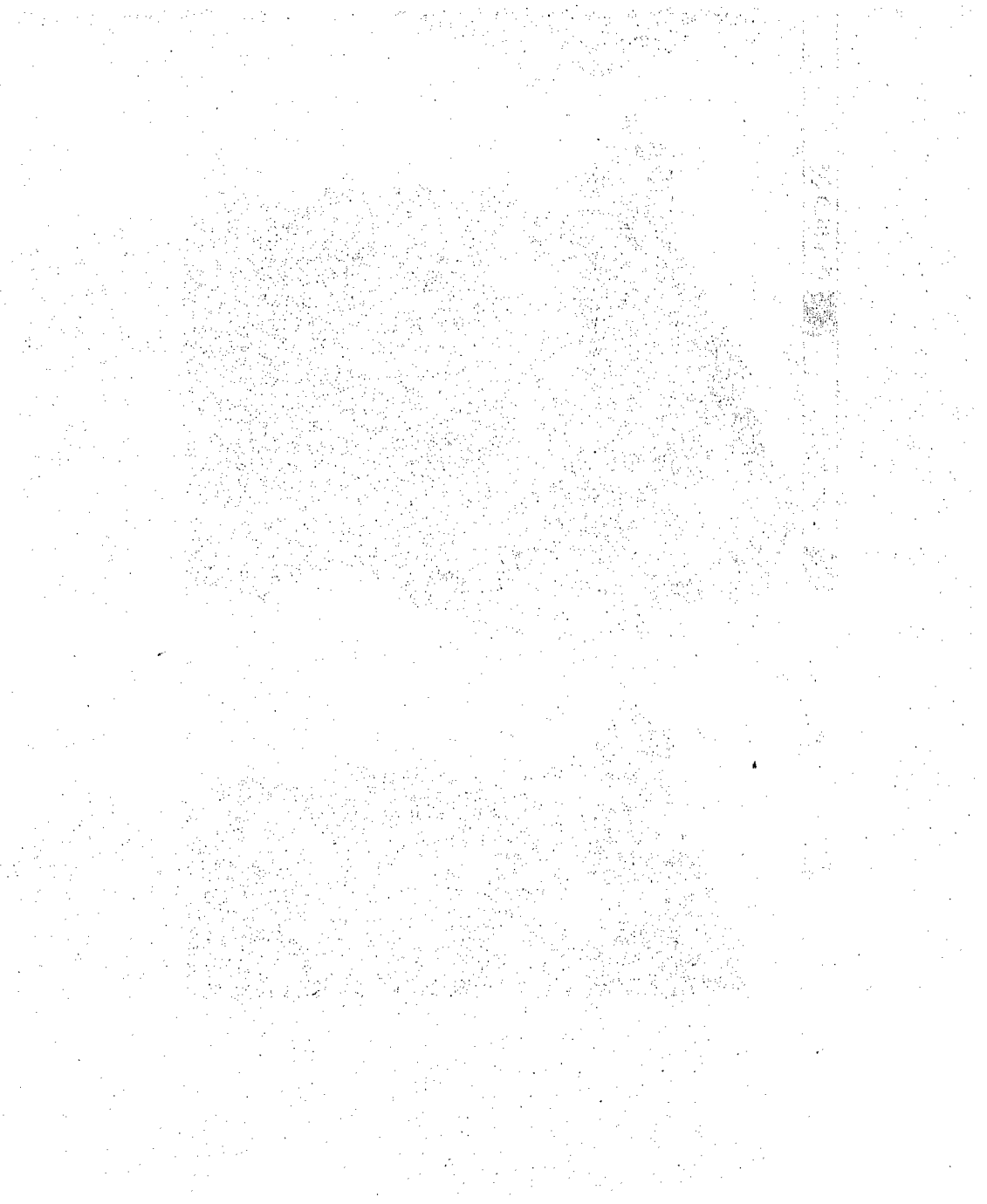
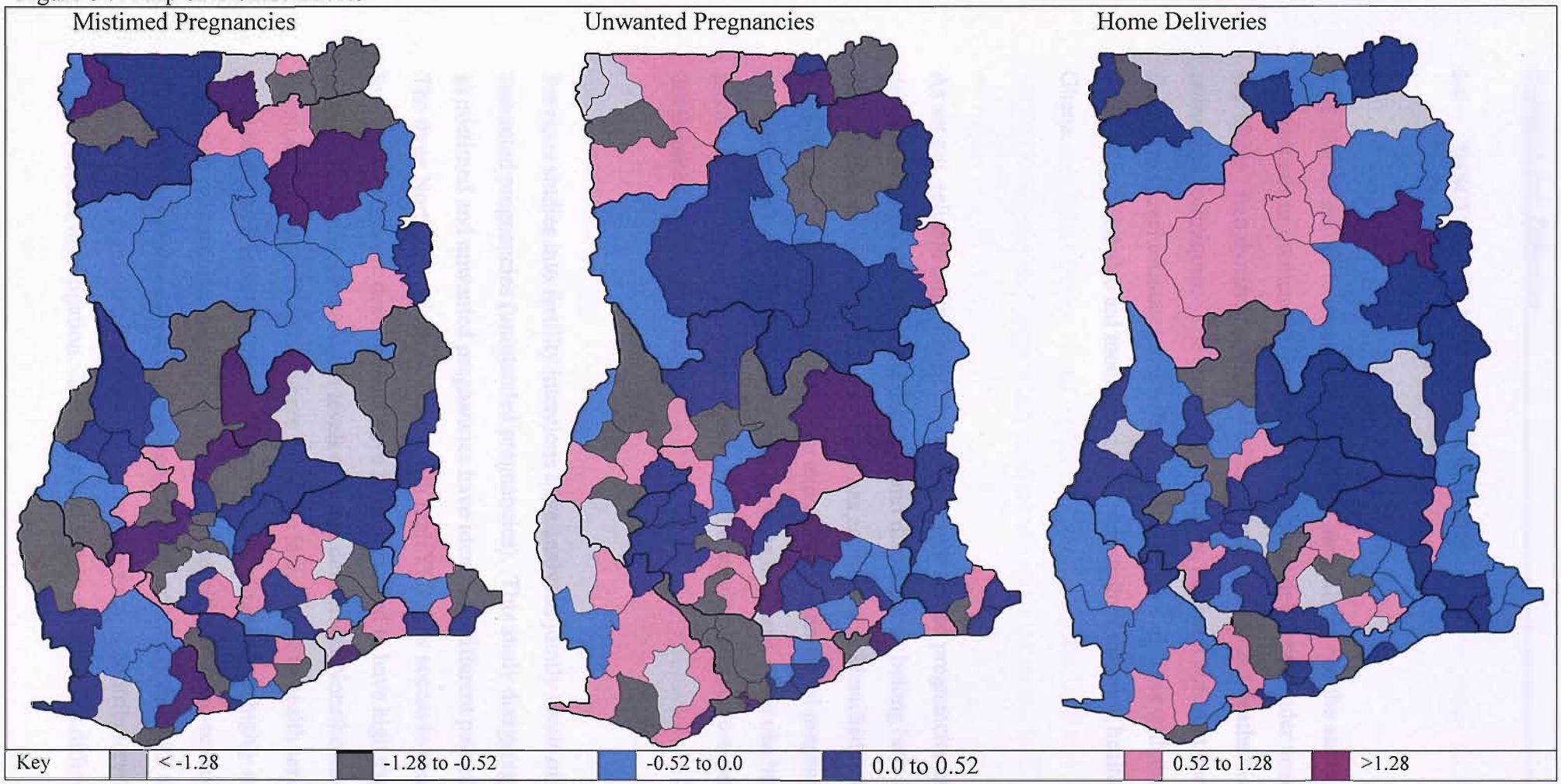


Figure 6.7: Map of District Effects



6.6 DISCUSSION AND CONCLUSIONS

This chapter set out to investigate the spatial inequalities and the associated predictors of exposures to unintended pregnancies and home deliveries under unskilled attendants', two dynamic correlates of maternal illnesses and deaths via small area estimation techniques. The chapter specifically, has been aimed at deriving domain and district level estimates that will aid target groups and areas with the appropriate interventions and also aid monitoring and evaluation of maternal health activities in Ghana.

As set out, reliable estimates of exposures to unintended pregnancies and home deliveries representative of the domains and districts they belong have been derived. The estimates derived from the analysis has confirmed as identified in Chapters Four and Five that high inequalities exist in exposures to unintended pregnancies (mistimed and unwanted) and use of delivery care services in Ghana. This can be attributed mainly to the varying levels of access to health services and socio-economic developments between areas.

Previous studies into fertility intentions have analysed jointly levels of mistimed and unwanted pregnancies (unintended pregnancies). This study disaggregating exposures to mistimed and unwanted pregnancies have identified different patterns of exposure. The three Northern regions of Ghana with high TFR, low access to health services and low socio-economic development have been identified to have high exposures to mistimed pregnancies and high levels of home deliveries. Nonetheless, the more developed regions of Ghana, where TFRs are low, access to health services are not as problematic as it is in the three Northern regions of Ghana are highly exposed to unwanted pregnancies. This is mainly due to disparities in socio-economic developments in these areas and not geographical proximity to health services. The growing slum communities in these areas maybe a major contributory factor and require further investigation. The study has clearly depicted that different policy

initiatives and interventions are required to target different groups and areas depending on their maternal health needs.

In the three Northern regions of Ghana the proportion of women exposed to mistimed pregnancies ranges from 39 to 61 percent, while home deliveries ranges from 46 to 95 percent. The proportion of home deliveries under unskilled attendant in the three Northern regions of Ghana (83 percent) is way above the 2003 GDHS national average of 54 (GSS, MI, NMIMR 2004), the African average of 58 percent and global average 43 percent (WHO 1998). In all regions of Ghana, only the Greater Accra and Ashanti regions have estimated proportions of home deliveries below the DHS national average.

This study has also found that there is high unmet need for birth spacing in the three northern regions of Ghana, indicating a demand for short term methods of contraception and intensive education to educate women in this area on reproductive health and fertility. The results portrays that promotion of long term methods of contraception in the Savannah zone of Ghana can only be accepted and become successful only when education into reproductive health and fertility has been successful, given the high desire for children. Aside poor access to health services in the Savannah zone, high TFR, high infant and child deaths and low educational attainments particularly among women is a very important contributor to the high risk to unintended pregnancies and home deliveries in the region.

The findings from this analysis has also confirm that unmet need for limiting childbearing is high in the Coastal and Forest zones of Ghana particularly the Eastern, Central and the eastern part of the Greater Accra region. Unmet need for limiting childbearing is also quite high in the southern part of the Volta region. An intensive education on reproductive health and introduction of long term methods in these high risk areas are warranted. The successful introduction of permanent methods in these areas will depend highly on education and the availability of suitable and user-friendly family planning services.

In sub-Saharan Africa, small area statistics has remained almost non-existent, particularly in the field of demography and health. This study has shown that with the availability of good auxiliary data, survey information such as the DHS could be used to derive reliable estimates to complement censuses, which are becoming less regular in the region. The successful continuation of studies to derive reliable small area statistics in sub-Saharan Africa to aid the decentralisation process and developmental dispensation highly depends on governments, statistical offices and related organisations making available the needed information to statisticians.

CHAPTER SEVEN

7.0 CONCLUSIONS AND RECOMMENDATIONS

7.1 SUMMARY AND CONCLUSIONS

The overall aim of this thesis was to quantify the spatial inequalities (within and across zones and regions of Ghana) associated with women's exposure to unintended pregnancies and their propensity to seek delivery care in institutional and non-institutional settings. The specific objectives were to:

- Determine the levels of inequality in women's exposures to unintended pregnancies (mistimed and unwanted) and delivery care in non-institutional settings between and across PSUs and districts in Ghana;
- Investigate the contextual factors that mitigate the spatial differentials using survey and census data.
- Provide small area (district level) estimates of exposures to unintended pregnancies and delivery care in non-institutional settings; and,
- Explore the feasibility of producing small area estimates, combining data from DHS and census, for the purpose of making comprehensive district level population and health policies.

The analysis was based on data from the 1998 and 2003 GDHS and the 2000 GPHC. The study acknowledges limitations in the data analysed. Comprehensive and reliable data on the subject in relation to the limitations highlighted in Chapter Three are not available. The time and cost of collecting such data would be substantial; hence it is necessary to derive maximum output from existing data. The findings should therefore be interpreted in light of the data limitations discussed in Chapter Three. Multilevel

models were the main statistical methods used for the analysis. The Fay-Herriot model was adopted for deriving domain (age-district) estimates of exposures to unintended pregnancies and uptake of home delivery care.

This study contributes to a better understanding of the spatial inequalities in maternal health care in Ghana, interlinking two distinct but related pre-disposing indicators of maternal deaths and illness (exposures to unintended pregnancies and delivery care uptake). The reader is referred to Chapter Two for a conceptual framework that interlinks the two pre-disposing factors. The study was not aimed at investigating the inter-relationship between the variables presented in the conceptual framework, but the extent of inequalities in exposure to unintended pregnancies and delivery care uptake after accounting for the necessary predictors (depending on availability of data).

The study identified predictors of pregnancy planning behaviour and uptake of delivery care that correspond with findings of studies on fertility intentions, contraceptive use and uptake of delivery care in sub-Saharan Africa. In addition, the refined operational definition of the study indicators of interest has permitted a more comprehensive investigation of the predictors of pregnancy planning behaviour and uptake of delivery care in Ghana. The use of multilevel models helped quantify the extent of spatial inequalities in pregnancy planning behaviour and uptake of delivery care at different levels and identify some of the factors that mitigate the spatial inequalities. Secondly, the study assessed the feasibility of using DHS and Census data to produce district level estimates of proportions of women exposed to unintended pregnancies and uptake of non-institutional delivery care in Ghana.

7.1.1 Levels of Inequality in Exposures to Unintended Pregnancies in Ghana

The analysis of spatial inequalities in pregnancy planning behaviour in Ghana, discussed in Chapter Four was based on DHS and Census data. Inequalities that exist

within rural PSUs and urban PSUs as well as the three ecological zones of Ghana were investigated. Finally, the influence of group-level variables on the spatial differentials was investigated.

The first section, which investigates the predictors of pregnancy planning behaviour, showed that place of residence, socio-economic status and demographic characteristics of a woman are very important determinants of her exposure to mistimed and unwanted pregnancies. Linking fertility intentions and contraceptive practices to define exposures to unintended pregnancies, the results of the study revealed different pattern of contraceptive needs for younger and older women. The results show that younger women have a higher unmet need for spacing, while older women have a higher unmet need for limiting. Also, it was identified that unmet need for spacing is higher in the Savannah Zone of Ghana, while the Coastal and Forest Zones have a higher unmet need for limiting. Consequently, attempts to reduce the incidence of unintended pregnancies in Ghana, should aim at promoting short-term contraceptive methods among younger women, while older women need to be well-informed and encouraged to take up long-term methods. The results of the study also suggests the need for intensive education on family planning in Ghana particularly in the Savannah Zone, which is characterised by high TFR, short birth intervals and low contraceptive uptake.

After accounting for the bio-demographic and socio-economic predictors, the results revealed high spatial inequalities in pregnancy planning behaviour in Ghana. The results indicate that inequalities in pregnancy planning behaviour have declined and become less important between urban PSUs of Ghana, while between rural PSUs, inequalities have widened and continue to be highly significant. It is important to note that in most sub-Saharan African countries including Ghana, family-planning services are usually provided by local chemist (Lande, R. E., and R. Blackburn 1989, GSS, NMIMR and ORC Macro 2004); however the results of the study suggest that some rural PSUs of Ghana lack even the services of local chemist or are unable to afford the cost of contraceptives. Cultural practices and traditional norms in some rural areas

may explain the widening inequalities between rural PSUs. This needs to be investigated.

Considering inequalities that exist between and within the ecological zones of Ghana, the analysis revealed significant inequalities between and within the ecological zones. High inequalities were identified between PSUs within the Rural Savannah and Rural Forest Zones. The inequalities that exist between PSUs within the Urban Coastal Zone were less important and not significantly different from the inequalities that exist between PSUs within the Rural Coastal Zone. This is an indication that urbanization plays an important role in the level of inequality within the ecological zones. The Coastal Zone of Ghana is the most urbanized zone in Ghana, followed by the Forest Zone, then the Savannah Zone. The extent of inequalities identified in this study in Urban Ghana follows the same trend, with the Urban Coastal Zone having the lowest inequalities, followed by the Forest Zone, then the Savannah Zone. The inequalities identified between rural communities also follow the same trend.

Investigating the areal characteristics that influence pregnancy planning in Ghana, the analysis revealed that the socio-economic development of a PSU in the Savannah Zone significantly influences women's exposure status to mistimed and unwanted pregnancies. Access to health facilities and TFR were identified to influence exposures to unwanted pregnancies within the Savannah Zone. For the Savannah Zone, the contextual analysis revealed that women residing in PSUs with high socio-economic development are more decisive about their fertility intentions and less exposed to mistimed and unwanted pregnancies. Women residing in PSUs within a district with less inequality in distribution of health facilities and low TFR are more decisive and less exposed to unintended preganancies. None of the contextual variables for the Forest Zone could significantly explain the inequalities within the zone. Having accounted for the significant contextual variables for the Savannah Zone in the multivariate model, there still remain significant unexplained inequalities in the Rural Savannah and Forest Zones. This indicates the need for an in-depth study to explain the inequalities between rural PSUs in the Savannah and Forest Zones. Attitudinal,

cultural practices and tradition norms are very influential within rural PSUs and their effects on contraceptive uptake and pregnancy planning need to be further investigated in order to device appropriate family planning programmes.

7.1.2 Levels of Inequality in Uptake of Delivery Care in Ghana

Chapter five focused on the spatial inequalities that exist in uptake of delivery care in Ghana. Multilevel models were applied to the 1998 and 2003 GDHS to investigate the extent of inequalities between PSUs in uptake of delivery care. Contextual data from the 2000 GPHC were merged with the survey data to investigate the areal characteristics that influence uptake of delivery care.

The first section of the analysis in Chapter Five revealed that uptake of delivery care in Ghana is determined by a range of socio-economic and demographic factors. Household socio-economic status was identified to be particularly important, with higher socio-economic status being associated with uptake of institutional delivery care. The place of residence was also identified as an important determinant of uptake of delivery, with rural residence and women residing in the Savannah Zone of Ghana having a higher propensity to deliver at home under the supervision of unskilled attendants. The results also suggest that the low socio-economic development of the Savannah Zone makes it vulnerable in attracting private-for-profit health care practitioners. In addition, the Savannah Zone has the lowest accessibility to health care.

One of the important predictors of institutional delivery care uptake is uptake of antenatal care. Inadequate uptake of antenatal care is identified as a principal contributing factor to home deliveries. The literature shows that antenatal care uptake is high in Ghana. However, the number of women who undertake the recommended number of antenatal care visits are very low. This is an indication that outreach

programmes play a vital role in antenatal care provision in Ghana. Nonetheless, outreach programmes cannot be reliable for delivery care and this reflects the importance of number of antenatal visits and delivery care uptake in institutional facilities. Women with high antenatal visits are more likely to be those with high accessibility to services and are more likely to have institutional deliveries.
The results from the multivariate analysis reveal considerable inequalities in uptake of delivery care in Ghana. The results show that inequalities in seeking institutional delivery care between PSUs in Urban Ghana has increased between the two successive surveys, but has remained relatively high between rural PSUs. Assessing the extent of inequalities at the ecological zone level, the results revealed significantly high inequalities in uptake of delivery care within and between all the ecological zones of Ghana. The Forest and Coastal Zones exhibited inequalities in uptake of public and private sector delivery care, while the Savannah Zone exhibited no significant inequalities in uptake of private sector delivery care. This can be attributed to the least developed nature of the Savannah Zone to attract private-for-profit health practitioners, given the high cost of obstertric care in the private sector.

The increasing inequality gap identified between urban PSUs was more pronounced within the Coastal and Forest Zones, while rural inequalities for all the zones remain relatively high. Again, the results suggest that urbanization plays an important role in uptake of delivery care. However, unlike contraceptives which are relatively cheap and more accessible to urban dwellers, obstetric care is quite expensive, and that draws the line between the urban poor and urban rich.

In an effort to identify the group effects that mitigate the spatial inequalities in uptake of delivery care in Ghana, the results of the analysis reveal that the socio-economic development of a PSU and access to health facilities in the Forest Zone are very important factors that determine the uptake of delivery care within the Zone. Women from the Forest Zone and resident in PSUs with high socio-economic development and high access to health services have higher likelihood to seek delivery care in a public sector facility. In the Coastal Zone, TFR was indentified to be important in uptake of

public sector delivery care; increase in TFR was associated with a decline in uptake of public sector delivery care. None of the contextual variables used in the analysis was significant regarding the inequalities in uptake of delivery care in the Savannah Zone. Also, none of the contextual varibles explaned the inequalities in uptake of private sector delivery care. Having accounted for the significant contextual variables, there still remained unexplained inequalities in uptake of delivery care in Ghana. This again calls for an in-depth study to investigate the areal characteristics contributing to the growing inequalities within urban Ghana and the continuing cycle of poverty in maternal health care within rural Ghana.

7.1.3 District Estimates of Exposures to Unintended Pregnancies and Home Deliveries in Ghana

Chapter six of the thesis explored the feasibility of deriving district level estimates of exposures to unintended pregnancies and delivery care in non-institutional settings, combining data from DHS and census. The Fay-Herriot Model was used for this purpose. Before the estimates were discussed, five diagnostic procedures were used to validate the reliability of the estimates. The diagnostic analysis revealed that with good auxiliary data it is feasible to derive small area/domain estimates using DHS and Census data.

The estimates confirmed that high inequalities exist in exposures to unintended pregnancies and uptake of delivery care in Ghana, attributable to the varying levels of socio-economic development and access to health services across the country. The three Northern Regions of Ghana (Savannah Zone) with high TFR, low access to health services and low socio-economic development were identified to have high exposures to mistimed pregnancies and high levels of home deliveries. Nonetheless, the more developed regions of Ghana (Coastal and Forest Zones), where TFRs are low, access to health services are not as problematic as it is in the three Northern Regions of Ghana, exposures to unwanted pregnancies were identified to be high. The results have

important implication for the integration of maternal health care and family planning services to achieve improved maternal health outcomes. With the meagre resources available for improving maternal health in Ghana, the results shows that the spatial inequalities need to be considered in intervention and programme efforts. The district level statistics generated for exposures to unintended pregnancies and home deliveries in Ghana has important implications for policy and programme initiatives, including planning, monitoring and evaluation of maternal health activities.

7.2 RECOMMENDATIONS

Based on the findings of the study the following recommendations are drawn for policy implementations.

- There is the need for the integration of maternal health care and family planning services to achieve improved maternal health in Ghana.

- There is the need for perception and attitudinal change programmes focusing on health seeking behaviours, particularly maternal health and beliefs about disease causation targeting particularly rural areas and urban slums.

- Male involvement in family planning programmes is very essential.

- Increasing access to maternal health services to areas of low socio-economic development is essential.

- Attempts need to be made in reducing the incidence of high-risk pregnancies and improving quality of obstetric care.

- The significant areal inequality in uptake of maternal health care services should be taken into account in the provision of family planning services and essential obstetric care, promoting public awareness on the need for timely and

appropriate care during pregnancy and delivery and offer access to affordable maternal health care.

- Governments, national statistics offices in sub-Saharan Africa and organisation with reliable contextual data should be encouraged to make their data available to survey statisticians to explore the feasibility of producing local-level statistics, to aid policy and programme efforts.

7.3 FUTURE RESEARCH

The results of the study suggest that there is the need for:

- Comprehensive local and national data on obstetric complications, access and quality of care to investigate the factors that mitigate the inequalities in pregnancy planning and uptake of delivery care;

- In-depth field research to investigate the effect of cultural practices and traditional norms on pregnancy planning behaviour and uptake of delivery care in Ghana;

- Further research to understand the link between medical causes, socio-economic factors and the inequalities in maternal health care in order to understand how to implement maternal health initiatives in both the medical and socio-economic contest in bridging the inequality gap between areas.

- Further research to continue assessing the feasibility of generating small area estimates using DHS and auxiliary data.

- Small area analysis needs to be extended to cover other demographic and health indicators to aid planning and monitoring of reproductive and sexual health activities.

- The analysis also needs to be extended to other sub-Saharan African countries to establish it's generally feasibility.

REFERENCES

AbouZahr, C. (1998) Maternal Mortality Overview: *Health Dimensions* of *Sex and Reproduction.* In Murray C.J.L., and A.D. Lopez, Global Burden of Disease and Injury Series, Volume III. Geneva: World Health Organisation. 111 - 164.

AbouZahr, C. and T. Wardlaw (2001) *Maternal Mortality at the End of the Decade: Signs of Progress.* Bulletin of the World Health Organization, 2001, 79: 561-568.

Adongo, P.B., J.F. Phillips and F.N. Binka. (1998) *The Influence of Traditional Religion on Fertility Regulation among the Kassena-Nankana of Northern Ghana.* Studies in Family Planning, 29(1): 23-40

African Population and Health Research Centre (2002) *Population and Health Dynamics in Nairobi's Informal Settlements.* Nairobi (Kenya): African Population and Health Research Centre (APHRC).

Akin, J.S. and P. Hutchinson. (1999) *Health-Care facility Choice and the Phenomenon of Bypassing.* Health and Policy Planning; 14(2):135-151. Oxford University Press.

Alan Guttmacher Institute (1985) *Ghana: Contraceptives are Familiar but Little Used: Location Plays Primary Role in Limiting fertility.* International Family Planning Perspectives, 11(4):121-123.

Alderman, H., and V. Lavy (1996) *Household Responses to Public Health Services: Cost and Quality Tradeoffs.* World Bank Research Observer, Oxford University Press, 11(1):3-22.

Ambler, R., D. Caplan, R. Chambers, M. Kovacevic, S. Wang. (2001) *Combing Unemployment Benefits Data and LFS Data to Estimate ILO Unemployment for Small Areas: An Application of a Modified Fay-Herriot Method.* Proceedings of the International Association of Survey Statisticians, Meetings of the International Statistical Institute, Seoul, August 2001.

American Lung Association (2005) *Estimated Prevalence and Incidence of Lung Disease by Lung Association Territory.* Epidemiology and Statistics Unit, Research and Program Services, July 2005.

Appiah-Kubi, K. (2004) *Access and Utilisation of Safe Motherhood Services of Expecting Mothers in Ghana.* Policy and Politics, 32(3):387-407.

Aryee, F. (1985) *Nuptiality Pattern in Ghana.* Demographic Patterns in Ghana: Evidence from the Ghana Fertility Survey. Voorburg, Netherlands. International Statistical Institute, Susheela Singh, John Y. Owusu and Iqbal H. Shah (eds), 17-48.

Aryeetey, E., and A. Fosu. (2002) *Explaining African Economic Growth Performance: The Case of Ghana.* Paper Prepared for the African Economic Research Consortium, Kenya.

Ascadi, G. and G. Johnson-Ascadi. (1993) *Socio-Economic, Cultural and Legal factors Affecting Girls' and Women's Health and their Access to and Utilization of Health and Nutrition Services in Developing Countries.* Background Paper for the World

Asenso-Okyere, W.K, I. Osie-Akoto, A. Adote, and E.N. Appiah. (1997) *Willingness to Pay for Health Insurance in a Developing Economy.* A Pilot Study of the Informal Sector of Ghana Using Contingent Valuation. Health Policy 42.

Baker, J and S. Khasiani. (1992) *Induced Abortion in Kenya: Case Histories.* Studies in Family Planning, 23(1):34-44.

Bangser, M., B. Gumodoka, Z. Berege. (1999) *A Comprehensive Approach to Vesico-Vaginal Fistula: A project in Wwanza, Tanzania.* Safe Motherhood Initiatives: Critical Issues, Reproductive Health Matters 1999:157-164

Barrios, E. B. (1996) *Generating Small Area Statistics from Household Surveys.* National Statistics Office (NSO), MIMAP Research Paper Series No. 29.

Battese, G.E., R.M. Harter, and W.A. Fuller (1988) *An Error Component Model for Prediction of County Crop Areas Using Survey and satellite Data.* Journal of the American Statistical Association, 83:28-36.

Berer, M. and T.K. S. Ravindran. (1999) *Safe Motherhood Initiatives: Critical Issue.* Reproductive Health Matters, Special Edition 1999

Bergsjø, P. (2001) *What is the Evidence for the Role of Antenatal care Strategies in the Reduction of maternal Mortality and morbidity?* Studies in Health Services and Organisation & Policy, 17, 2001:35-54.

Bertrand, J.T., K. Hardee, R.J. Magnani, and M.A. Angle. (1995) *Access, Quality of Care and Medical barriers in Family Planning Programs.* International Family planning Perspectives, 21(2):64-69+74.

Bhatia, J.C. (1984) *Age at Marriage Differentials in Ghana (West Africa): A Multivariate Analysis.* Demography India, 13(1 & 2):54-69.

Bicego, G., J.T. Boerma, and C. Ronsmans. (2002) *The Effect of AIDS on Maternal Mortality in Malawi and Zimbabwe.* AIDS, Official Journal of the International Aids Society. 16(7):1078-1081

Biddlecom, A.E., and B.M. Fapohunda. (1998) *Covert Contraceptive Use: Prevalence, Motivations, and Consequences.* Studies in Family Planning, 29(4):360-372.

Blanc, A.K., and S. Grey (2002) *Greater than Expected Fertility Decline in Ghana: Untangle a Puzzle.* J. biosoc. Sci. 34:475-495.

Boakye-Yiadom, L. (2004). *The Evolution of Welfare in Ghana: A Rural-Urban Perspective.* Paper Prepared for Internal Conference on Ghana's Economy at Half Century, Accra, Ghana.

Bobadilla, J.L., S. Reyes Frausto, and S. Karchmer (1996). *The Magnitude and Causes of Maternal Mortality in the Federal District (1988-1989).* Gaceta Medica de Mexico 135(1):5-18.

Bongaarts, J. (1990). *The Measurement of Wanted Fertility.* Population and Development Review, 16(3): 487-506

Bongaarts, J. (1997) *Trends in Unwanted Fertility in the developing World.* Studies in Family Planning, 28(4):267-277

Bongaarts, J., O. Frank, and R. Lesthaeghe. (1984). *The Proximate Determinants of fertility in Sub-Saharan Africa.* Population and Development Review, 10(3):511-537.

Boulle A. (1997). *Rural Health Care and Rural Poverty - inextricably linked.* POLICY IN PROGRESS, National Manager Healthlink, Health System Trust

Brabin, L., F.H. Verhoeef, P. Kazembe, B.J. Brabin, L. Lyson and R. Broadhead (1998) *Improving Antenatal Care for Pregnant Adolescents in Southern Malawi.* Acta Obstet Gynecol 77:402-409.

Brown, G., R. Chambers, P. Heady, and D. Heasman (2001) *Evaluation of Small Area Estimation Methods – An Application to Unemployment Estimates from the UK LFS.* Proceedings of Statistics Canada Symposium 2001:1-10.

Brugha, R., and S. Pritze-Aliassime (2003) *Promoting Safe Motherhood through the Private Sector in Low- and Middle-Income Countries.* Bulletin of the World Health Organization, 2003, 81(8):616-623.

Bryk, A.S., and S.W. Raudenbash. (1992). *Hierarchical Liner Models: Applications and Data Analysis,* Sage Publications, Newbury Park.

Bulatao, R.A., and J.A. Ross. (2001). *Do Health Services Reduce Maternal Mortality? Evidence from Ratings of Maternal Health Programs.* MEASURE *Evaluation.* Wp-01-39

Buor, D. (2003) *Analysing the Primacy of Distance in the Utilization of Health Services in the Ahafo-Ano South District, Ghana.* International Journal of Health Planning and management 18(4): 293-311.

Burnside, C., and D. Dollar (2002) *Aid, Policies and Growth.* American Economic Review, 90(4): 847-868.

Buve, A., K. Bishikwabo-Ngarhaza, and G. Mutangadura (2002) *The Spread of HIV-1 in sub-Saharan Africa.* Lancet 2002, 359:2011-2017.

Calman, K.C. (1997). *Equity, Poverty and Health for All.* British Medical Journal 314:1187-1191

Campbell, O. (2001). *What are Maternal Health Policies in Developing Countries and Who Drives Them? A Review of the Last Half-Century.* In Van De Brouwere and W. Van Lerberghe (Eds.), Studies in Health Services Organisation and Policy, 17, 2001:415-448,

Campbell, O., M. Koblinsky, P. Taylor (1995) *Off to a Rapid Start: Appraising Maternal Mortality and Services.* International Journal of Gynaecology and Obstetrics, 48 suppl. S33-S52.

Casterline, J.B., A.E. Perez, and A.E. Biddlecom. (1996) *Factors Underlying Unmet Need for Family Planning in the Philippines.* New York, Population Council Working Paper Number 84

Central Bureau of Statistics (CBS) [Kenya], Ministry of Health (MOH) [Kenya] and ORC Macro (2004) *Kenya Demographic and Health Survey 2003,* Maryland: CBS, MOH and ORC Macro.

Chattopadhyay, M., P. Lahiri, M. Larsen and J. Reimnitz (1999) *Composite Estimation Drug Prevalence for Sub-State Areas.* Survey Methodology 25:81-86

Chigunta F., 1998, Zambia: *Climax and Decline.* Social watch, socialwatch.org

CIA (2005) *The World Factbook 2005: Ghana.* Central Intelligence Agency

Clayton, D and J. Kaldor (1987) *Empirical Bayes Estimates of Age-Standardized Relative Risk for Use in Disease Mapping.* Biometrics, 43:671-681.

Coeytaux, F. (1988) *Induced Abortion in sub-Saharan Africa: What We Do and Don't Know.* Studies in Family Planning, 19(3):186-190.

Collymore, Y. (2005). *Tracking and Reducing Maternal Deaths Presents Major Challenges.* Population Reference Bureau, April 2005

Curtis, D. (2005). *Area Random Effects Model Based Estimation of Unemployment at Local Authority Level.* 7th Meeting of the National Statistics Methodology Advisory Committee, National Statistics, United Kingdom.

Datta, G.S., M. Ghosh and M.A. Waller (2000) *Hierarchical and Empirical Bayes Method for Environmental Risk Assessment,* in P.K. Sen and C.R. Rao, Handbook of Statistics, Volume 18, Amsterdam: Elsevier Science B.V., 223-245.

Datta, S.G., R.E. Fay and M. Ghosh (1991) *Hierarchical and Empirical Bayes Multivariate Analysis in Small Area Estimation.* In Proceedings of Bureau of the Census 1991 Annual Research Conference, U.S. Bureau of the Census, Washington, DC: 63-79.

De Brouwere, V. and W. Van Lerberghe. (2001). *Safe Motherhood Strategies: A Review of Evidence.* Studies in Health Services Organisation & Policy, 17, 2001.

Desgrees du Lou, A. 1999. *Reproductive Health and AIDS in Africa: Problems and Prospects.* Population, 11: 61-87.

DiGaetano, R., E. MacKenzie, J. Waksberg, and R. Yaffe (1980) *Synthetic Estimates for Local Areas from the Health Interview Survey.* 1980 Proceedings of the Section on the Survey Research Methods, American Statistical Association.

Dow, T.E., and L.H. Werner (1982) *Modern, Transitional, and Traditional Demographic and Contraceptive Patterns among Kenyan Women.* Studies in Family Planning, 13(1):12-23.

Elo, I. 1992. *Utilization of Maternal Health Care Services in Peru: The Role of Women's Education.* Health Transition Review 2: 49-61.

Enkin, M., M.J. Keirse., M. Renfrew and J. Neilson. (1995). *A Guide to Effective Care in Pregnancy and Childbirth,* 2nd Edition, Oxford University Press, Oxford.

Ensor, T., A. Hossain, Q.Ali, S. Begum, and A. Moral. 2001. *Geographical Resource Allocation in Bangladesh.* Research Paper 21, Ministry of Health and Family Welfare, Health Economics Unit, Dhaka

Ezeh, A.C. (1993) *The Influence of Spouses over Each Other's Contraceptive Attitudes in Ghana.* Studies in Family Planning Issues, 24(3):163-174.

Family Care International (1999) *Skilled Care during Childbirth.* Safe Motherhood Fact Sheet

Family Care International and Safe Motherhood Inter-Agency Group (1998) *Safe Motherhood Fact Sheets*: Fact sheets Prepared from Safe Motherhood Technical Consultation in Sri Lanka, 18-23 October1997.

Farrell, P.J. (2000) *Bayesian Inference for Small Area Proportions.* The Indian Journal of Statistics, 62, Series B (3):402-416

Fay, R.E. and R.A. Herriot (1979) *Estimation of Income from Small Places: An Application of James-Stein Procedure to Census Data.* Journal of the American Statistical Association, 74:269-277.

Filmer D. and L.H. Pritchett (2001) *Estimating Wealth Effects without Expenditure Data – or Tears: An Application to Education Enrolments in States of India.* Demography, 38(1): 115-132.

Folson R., B. Shah and A. Vaish (1999) *Substance Abuse in States: Model Based Estimates from the 1994-1996 National Household Surveys on Drug Abuse.* Prepared for the U.S Substance Abuse and Mental Health Services Administration.

Fu, H., J.E. Darroch, T. Haas, N. Ranjit. (1999). *Contraceptive Failure Rates: New Estimates from the 1995 National Survey of Family Growth.* Family Planning Perspectives, 31(2):56-63

Gertler, P. and J. van de Gaag. (1990). The *Willingness to Pay for Medical Care.* Baltimore: The Johns Hopkins University Press.

Ghana Statistical Service (2000). *Ghana Living Standards Survey.* Report of the Fourth Round (GLSS 4), GSS.

Ghana Statistical Service (2002) *2000 Population and Housing Census: Special Report on 20 Largest Localities.* 2002 GSS

Ghana Statistical Service (2002) *2000 Population and Housing Census: Summary Report of Final Results.* 2002 GSS.

Ghana Statistical Service (GSS) and Macro International Inc. (MI) (1999). *Ghana Demographic and Health Survey 1998.* Calverton, Maryland: GSS and MI.

Ghana Statistical Service (GSS) and Macro International Inc. [MI] (1994). *Ghana Demographic and Health Survey 1993.* Calverton, Maryland: GSS and MI.

Ghana Statistical Service (GSS), Nouguchi Memorial Institute for Medical Research (NMIMR) and ORC Macro (2004) *Ghana Demographic and Health Survey 2003.* Calverton, Maryland: GSS, NMIMR and ORC Macro.

Ghana Statistical Service, Health Research Unit, Ministry of Health, Ghana and ORC Macro. 2003. *Ghana Service Provision Assessment Survey 2002.* Calverton, Maryland: Ghana Statistical Service and ORC Macro.

Ghosh, M. and J.N.K. Rao. (1994) *Small Area Estimation: An Appraisal.* Statistical Science, 9(1):55-76

Ghosh, M., K. Natarajan, L.A. Waller, and D.H. Kim (1999) *Hierarchical Bayes GLMs for the Analysis of Spatial Data: An Application to Disease Mapping.* Journal of Statistical Planning and Inference, 75:305-318.

Goldstein, H. (1995). *Multilevel Statistical Models.* Second edition, Kendall's Library of Statistics 3.

Gonzalez M.E. and C. Hoza (1978). *Small-Area Estimation with Application to Unemployment and Housing Estimates.* Journal of American Statistical Association, 73, Issue 361:7-15

Gonzalez, M.E. (1973) *Use and Evaluation of Synthetic Estimates,* Proceeding of the Social Statistics Section, American Statistical Association, 33-36.

Goodburn, E., and Campbell, O. (2001) *Reducing Maternal Mortality in the Developing World: Sector-Wide Approaches May be the Key.* BMJ 322:917 – 920.

Goody, J. (1989) *Futures of the Family in Rural Africa.* Population and Development Review, 15(Suppl.): Rural Development and Population: Institutions and Policy: 119-144.

Graham, W.J., J.S. Bell, and C.H.W. Bullough. (2001). *Can Skilled Attendance at Delivery Reduce Mater mortality in Developing Countries?* Studies in Health Services and Organisation & Policy, 17, 2001: 35-54.

Gray, J.A.M (1997) *Evidence-Based Health Care.* London: Churchill Livingstone.

Gregson S, Terceira N, Kakowa M, Mason PR, Anderson RM, Chandiwana SK, Carael M. (2002). *Study of Bias in Antenatal Clinic HIV-1 Surveillance Data in a High Contraceptive Prevalence Population in sub-Saharan Africa.* AIDS, 16(4):643-652.

Griffiths, P.L., J.J. Brown and P.W.F. Smith. (2004) *A comparison of Univariate and Multivariate Multilevel Models for Repeated Measures of Use of Antenatal care in Uttar Pradesh.* Journal of the Royal Statistical Society: Series A, (Statistics in Society), 167(4):597-611(15)

Guilkey, D.K., S. Jayne. (1997). *Fertility Transition in Zimbabwe: Determinants of Contraceptive Use and Method Choice.* Population Studies, 51(2):173-189.

Gwatkin, D.R., S. Rutstein, K. Johnson, R.P. Pande, A. Wagstaff. (2000). *Socio-Economic Differences in Health, Nutrition and Population.* Washington, World Bank, HNP/Poverty Thematic Group.

Hamilton, L.C. (1998). *Statistics with STATA 5.* Duxbury Press. An International Thomson Publishing Company.

Heady, P., P. Clarke, G. Brown, A. D'Amore, B. Mitchell. (2000). *Small Area Estimates Derived from Surveys: ONS Central Research and Development Programme.* Statistics in Transition, 4(4):635-648.

Hedeker, D. (1996) *MIXNO: A Computer Program for Mixed-Effects Nominal Logistic Regression.* Division of Epidemiology and Biostatistics & Health Policy Research Centres, School of Public Health, University of Illinois at Chicago.

Hedeker, D. (2003) *A Mixed-Effects Multinomial Logistic Regression Model.* Statistics in Medicine, 22:1433-146.

Hill, K., Y. Choi, C. AbouZahr, T. Wardlaw. (2000) *Estimates of Maternal Mortality for 2000.* John Hopkins University, World Health Organisation and United Nations Children Fund

Hogberg, U., and S. Wall. (1986). *Secular Trends in Maternal Mortality in Sweden from 1750 to 1980.* Bulletin of the World Health Organisation, 64(1):79-84.

Huffman, S.L., E.R. Zehner, P. Harvey, L. Martin, E. Piwoz, K.S. Ndure, C. Combest, R. Mwadime, V. Quinn. (2001). *Essential Health Sector Actions to Improve Maternal Nutrition in Africa.* The LINKAGE Project, May 2001.

Hulton, L.A., Z. Mathews, R.W. Stones. (2000). *A Framework for the Evaluation Quality of Care in Maternal Services.* Reproductive Health Research, Opportunities and Choices Programme; University of Southampton

IRIN. (2005). *GHANA: National Health Insurance Scheme.* March 2004. United Nations Office for the Coordination of Humanitarian Affairs, Integrated Regional Information Network, IRINnews.org

Kane, T.T., A.A. El-Kadi; S. Saleh; M. Aje; J. Stanback and L. Potter. (1992). Maternal *Mortality in Giza, Egypt: Magnitude, Causes and Prevention.* Studies in Family Planning, 23:45-57.

Kausar, F.K. (2001). *Maternal Health Care Utilisation among the Urban Poor of Maharashtra, India.* Department of Social Statistics, University of Southampton, Southampton.

Koblinsky, M., O. Campbell, and J. Heichelheim (1999) *Organising Delivery Care: What Works for Safe Motherhood?* Bulletin of the World Health Organisation, 77(5):399-406.

Kuate Defo, B. (1997). *Effects of Socio-Economic Disadvantage and Women's Status on Women's Health in Cameroon.* Social Science and Medicine 44:1023-1042

Kunst, A.E., and T.H. Houweling. (2001). *A Global Picture of Poor-Rich Differences in the Utilisation of Delivery care,* Studies in Health Services Organisation and Policy, 17:297-316.

Kutzin, J. (1993).*Obstacles to Women's Access: Issues and Options for More Effective Interventions to Improve Women's Health.* World Bank, Human Resources Development and Operations Policy.

Kwast, B.E. (1989) *Maternal Mortality: Levels, Causes and Promising Interventions,* Journal of Biosocial Science, 10(suppl.):51-67.

Kwesigabo G, Killewo JZ, Urassa W, Mbena E, Mhalu F, Lugalla JL, Godoy C, Biberfeld G, Emmelin M, Wall S, Sandstrom A. 2000. *Monitoring of HIV-1 infection prevalence and trends in the general population using pregnant women as a sentinel population: 9 years experience from the Kagera region of Tanzania.* J Acquir Immune Defic Syndr. 2000 Apr 15, 23(5):410-7.

Kyomuhendo, G.B. (2003). *Low Use Rural Maternity Services in Uganda: Impact of Women's Status, Traditional Beliefs and Limited Resources.* Reproductive Health Maters, 11(21):16-26.

Lande, R.E., and R. Blackburn. (1989) *Buying Contraceptives at the Pharmacy.* Populations Reports, Nov. 1989.

Larsen, U., and S. Yan. (2000). *Does Female Circumcision Affect Infertility and Fertility? A Study of Central African Republic, Cote D'Ivoire and Tanzania.* Demography, 37(3): 313-321.

Lasee, A., and S. Becker. (1997) *Husband-Wife Communication about Family Planning and Contraceptive Use in Kenya.* International family planning perspectives, 23(1):15-20+33.

Levin, A., M. McEuen, V. Tanzi, G. Van Dyck, N. Sekyere-Boakye. (1999). *Cost of Maternal Health care Services in South Kwahu District, Ghana.* Special Initiatives Report 20.

Lindelow, M. (2003). *Understanding Spatial Variation in the Utilization of Health Services: Does Quality Matter?* The World Bank, Centre for Study of African Economies, Oxford University.

Linden, E. (1996). *The Exploding Cities of the Developing World.* Foreign Affairs, 75(1):52-65.

Litvack, J.I., and C. Bodart (2003) *User fees plus quality equals improved access to health care: Results of a field experiment in Cameroon.* Social Science & Medicine, 37(3):369-383.

Longhurst, J., and S. Goldring. (2005). *Modelling Households on Low Income by Ward.* 7th Meeting of the National Statistics Methodological Advisory Committee, National Statistics, United Kingdom.

Loudon, I. 1992. *Death in Childbirth: An International Study of Maternal Care and Maternal Mortality 1800-1950.* Clarendon Press, Oxford.

Lutalo, T., M. Kidugavu, M.J. Wawer, D. Serwadda, L.S. Zabin, R.H. Gray. (2000) *Trends and Determinants of Contraceptive Use in Rakai, Uganda.* Studies in Family Planning, 31(3):217-227.

MacLeod, J., R. Rhode. (1998). *Retrospective Follow-up of Maternal Deaths and Their Associated Risk factors in a Rural District of Tanzania.* Tropical Medicine and International Health. 3(2):130-137.

Maddala, G.S. (1983) *Limited-Dependent and Qualitative Variables in Econometrics.* Cambridge University Press: Cambridge, UK.

Madise, N., R. Stephenson, D. Holmes, and Z. Matthews. (2002). *Impact of Estimation Techniques on Regression Analysis: An Application to Survey Data on Child Nutritional Status in Five African Countries.* Department of Social Statistics, University of Southampton.

Magadi M., I. Diamond, and R. Rodriguez. (2002). *The Determinants of Delivery Care in Kenya.* Social Biology 47 (3-4): 164-188

Magadi, M (2004) *Poor Pregnancy Outcomes among Adolescents in South Nyanza Region of Kenya.* Southampton, UK, Southampton Statistical Sciences Research Institute, 20pp. (S3RI Applications and Policy Working Papers, A04/04)

Magadi, M. (1999) *The Determinants of Poor Maternal Health Care and Adverse Pregnancy Outcomes in Kenya.* Unpublished document, Department of Social Statistics, Faculty of Social Sciences.

Magadi, M.A., and S.L. Curtis. (2003). *Trends and Determinants of Contraceptive Method Choice in Kenya.* SSRC Application and Policy Working Paper A03/13.

Magadi, M.A., E.M. Zulu and M. Brockerhoff (2003) *The Inequality of Maternal Health in Urban sub-Saharan Africa in the 1990s.* Population Studies, 57(3): 347-366.

Magnussen, P. (2003). Antimalarial intermittent treatment during pregnancy: how do we ensure coverage and compliance in Africa? PREMA-EU Newsletter, Issue 2

Maine, D and R. McNamara. (1987). *Birth Spacing and Child Survival.* New York: Columbia University, Centre for Population and Family Health.

Maine, D. (1999). *What's so Special About Maternal Mortality?* Safe Motherhood Initiative: Critical Issues, Reproductive Health Matters, 1999:175-182.

Malec, D., W.W. Davis, and X. Cao (1999) *Model-Based Estimates of Overweight Prevalence Using Sample Selection Adjustment.* Statistics in Medicine, 18:3189-3200.

Manuah, T. (1998) *Women in Africa's Development: Overcoming Obstacles, Pushing for Progress.* Africa Recovery, A United Nations Publication, Number 11, April 1998.

Marston, C., and J. Cleland. (2002). *The Effects of Contraception on Obstetric Outcomes. Centre for Population Studies*; London School of Hygiene &

Tropical Medicine. Paper prepared for the Department of reproductive Health and research, World Health Organisation.

Mbizvo, M.T., and D.J. Adamchak (1991) *Family Planning Knowledge, Attitudes and Practices of Men in Zimbabwe.* Studies in Family Planning, 22(1):31-38.

McCarthy J., and D. Maine. (1992). *A Framework for Analysing the Determinants of Maternal Mortality.* Studies in Family Planning, 23(1):23-33

McDonagh, M. (1996). *In Antenatal Care Effective in Reducing Maternal Morbidity and Mortality?* Health Policy and Planning, 11:1-15

Meda N, Cartoux M, Dabis F, Bazie B, Hetherington J, Dahourou H, Ouangre A, Kpozehouen A, Sombie I, Tiendrebeogo S, Yaro S, Ky-Zerbo O, Mandelbrot L, Van de Perre P. (2001). *Stabilization of HIV infection rates in urban Burkina Faso, 1995-1999.* Int J STD AIDS. 12(7): 460-2

Miaffo, C., F. Some, B. Kouyate, A. Jahn and O. Mueller. 2004. *Malaria and Anaemia Prevention in Pregnant Women in Rural Burkina Faso.* BMC Pregnancy and Childbirth 4(18)

Ministry of Finance, Ghana. (2000). *Interim Poverty Reduction Strategy Paper 2000-2002.* Government of Ghana, Accra, June 2000.

Ministry of Health, Ghana (1996) *Health Sector 5 Year Programme of Work.* MoH, Accra, Ghana, August 1996.

Ministry of Health, Ghana (2002) *Health Sector Five-Year Programme of Work (2002-2006): Bridging the Inequalities Gap.* MoH, Accra, Ghana January 2002.

Ministry of Local Government and Rural Development, Ghana. (1999). *Comprehensive Development Framework: Decentralization.* Government of Ghana

Mooney, G. (1987). *What Does Equity in Health Mean?* World Health Statistics Quarterly 40:296-303.

Mroz, T.A., K.A. Bollen, I.S. Speizer, and D.J. Mancini. (1999). *Quality, Accessibility and Contraceptive Use in Rural Tanzania.* Demography, 36(1): 23-40.

Nabila, J.S., and C. Fayorsey. (1996). *Adolescent Fertility and Reproductive Health in Ghana: A Case Study of Accra and Kumasi.* FADEP Technical Series, No. 7. Accra, Ghana.

Namekata, T., P.S. Levy, and T.W. O'Rourke (1975) *Synthetic Estimates of Work Loss Disability for Each State and the District of Columbia.* Pub. Health Rep. 90:532-538.

Nankunda, H.K. (1990) *Nuptiality and Fertility in Tutu Akwapim District of Ghana.* Unpublished Document. M.A. Dissertation. University of Ghana, Legon, Ghana.

National Research Council (2000) *Small-Area Estimates of School-Age Children in Poverty: Evaluation of Current Methodology,* C.F. Citro and G. Kalton (Eds.), Committee on National Statistics, Washington DC: National Academy Press.

National Statistical Office [Malawi] and ORC Macro (2001) *Malawi Demographic and Health Survey 2000.* Zomba, Malawi and Calverton, Maryland, USA: National Statistics Office and ORC Macro.

National Statistics and Evaluation Office (NSEO) [Eritrea] and ORC Macro (2003). *Eritrea Demographic and Health Survey 2002.* Calverton, Maryland, USA: National Statistics and Evaluation Office and ORC Macro.

Ngom, P., F.N. Binka., J.F. Phillips., B. Pence., and B. MacLeod B. (2001). *Demographic Surveillance and Health Equity in Sub-Saharan Africa.* Health Policy and Planning, 16(4):337-344.

Ngom, P., P. Akweongo, P. Adongo, A.A. Bawah, F. Binka. (1999). *Maternal Mortality among the Kassena-Nankana of Northern Ghana.* Studies in Family Planning, 30(2):142-147.

Njogu, W. (1991). *Trends and Determinants of Contraceptive Use.* Demography, 28(1):83-99.

Nortman, D.L. (1982) *Measuring the Unmet Need for Contraception to Space and Limit Births.* International Family Planning Perspectives, 8(4):125-134.

Nyarko, P., N. Madise and I. Diamond. (2003) *Child Loss and fertility Behaviour in Ghana.* SSRC Application and Policy Working Paper A03/08

Obuobi, A.A.D., M. Pappoe, S. Ofosu-Amaah, and P.D.Y. Boni (1999) *Private Health Care Provision in the Greater Accra Region of Ghana.* A Small Applied Research Paper No. 8, Partnership for Health Reform.

Parkes, K.A. (2001). *Ghana's Participation Programme, 1996-2000: Reproductive Health Advocacy at District, Sub-district and Community Levels in the Eastern*

Region. POLICY, National Population Council and Regional Population Advisory Committee, Eastern Region.

Parveen, S., M.E. Khan, J.W. Townsend and B.C. Patel. (1995) *Lessons Learned from a Community Based Distribution Programme in Rural Bihar.* The Population Council, India 4: 290-307

Pferfferman, D. (2002). *Small Area Estimation – New Developments and Directions.* International Statistical Review (2002), 70:125-143.

Platek, R., J.N.K. Rao, C.E. Sarndal and M.P. Singh. (1987). *Small Area Statistics.* New York: Wiley.

Porges, R.F (1985). *The Response of the New York Obstetrical Society to the Report by the New York Academy of Medicine on Maternal Mortality, 1933-1934.* American Journal of Obstetrics and Gynaecology 152:642-649.

Purcell, N.J., and S. Linacre (1976) *Techniques for the Estimation of Small Area Characteristics.* Unpublished Paper, Australian Bureau of Statistics, Canberra.

Raghupathy, S. 1996. *Education and the Use of Maternal HealthCare in Thailand.* Social Science and Medicine 43:459-471

Raisler, J., and J. Cohn (2005) *Mothers, Midwives and HIV/AIDS in Sub-Saharan Africa.* Journal of Midwifery and Women's Health, 50(4):275-282.

Rajalakshmi, T.K. (1998). *Combating Malnutrition.* Frontline, 15(4)

Rajkumar, A., and V. Swaroop (2002) *Public Spending and Outcomes: Does Governance Matter?* Policy Research Working Paper 2840, World Bank, Washington DC.

Ranjit, N., A. Bankole, J.E. Darroch, S. Singh. (2001). *Contraceptive Failure in the First Two Years of Use: Difference across Socioeconomic Subgroups.* Family Planning Perspectives, 33(1):19-27.

Rao, J.N.K. (2003). *Small Area Estimation.* Wiley Series in Survey Methodology, John Wiley and Sons, Inc.

Rasbash, J., Browne, W., Goldstein, H., Yang, M. Plewis, I., Healy, M. Woodhouse, G., Draper, D., Langford, I., and Lewis, T. (2000). *A User's Guide to MlwiN.* Version 2.1c. Centre for Multilevel Modelling. Institute of Education, University of London

Ravindran, T.K., R. Savitri, A. Bhavani. (1999). *Women's Experience of Utero-Vaginal Prolapses:* A Qualitative Study from Tamil, India. In Marge Berer,

Sundari Ravindran TK (eds). Safe Motherhood: Critical issues. Special publication of the Reproductive Health Matters, London.

Retherford, R.D., and M.K. Choe (1993) *Statistical Models for Causal Analysis.* New York: John Wiley and Sons.

Robinson, J.J.A., and H. Wharrad (2001) *The Relationship between Attendance at Birth and Maternal Mortality rates: An Explanation of United Nations Dataset Including Physicians and Nurses to the Population, GNP per capita and Female Literacy.* Journal of Advanced Nursing 34(4):445-455.

Ronsmans, C., O. Campbell, J. McDermott, M. Koblinsky. 2002. *Questioning the Indicators of Need for Obstetric Care.* Bulletin of the World Health Organization 2002; 80:317-324.

Rooney, C. 1992. *Antenatal Care and Maternal Health. How Effective Is It? A Review of Evidence.* Maternal health and safe Motherhood Programme, World health organisation, Geneva.

Royston, E., and S. Armstrong (1989) *Preventing Maternal Deaths.* World Heath Organisation, Geneva.

Rutenberg, N., and S.C. Watkins (1997) *The Buzz Outside the Clinics: Conversation and Contraception in Nyanza Province, Kenya.* Studies in Family Planning, 28:290-307

Saei, A., and R. Chambers (2003) *Small Area Estimation Under Linear and Generalized Linear Mixed Models with Time and Area Effects.* Southampton Statistical Sciences Research Institute, University of Southampton.

Safe Motherhood Inter-Agency Group (2000). *Technical Consultation "Ensure Skilled Attendance at Delivery.* Geneva: 25-27 April 2000. New York: SMAIG/FCI.

Sarndal, C.E. (1984) *Design Consistent Versus Model-Dependent Estimation for Small Domains.* Journal of American Statistical Association, 79:624-631

Schierhout, G., S. Johnson, A. Dzokoto, W. Bonsu. (2003). *Research Agenda for People at High Risk HIV in Ghana.* A paper prepared for the U.S Agency for International Development, Ghana.

Schuler, S.R., M.E. Choque, and S. Rance (1994) *Misinformation, Mistrust, and Mistreatment: Family Planning Among Bolivian Market Women.* Studies in Family Planning, 25(4):211-221

Sewankambo, K. N., R.H. Gray, S. Ahmad, D. Serwadda, F. Wabwire-Mangen, F. Nalugoda, N. Kiwanuka, T. Lutalo, G. Kigozi, C. Li, M.P. Meehan, H. Brahmbatt, Wawer, M.J., (2000). *Mortality associated with HIV infection in rural Rakai District, Uganda.* AIDS, Official Journal of the International Aids Society. 14(15):2391-2400

Shiffman, J. (2000). *Can Poor Countries Surmount High Maternal Mortality?* Studies in Family Planning, 31(4): 274-289

Singh, R., and R.C. Goel (2000) *Use of Remote Sensing Satellite Data in Crop Surveys, Technical Report,* Indian Agricultural Statistics Research Institute, New Delhi, India.

Smith, J.B, J.A. Fortney, E. Wong, R. Amatya, N.A. Cole. (2001). *Estimates of Maternal Mortality Ratio in Two Districts of the Brong Ahafo Region, Ghana.* Bulletin of World Health Organization, 79:400-408

Snijders, T and R. Bosker. (1999). *Multilevel Analysis: An Introduction to Basic and Advance Multilevel Modelling.* SAGE Publications.

Songsore, J. (1989). *The Spatial Impress and Dynamics of Underdevelopment in Ghana.* Inequality and Development: Case Studies from the Third World. Macmillan Publishers, London.

Starr, A. (1997). *The Safe Motherhood Action Agenda: Priorities for the Next Decade.* New York: Inter-Agency Group for Safe Motherhood and Family Care International.

Stash, S. (1996) *Ideal-Family-size and Sex-Composition Preferences among Wives and Husbands in Nepal.* Studies in Family Planning, 27(2):107-118

Stekelenburg, J., S. Kyanamina, M. Mukelabai, I. Wolffers and J. van Roosmalen. (2004). *Waiting Too Long: Low Use of Maternal Health Services in Kalabo, Zambia.* Tropical Medicine & International Health, 9(3):390-398

Stephenson, Rob, Clements, Steve, Baschieri, Angela, Hennink, Monique and Madise, Nyovani (2004) *Contextual influences on the use of health facilities for childbirth in Africa.* Southampton, UK, Southampton Statistical Sciences Research Institute, 35pp. (S3RI Applications and Policy Working Papers, A04/18)

Suciu, G., Hoshaw-Woodard, M. Elliot, and H. Doss. (2001). *Uninsured Estimates by County: A Review of Options and Issues.* Centre for Biostatistics, The Ohio State University.

Taylor, J., and M. Abbey. 1994. *The Dimensions of Unsafe Abortion.* An Exploratory Study Conducted in the Kwahu South District, Eastern Region, Ghana.

Thaddeus, S., and D. Maine. (1994). *Too Far to Walk: Maternal Mortality in Context.* Social Science and Medicine, 38(8):1091-1110.

The Daily Graphic *(2001) Abortion is leading Cause of Death in Accra.* General News of Tuesday, 4 September 2001.

The Daily Graphic. (2002). *Maternal Deaths in Country Increase.* General News of Friday, 17 May 2002

The Ghana AIDS Commission. (2004). *HIV Sentinel Survey Report 2003.* National AIDS/STI Control Programme Ghana Health Service – 7/5/2004

The Panos Feature Service (1999) *Midwives to the Rescue.* People & the Planet, 8(1)

The U.S Department of Education (1997) *Small-Area Estimates of School-Age Children in Poverty: Interim Report 1, Evaluation of 1993 County Estimates for Title I Allocations.* Commission on Behavioral and Social Sciences and Education

The U.S. National Centre for Health Statistics (1968) *Synthetic State Estimates of Disability.* PHS Publication, No. 1759, U.S. Government Printing Office, Washington DC.

Todd, A. (1996). *Health Inequalities in Urban Areas: A Guide to the Literature.* Environment and Urbanization, 8(2):141-152.

Toubia, N. (1998) *Female Circumcision/Female Genital Mutilation.* African Journal of Reproductive Health, 2:6-8.

UNAID (2004) *LINKAGES Project Ghana: Final Report (1997-2004).* The LINKAGES Project, Academy for Educational Development, Washington DC.

UNAID/WHO (2004) *AIDS Epidemic Update: December 2004.* Joint United Nations Programme on HIV/AIDS

UNDP (2004) *Human Development Report 2004: Cultural Liberty in Today's Diverse World.* United Nations Development Programme

UNFPA (1996) *Safe Motherhood.* Evaluation FINDINGS. Office of Oversight and Evaluation, Issue 10, United Nations Population Fund.

UNFPA (2004) *State of World Population 2004. The Cairo Consensus at Ten: Population, Reproductive Health and the Global Effort to End Poverty.* United Nations Population Fund.

UNICEF (2003) *Maternal Mortality: The Challenge.* October 2003.

Urassa, E., S. Massawe, G. Lindmark and L. Nystrom. (1997). *Operational Factors Affecting Maternal Mortality in Tanzania.* Health Policy and Planning, 12(1):50-57

Uzochukwu, B.S.C., O.E. Onwujekwe, and C.O. Akpala. (2004). *Did the Bamako Initiative Improve the Utilization of Maternal and Child Health Care Services in Nigeria? A Case Study of the Oji River Local Government Area in Southeast Nigeria.* Journal of Health and Population in Developing Countries, (ISSN 1095-8940):2-18, February 2004.

van den Boom, G.J.M., N.N.N. Nsowah-Nuamah, and G.B. Overbosch (2004) *Health Care Provision and Self Medication in Ghana.* Centre for World Food Studies, SOW-VU, Vrije University, Amsterdam, The Netherlands, Institute for Statistical, Social and Economic Research (ISSER), University of Ghana, Legon, Ghana.

Vanderpauye-Orgle, J. (2002). *Spatial Inequality and Polarization in Ghana 1987-99.* A paper presented at the Conference on Spatial Inequalities in Africa. Centre for the Study of African Economies, University of Oxford, September 21-22, 2002

Waddington, C., and K.A. Enyimayew (1990) *A Price to Pay, Part 2: The Impact of User Charges in the Volta Region of Ghana.* International Journal of Health Planning and Management, 5:287-312.

Wagstaff, A., and M. Claeson. (2004). *Rising to the Challenges.* The Millennium Development Goals for Health. The World Bank.

Wall, L.L. (1998). *Dead Mothers and Injured Wives: The Social Context of Maternal Morbidity and Mortality among the Hausa of Northern Nigeria.* Studies in Family Planning, 29(4): 341-359

World Bank. (1998). *Status and Poverty in Sub-Saharan Africa.* Findings; Africa Region; Number 108, April 1998. The World Bank Group.

World Bank. (1999). *Peru: Improving Health Care for the Poor.* Washington D.C: The World Bank Group.

World Health Organisation. (1994). *The Mother-Baby-Package: Implementing Safe Motherhood in Countries.* WHO Geneva.

World Health Organisation. (1995). *Revised 1995 Estimates of Maternal mortality: A new Approach by WHO and UNICEF.* WHO Geneva.

World Health Organisation. (1995). *The World's Women.* Trends and Statistics, United Nations, WHO Geneva.

World Health Organisation. (1996). *Revised 1990 Estimates of Maternal mortality.* WHO Statistics, 1995 Country Estimates, WHO Geneva.

World Health Organisation. (1997). *Coverage of Maternity care: A listing of Available Information.* Fourth Edition, WHO Geneva.

World Health Organisation. (1998). *Safe Motherhood: World Health Day 1998.* WHO Geneva.

World Health Organisation. (1998). *World Health Day: Safe Motherhood.* Maternal Mortality (WHD 98.1). WHO Geneva.

World Health Organization (2002) *WHO Country Cooperation Strategy: Ghana.* WHO Regional Office for Africa, Brazzaville.

Wyss, K. (2003). *Access of the Urban Poor and Vulnerable to Health Care in Africa: SDC Experiences in N'Djamena, Douala and Dar es Salam.* Swiss Tropical Institute, Swiss Centre for International Health.

Zaky, H.H.M. (1995) *Profile of Men's and Women's Fertility Preferences in Egypt.* In Perspectives on Fertility and Family Planning in Egypt. National Population Council, Demographic and Health Surveys, Macro International Inc., 57-79.

Zezai, A., L. Apers, C. Zishiri. (2001). Caesarean Section Rate as a Process Indicator of Safe Motherhood Programmes: The Case of Midland Province, Cent Afr J Med. 47(5) 129-34.

APPENDICES

APPENDIX I

Table 1.1: Correlation Matrix of Socio-economic Variables (PSU-level)

No.	Variables	1	2	3	4	5	6	7	8	9	1	11
1	Literacy	1.00										
2	Unemployment	-0.51	1.00									
3	Professional/Technical	0.67	-0.63	1.00								
4	Administration/Technical	0.58	-0.78	0.75	1.00							
5	Clerical	0.66	-0.67	0.74	0.69	1.00						
6	Sales	0.56	-0.47	0.66	0.72	0.67	1.00					
7	Service	0.41	-0.55	0.76	0.73	0.74	0.64	1.00				
8	Agriculture	-0.72	0.36	-0.63	-0.60	-0.83	-0.84	-0.59	1.00			
9	Production	0.54	-0.64	0.57	0.57	0.62	0.63	0.69	-0.50	1.00		
10	Other	0.54	-0.39	0.48	0.46	0.57	0.53	0.44	-0.72	0.28	1.00	
11	Students	0.60	-0.53	0.41	0.26	0.36	0.28	0.20	-0.39	0.14	0.20	1.00

Table 1.2: Correlation Matrix of Socio-economic Variables (District-level)

No.	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	1
1	Literacy rate	1.00																	
2	No education	-0.98	1.00																
3	Pre-school	0.78	-0.84	1.00															
4	Primary	0.80	-0.87	0.82	1.00														
5	Middle/JSS	0.97	-0.98	0.83	0.87	1.00													
6	Secondary/SSS	0.77	-0.72	0.42	0.34	0.64	1.00												
7	Vocation/Technical/ Commercial	0.72	-0.65	0.37	0.26	0.57	0.94	1.00											
8	Post Secondary	0.82	-0.78	0.52	0.52	0.71	0.80	0.77	1.00										
9	Tertiary	0.58	-0.51	0.30	0.14	0.41	0.76	0.85	0.73	1.00									
10	Professional/ Technical	0.84	-0.79	0.54	0.46	0.73	0.89	0.87	0.91	0.84	1.00								
11	Administration/ Managerial	0.59	-0.52	0.30	0.15	0.44	0.82	0.87	0.65	0.87	0.80	1.00							
12	Clerical	0.75	-0.71	0.49	0.34	0.64	0.90	0.90	0.69	0.79	0.86	0.84	1.00						
13	Sales	0.64	-0.59	0.32	0.27	0.53	0.83	0.81	0.64	0.67	0.78	0.71	0.90	1.00					
14	Service	0.58	-0.51	0.29	0.12	0.44	0.84	0.84	0.63	0.77	0.77	0.79	0.85	0.81	1.00				
15	Agriculture	-0.72	0.67	-0.44	-0.33	-0.59	-0.87	-0.88	-0.71	-0.77	-0.85	-0.80	-0.94	-0.95	-0.88	1.00			
16	production	0.57	-0.53	0.42	0.30	0.45	0.65	0.70	0.53	0.60	0.64	0.61	0.73	0.76	0.70	-0.89	1.00		
17	Other	0.49	-0.47	0.47	0.33	0.46	0.42	0.40	0.30	0.38	0.40	0.49	0.51	0.31	0.42	-0.44	0.34	1.00	
18	Urbanization	0.54	-0.49	0.30	0.15	0.45	0.77	0.70	0.58	0.61	0.70	0.68	0.79	0.77	0.71	-0.77	0.58	0.33	

APPENDIX II

Figure 2.1: Residual Diagnostic Plots

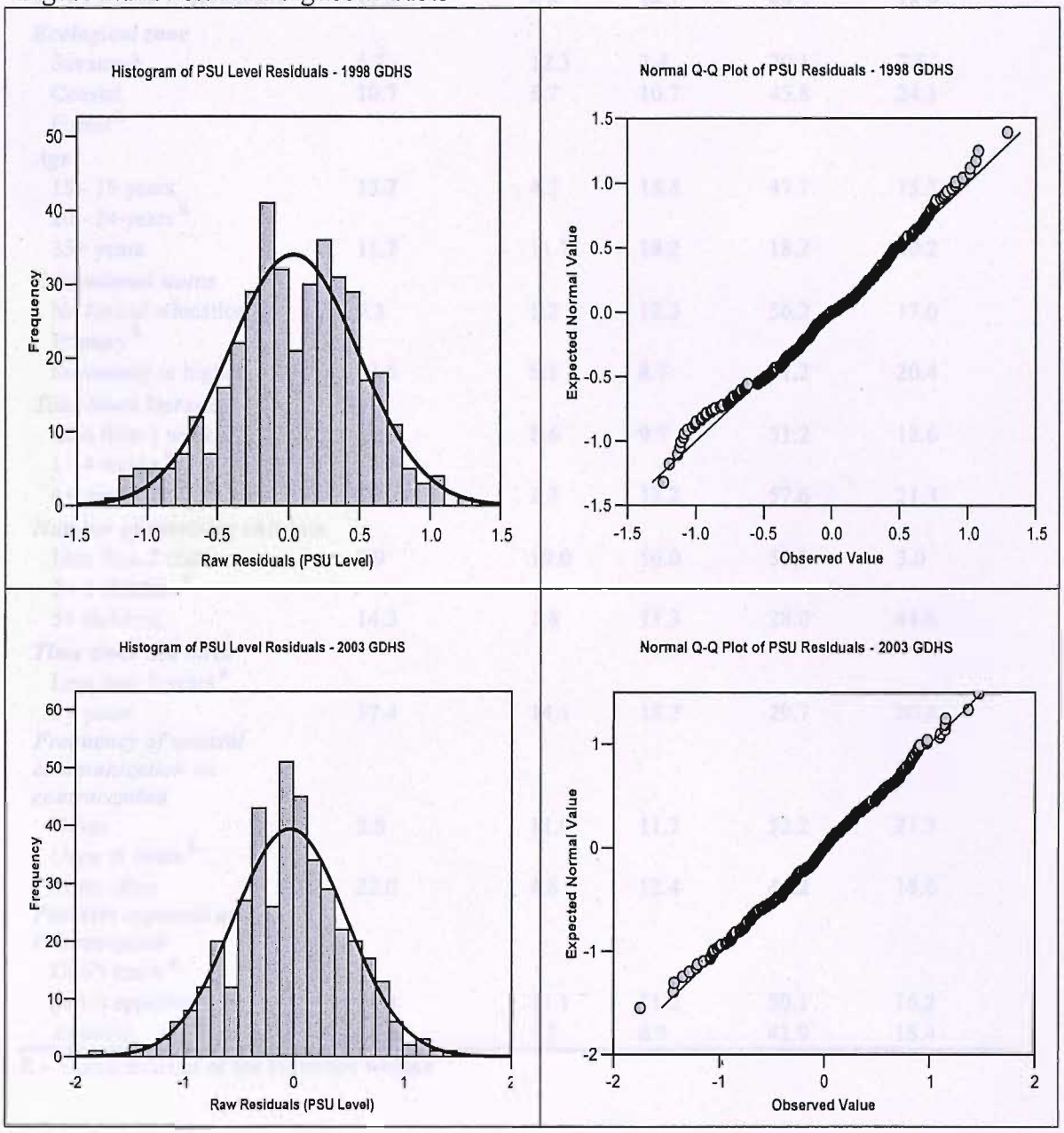


Table 2.1: Estimated Probabilities for Pregnancy Planning Behaviour – 1998 Rural Ghana (%)

Background Characteristics	Contracepting	Wanting	Undecided	Mistimed	Unwanted
REFERENCE WOMAN	11.0	6.8	14.1	49.2	18.9
Ecological zone					
Savannah	6.7	12.3	3.4	70.1	7.6
Coastal	10.7	8.7	10.7	45.8	24.1
Forest [R]					
Age					
15 - 19 years	13.7	4.3	18.8	47.7	15.5
20 - 34 years [R]					
35+ years	11.7	11.7	18.2	18.2	40.2
Educational status					
No formal education	9.3	5.2	12.3	56.2	17.0
Primary [R]					
Secondary or higher	13.6	6.1	8.7	51.2	20.4
Time since last sex					
Less than 1 week	11.9	8.6	9.7	51.2	18.6
1 - 4 weeks [R]					
4+ weeks	5.1	2.8	13.2	57.6	21.3
Number of surviving children					
Less than 2 children	8.9	19.0	16.0	53.1	3.0
2 - 4 children [R]					
5+ children	14.3	1.8	11.3	28.0	44.6
Time since last birth					
Less than 2 years [R]					
2+ years	17.4	14.1	18.2	29.7	20.6
Frequency of spousal communication on contraception					
Never	3.8	11.0	11.7	52.2	21.3
Once or twice [R]					
More often	22.0	4.8	12.4	42.2	18.6
Partners approval of contraception					
Don't know [R]					
Don't approve	11.4	11.1	11.2	50.1	16.2
Approve	28.2	5.2	6.3	41.9	18.4

R – Characteristics of the reference woman

Table 2.2: Estimated Probabilities for Pregnancy Planning Behaviour – 2003 Rural Ghana (%)

Background Characteristics	Contracepting	Wanting	Undecided	Mistimed	Unwanted
REFERENCE WOMAN	22.3	6.3	4.5	43.1	23.7
Ecological zone					
Savannah	21.8	5.7	3.4	59.9	9.1
Coastal	23.9	5.4	3.8	40.9	26.0
Forest [R]					
Age					
15 - 19 years	17.7	4.0	6.5	44.3	27.5
20 - 34 years [R]					
35+ years	22.3	11.2	7.0	14.8	44.7
Educational status					
No formal education	16.7	6.3	4.1	54.4	18.5
Primary [R]					
Secondary or higher	26.7	5.0	3.5	41.4	23.4
Time since last sex					
Less than 1 week	26.3	10.3	3.0	40.9	19.5
1 - 4 weeks [R]					
4+ weeks	7.6	3.7	5.5	52.8	30.4
Number of surviving children					
Less than 2 children	14.8	22.2	5.7	52.5	4.7
2 - 4 children [R]					
5+ children	23.5	1.9	2.6	23.9	48.1
Time since last birth					
Less than 2 years [R]					
2+ years	22.7	21.7	5.4	26.7	23.5
Frequency of spousal communication on contraception					
Never	9.8	8.6	6.4	48.5	26.7
Once or twice [R]					
More often	36.2	5.2	3.8	31.4	23.5
Partners approval of contraception					
Don't know [R]					
Don't approve	22.0	8.5	4.0	42.3	23.2
Approve	37.9	3.4	2.2	37.4	19.0

R – Characteristics of the reference woman

Table 2.3: Estimated Probabilities for Pregnancy Planning Behaviour – 1998 Urban Ghana (%)

Background Characteristics	Contracepting	Wanting	Undecided	Mistimed	Unwanted
REFERENCE WOMAN	17.1	8.0	20.3	34.7	19.8
Ecological zone					
Savannah	12.0	16.5	5.7	56.7	9.1
Coastal	16.8	10.2	15.5	32.3	25.2
Forest [R]					
Age					
15 - 19 years	20.6	4.9	26.3	32.5	15.7
20 - 34 years [R]					
35+ years	16.1	12.1	23.2	11.4	37.2
Educational status					
No formal education	15.1	6.4	18.6	41.4	18.5
Primary [R]					
Secondary or higher	21.5	7.3	12.8	36.7	21.7
Time since last sex					
Less than 1 week	18.9	10.3	14.3	36.7	19.8
1 - 4 weeks [R]					
4+ weeks	8.5	3.6	20.4	43.6	23.9
Number of surviving children					
Less than 2 children	13.8	22.3	23.2	37.5	3.2
2 - 4 children [R]					
5+ children	20.8	2.0	15.2	18.5	43.6
Time since last birth					
Less than 2 years [R]					
2+ years	24.1	14.8	23.4	18.6	19.1
Frequency of spousal communication on contraception					
Never	6.2	13.5	20.8	38.4	21.1
Once or twice [R]					
More often	29.3	5.3	16.9	28.1	20.3
Partners approval of contraception					
Don't know [R]					
Don't approve	17.9	13.2	16.2	35.6	17.1
Approve	40.6	5.7	8.5	27.4	17.8

R – Characteristics of the reference woman

Table 2.4: Estimated Probabilities for Pregnancy Planning Behaviour – 2003 Urban Ghana (%)

Background Characteristics	Contracepting	Wanting	Undecided	Mistimed	Unwanted
REFERENCE WOMAN	28.8	5.9	4.5	37.3	23.4
Ecological zone					
Savannah	28.8	5.5	3.5	53.0	9.2
Coastal	30.7	5.0	3.7	35.1	25.5
Forest [R]					
Age					
15 - 19 years	23.2	3.8	6.5	38.9	27.6
20 - 34 years [R]					
35+ years	27.9	10.2	6.7	12.4	42.8
Educational status					
No formal education	22.3	6.1	4.2	48.6	18.9
Primary [R]					
Secondary or higher	34.0	4.6	3.4	35.2	22.8
Time since last sex					
Less than 1 week	33.6	9.5	2.9	35.0	19.0
1 - 4 weeks [R]					
4+ weeks	10.3	3.7	5.8	48.4	31.8
Number of surviving children					
Less than 2 children	20.0	21.7	5.9	47.4	4.9
2 - 4 children [R]					
5+ children	29.5	1.8	2.5	20.1	46.1
Time since last birth					
Less than 2 years [R]					
2+ years	29.0	20.1	5.3	22.8	22.9
Frequency of spousal communication on contraception					
Never	13.3	8.5	6.6	43.9	27.7
Once or twice [R]					
More often	44.3	4.6	3.5	25.7	21.9
Partners approval of contraception					
Don't know [R]					
Don't approve	28.5	7.9	4.0	36.6	22.9
Approve	46.4	3.0	2.1	30.7	17.8

R – Characteristics of the reference woman

APPENDIX III

Table 3.1: [1]Institutional / [2]Non-institutional Switching Dynamics in Delivery Care

Pattern of Switching in Delivery Care	1998 GDHS		2003 GDHS	
	Number	%	Number	%
Women with at lest 5 births				
I, I, I, I, I	2	100.0	1	100.0
Total	2	100.0	1	100.0
Women with at least 4 births				
NI, NI, NI, NI	4	40.0	4	40.0
NI, NI, NI, I	0	0.0	1	10.0
NI, I, NI, NI	0	0.0	1	10.0
NI, I, I, NI	0	0.0	1	10.0
NI, NI, I, I	2	20.0	0	0.0
I, I, I, I	4	40.0	2	20.0
I, I, NI, NI	0	0.0	1	10.0
Total	10	100.0	10	100
Women with at least 3 births				
NI, NI, NI	47	55.3	36	42.4
NI, NI, I	1	1.2	8	9.4
NI, I, NI	1	1.2	1	1.2
NI, I, I	2	2.4	6	7.1
I, I, I	20	23.5	21	24.7
I, I, NI	2	2.4	5	5.9
I, NI, NI	8	9.4	5	5.9
I, NI, I	4	4.7	3	3.5
Total	85	100.0	85	100.0
Women with at least 2 births				
NI, NI	424	55.1	537	56.5
NI, I	64	8.3	95	10.0
I, I	230	29.9	254	26.7
I, NI	51	6.6	65	6.8
Total	769	100.0	951	100.0
Women with at least 1 birth				
NI	1246	54.3	1555	56.4
I	1047	45.7	1202	43.6
Total	2293	100.0	2757	100.0

Source: 1998 and 2003 Ghana Demographic and Health Surveys

[1] I – Institutional deliveries
[2] NI – Non-institutional deliveries

Table 3.2: Home-Public-Private Switching Dynamics in Delivery Care

Pattern of Switching in Delivery Care	1998 GDHS		2003 GDHS	
	Number	Percentage	Number	Percentage
Women with at least 5 births				
Public, Public, Public, Public, Public	2	100.0	1	100.0
Total	2	100.0	1	100.0
Women with at least 4 births				
Home, Home, Home, Home	4	40.0	4	40.0
Home, Home, Home, Public	0	0.0	1	10.0
Home, Home, Private, Private	1	10.0	0	0.0
Home, Home, Public, Public	1	10.0	0	0.0
Home, Public, Public, Public	1	10.0	0	0.0
Home, Public, Home, Home	0	0.0	1	10.0
Home, Public, Private, Home	0	0.0	1	10.0
Public, Public, Public, Public	2	20.0	2	20.0
Private, Private, Private, Private	1	10.0	0	0.0
Private, Private, Home, Home	0	0.0	1	10.0
Total	10	100.0	10	100.0
Women with at least 3 births				
Home, Home, Home	47	55.3	36	42.4
Home, Home, Public	1	1.2	6	7.1
Home, Home, Private	0		2	2.4
Home, Public, Home	1	1.2	1	1.2
Home, Public, Private	0	0.0	1	1.2
Home, Public, Public	2	2.4	4	4.7
Home, Private, Public	0	0.0	1	1.2
Public, Public, Public	13	15.3	14	16.5
Public, Public, Home	2	2.4	4	4.7
Public, Home, Home	6	7.1	4	4.7
Public, Home, Public	4	4.7	3	3.5
Public, Public, Private	0	0.0	1	1.2
Private, Private, Private	5	5.9	3	3.5
Private, Private, Public	1	1.2	2	2.4
Private, Public, Public	1	1.2	1	1.2
Private, Home, Home	2	2.4	1	1.2
Private, Private, Home	0	0.0	1	1.2
Total	85	100.0	85	100.0
Women with at least 2 births				
Home, Home	424	55.1	537	56.5
Home, Public	50	6.5	81	8.5
Home, Private	14	1.8	14	1.5
Public, Public	167	21.7	191	20.1
Public, Home	37	4.8	56	5.9
Public, Private	10	1.3	9	0.9
Private, Private	45	5.9	41	4.3
Private, Home	14	1.8	9	0.9
Private, Public	8	1.0	13	1.4
Total	769	100.0	951	100.0
Women with at least 1 birth				
Home	1246	54.3	1555	56.4
Public	787	34.3	965	35.0
Private	260	11.4	237	8.6
Total	2293	100.0	2757	100.0

Figure 3.1: Residual Diagnostic Plots

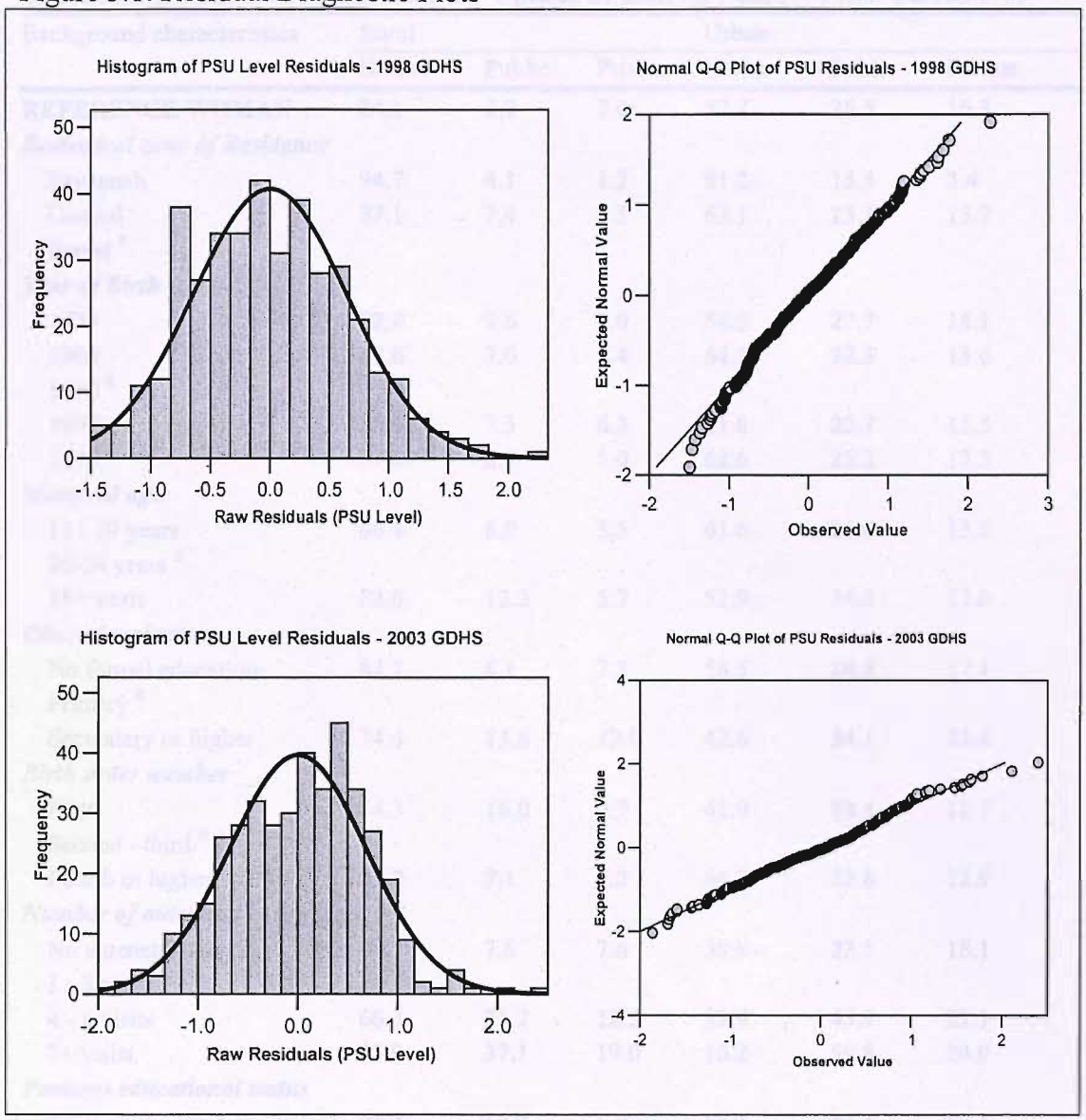


Table 3.3: Estimated Probabilities for Uptake of Delivery care – 1998 GDHS (%)

Background characteristics	Rural			Urban		
	Home	Public	Private	Home	Public	Private
REFERENCE WOMAN	84.1	8.9	7.0	57.2	26.5	16.3
Ecological zone of Residence						
Savannah	94.7	4.1	1.2	81.2	15.4	3.4
Coastal	87.1	7.4	5.5	63.1	23.3	13.7
Forest [R]						
Year of Birth						
1994	82.4	9.6	8.0	54.3	27.7	18.1
1995	87.6	7.0	5.4	64.1	22.3	13.6
1996 [R]						
1997	86.4	7.3	6.3	61.8	22.7	15.5
1998	87.0	8.0	5.0	62.6	25.2	12.3
Maternal age						
15 - 19 years	86.4	8.0	5.5	61.6	25.0	13.5
20-34 years [R]						
35+ years	82.0	12.3	5.7	52.9	34.5	12.6
Educational status						
No formal education	84.7	8.1	7.3	58.5	24.4	17.1
Primary [R]						
Secondary or higher	74.4	13.6	12.0	42.6	34.1	23.4
Birth order number						
First	74.3	16.0	9.7	41.9	39.4	18.7
Second - third [R]						
Fourth or higher	87.7	7.1	5.2	64.2	22.8	12.9
Number of antenatal care visits						
No antenatal care	84.7	7.6	7.6	58.8	23.1	18.1
1 - 3 visits [R]						
4 - 6 visits	66.3	21.2	12.5	32.9	45.9	21.1
7+ visits	43.9	37.1	19.0	16.2	59.8	24.0
Partners educational status						
No formal education	83.2	10.7	6.0	55.2	31.1	13.6
Primary [R]						
Secondary or higher	78.2	13.5	8.3	47.3	35.7	17.1
Household wealth status						
Poor	91.1	5.1	3.8	72.1	17.6	10.3
Modest [R]						
Rich	73.5	13.2	13.3	41.6	32.7	25.7

R – Characteristics of the reference woman

Table 3.4: Estimated Probabilities for Uptake of Delivery Care – 2003 GDHS (%)

Background characteristics	Rural			Urban		
	Home	Public	Private	Home	Public	Private
REFERENCE WOMAN	89.7	7.8	2.5	45.2	40.3	14.5
Ecological zone of Residence						
Savannah	95.3	4.1	0.6	66.2	29.3	4.5
Coastal	91.5	6.0	2.5	50.5	33.9	15.6
Forest [R]						
Year of Birth						
1994	86.6	9.5	3.8	38.0	42.9	19.1
1995	89.7	8.2	2.1	45.4	42.7	11.9
1996 [R]						
1997	91.1	6.6	2.4	49.1	36.4	14.5
1998	92.4	5.7	1.9	53.4	34.0	12.6
Maternal age						
15 - 19 years	92.6	5.2	2.2	54.0	31.1	14.9
20-34 years [R]						
35+ years	88.0	9.3	2.7	41.0	44.4	14.6
Educational status						
No formal education	88.3	8.4	3.3	41.7	40.7	17.5
Primary [R]						
Secondary or higher	83.5	12.1	4.4	32.3	48.3	19.4
Birth order number						
First	81.1	15.0	3.9	29.0	55.1	16.0
Second - third						
Fourth or higher	89.5	8.4	2.0	44.9	43.4	11.6
Number of antenatal care visits						
No antenatal care	85.5	10.7	3.8	35.8	46.1	18.1
1 - 3 visits [R]						
4 - 6 visits	73.9	19.6	6.5	21.2	57.5	21.3
7+ visits	62.9	29.4	7.6	13.9	66.8	19.3
Partners educational status						
No formal education	90.4	7.5	2.1	47.3	40.1	12.5
Primary [R]						
Secondary or higher	84.6	12.1	3.4	34.3	50.2	15.5
Household wealth status						
Poor	93.9	5.2	0.9	59.5	34.0	6.6
Modest [R]						
Rich	81.2	13.3	5.5	29.0	48.7	22.3

R – Characteristics of the reference woman

Appendix IV

Table 4.1: Direct Estimates of the Proportion of Women Aged 15-19 Years Exposed to Mistimed Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
JUABESO-BIA	100.0	0.0	2	0.0
SEFWI BIBIANI	100.0	0.0	2	0.0
WASSA AMENFI	66.7	0.33	3	49.5
NZIMA EAST	50.0	0.29	4	58.0
JOMORO	0.0	-	1	-
AOWIN-SUAMAN	100	-	1	-
SEFWI WIASO	100	-	1	-
REGIONAL TOTAL	71.4	0.13	14	17.5
CENTRAL				
KOMENDA-EDINA-EGYAFO-ABIREM	100.0	0.0	3	0.0
AGONA	100.0	0.0	2	0.0
AJUMAKO-ENYAN-ESIAM	50.0	0.50	2	100.0
ABURA-ASEBU-KWAMANKESE	100.0	-	1	-
GOMOA	0.0	-	1	-
EFUTU-EWUTU-SENYA	0.0	-	1	-
ASIKUMA-ODOBEN-BRAKWA	100.0	-	1	-
ASSIN	100.0	-	1	-
UPPER DENKYIRA	100.0	-	1	-
REGIONAL TOTAL	76.9	0.12	13	15.8
GREATER ACCRA				
ACCRA METROPOLITAN	85.7	0.14	7	16.3
DANGBE EAST	66.7	0.33	3	49.5
GA	0.0	0.0	2	-
REGIONAL TOTAL	66.7	0.14	12	21.3
VOLTA				
JASIKAN	33.3	0.33	3	99.1
HO	50.0	0.50	2	100.0
NKWANTA	50.0	0.50	2	100.0
KETU	100.0	-	1	-
REGIONAL TOTAL	50.0	0.19	8	37.8
EASTERN				
AKWAPIM SOUTH	100.0	0.0	2	0.0
BIRIM SOUTH	0.0	-	1	-
WEST AKIM	100.0	-	1	-
KWAEBIBIREM	0.0	-	1	-
AKWAPIM NORTH	100.0	-	1	-
MANYA KROBO	0.0	-	1	-
AFRAM PLAINS	100.0	-	1	-
KWAHU SOUTH	0.0	-	1	-
REGIONAL TOTAL	55.6	0.18	9	31.6

Table 4.1 cont.: Direct Estimates of the Proportion of Women Aged 15-19 Years Exposed to Mistimed Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
ASHANTI				
ADANSI WEST	100.0	0.00	2	0.0
KUMASI METROPOLITAN	50.0	0.22	6	44.0
AHAFO-ANO SOUTH	50.0	0.50	2	100.0
ATWIMA	100.0	-	1	-
AMANSIE EAST	100.0	-	1	-
ADANSI EAST	100.0	-	1	-
BOSOMTWI KWANWOMA	0.0	-	1	-
SEKYERE WEST	100.0	-	1	-
REGIONAL TOTAL	66.7	0.13	15	18.9
BRONG AHAFO				
DORMAA	100.0	0.00	2	0.0
NKORANZA	50.0	0.29	4	58.0
KINTAMPO	25.0	0.25	4	100.0
ASUNAFO	0.0	-	1	-
SUNYANI	0.0	-	1	-
BEREKUM	100.0	-	1	-
WENCHI	100.0	-	1	-
SENE	0.0	-	1	-
REGIONAL TOTAL	46.7	0.13	15	28.6
NORTHERN				
YENDI	83.3	0.17	6	20.4
WEST MAMPRUSI	75.0	0.25	4	33.3
ZABZUGU-TATALI	50.0	0.29	4	58.0
EAST MAMPRUSI	40.0	0.24	5	60.0
EAST GONJA	50.0	0.50	2	100.0
NANUMBA	50.0	0.50	2	100.0
SABOBA-CHEREPONI	25.0	0.25	4	100.0
BOLE	100.0	-	1	-
GUSHIEGU-KARAGA	0.0	0.00	2	-
SAVELUGU-NANTON	100.0	-	1	-
TOLON-KUMBUNGU	0.0	-	1	-
REGIONAL TOTAL	53.1	0.09	32	16.9
UPPER EAST				
BOLGATANGA	100.0	0.00	4	0.0
KASENA-NANKANA	80.0	0.20	5	25.0
BAWKU WEST	50.0	0.50	2	100.0
BAWKU EAST	50.0	0.50	2	100.0
BUILSA	100.0	-	1	-
BONGO	100.0	-	1	-
REGIONAL TOTAL	80.0	0.11	15	13.4
UPPER WEST				
WA	75.0	0.25	4	33.3
JIRAPA-LAMBUSSIE	66.7	0.33	3	49.5
NADAWLI	25.0	0.25	4	100.0
SISSALA	0.0	-	1	-
REGIONAL TOTAL	50.0	0.15	12	30.2
OVERALL TOTAL	61.4	0.04	145	6.5

Table 4.2: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Mistimed Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
SEFWI WIASO	50.0	0.13	16	25.8
WASSA AMENFI	34.6	0.10	26	27.5
JOMORO	46.2	0.14	13	31.2
WASSA WEST	31.8	0.10	22	31.9
SHAMA-AHANTA EAST	25.9	0.09	27	33.1
JUABESO-BIA	30.0	0.11	20	35.0
MPOHOR-WASSA EAST	44.4	0.18	9	39.5
AOWIN-SUAMAN	44.4	0.18	9	39.5
SEFWI BIBIANI	33.3	0.21	6	63.2
AHANTA WEST	22.2	0.15	9	66.1
NZIMA EAST	18.2	0.12	11	67.1
REGIONAL TOTAL	**33.9**	**0.04**	**168**	**10.8**
CENTRAL				
AJUMAKO-ENYAN-ESIAM	77.8	0.15	9	18.9
UPPER DENKYIRA	66.7	0.17	9	25.0
ASSIN	45.0	0.11	20	25.4
GOMOA	37.5	0.10	24	26.9
KOMENDA-EDINA-EGYAFO-ABIREM	60.0	0.16	10	27.2
AGONA	50.0	0.19	8	37.8
ASIKUMA-ODOBEN-BRAKWA	60.0	0.24	5	40.8
LOWER DENKYIRA	27.3	0.14	11	51.6
ABURA-ASEBU-KWAMANKESE	40.0	0.24	5	61.2
MFANTSIMAN	40.0	0.24	5	61.2
CAPE COAST	33.3	0.21	6	63.2
EFUTU-EWUTU-SENYA	11.1	0.11	9	100.0
REGIONAL TOTAL	**44.6**	**0.05**	**121**	**10.2**
GREATER ACCRA				
ACCRA METROPOLITAN	29.1	0.04	103	15.4
DANGBE WEST	52.6	0.12	19	22.4
GA	14.9	0.05	47	35.2
TEMA	17.1	0.06	35	37.7
DANGBE EAST	50.0	0.22	6	44.7
REGIONAL TOTAL	**26.7**	**0.03**	**210**	**11.5**
VOLTA				
HOHOE	80.0	0.20	5	25.0
SOUTH TONGU	62.5	0.18	8	29.3
HO	30.8	0.09	26	30.0
JASIKAN	42.9	0.14	14	32.0
NKWANTA	29.4	0.11	17	38.7
KPANDU	25.0	0.13	12	52.2
KRACHI	23.1	0.12	13	52.7
KETU	17.6	0.10	17	54.0
NORTH TONGU	33.3	0.21	6	63.2
AKATSI	16.7	0.11	12	67.4
KETA	50.0	0.50	2	100.0
KADJEBI	0.0	0.00	3	-
REGIONAL TOTAL	**31.1**	**0.04**	**135**	**12.9**

Table 4.2 cont.: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Mistimed Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
EASTERN				
BIRIM NORTH	54.5	0.16	11	28.9
KWAHU SOUTH	55.6	0.18	9	31.6
EAST AKIM	33.3	0.11	18	34.3
KWAEBIBIREM	45.5	0.16	11	34.6
WEST AKIM	50.0	0.19	8	37.8
MANYA KROBO	27.8	0.11	18	39.1
FANTEAKWA	37.5	0.18	8	48.8
BIRIM SOUTH	33.3	0.17	9	50.0
YILO KROBO	23.1	0.12	13	52.7
AKWAPIM SOUTH	33.3	0.21	6	63.2
KOFORIDUA	25.0	0.16	8	65.5
AFRAM PLAINS	25.0	0.16	8	65.5
SUHUM-KRABOA-COALTAR	13.3	0.09	15	68.1
AKWAPIM NORTH	0.0	0.00	5	-
ASUOGYAMAN	0.0	-	1	-
REGIONAL TOTAL	**32.4**	**0.04**	**148**	**11.9**
ASHANTI				
KUMASI METROPOLITAN	24.1	0.05	83	19.6
OFFINSO	64.3	0.13	14	20.7
ATWIMA	45.8	0.10	24	22.7
ASHANTI AKIM SOUTH	63.6	0.15	11	23.9
EJURA SEKODUMASI	66.7	0.17	9	25.0
ADANSI EAST	53.8	0.14	13	26.7
SEKYERE EAST	53.8	0.14	13	26.7
ADANSI WEST	33.3	0.11	21	31.6
BOSOMTWI KWANWOMA	31.6	0.11	19	34.7
ASHANTI AKIM NORTH	36.4	0.15	11	41.8
AHAFO-ANO SOUTH	30.8	0.13	13	43.3
KWABRE	28.6	0.13	14	43.9
AFIGYA SEKYERE	33.3	0.17	9	50.0
AHAFO-ANO NORTH	66.7	0.33	3	50.0
SEKYERE WEST	20.0	0.13	10	66.7
AMANSIE EAST	13.3	0.09	15	68.1
AMANSIE WEST	14.3	0.14	7	100.0
EJISU-JUABEN	20.0	0.20	5	100.0
REGIONAL TOTAL	**35.0**	**0.03**	**294**	**8.6**
BRONG AHAFO				
ATEBUBU	75.9	0.08	29	10.7
ASUNAFO	38.2	0.08	34	22.1
JAMAN	30.8	0.07	39	24.3
KINTAMPO	40.9	0.11	22	26.2
SUNYANI	36.8	0.11	19	30.9
WENCHI	36.8	0.11	19	30.9
TECHIMAN	30.4	0.10	23	32.2
NKORANZA	29.4	0.11	17	38.7
SENE	23.8	0.10	21	40.0
TANO	42.9	0.20	7	47.1
DORMAA	15.8	0.09	19	54.4
ASUTIFI	28.6	0.18	7	64.5
BEREKUM	16.7	0.17	6	100.0
REGIONAL TOTAL	**36.6**	**0.03**	**262**	**8.1**

Table 4.2 cont.: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Mistimed Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
NORTHERN				
GUSHIEGU-KARAGA	86.1	0.06	36	6.8
WEST MAMPRUSI	85.7	0.10	14	11.3
ZABZUGU-TATALI	73.9	0.09	23	12.7
EAST MAMPRUSI	66.7	0.09	30	13.1
SABOBA-CHEREPONI	73.7	0.10	19	14.1
BOLE	70.0	0.11	20	15.0
WEST GONJA	62.5	0.10	24	16.2
EAST GONJA	43.2	0.08	37	19.1
NANUMBA	62.5	0.13	16	20.0
YENDI	47.6	0.11	21	23.5
SAVELUGU-NANTON	52.9	0.12	17	23.6
TOLON-KUMBUNGU	50.0	0.12	18	24.3
TAMALE	37.0	0.09	27	25.6
REGIONAL TOTAL	**61.9**	**0.03**	**302**	**4.5**
UPPER EAST				
BUILSA	88.9	0.08	18	8.6
BAWKU EAST	56.7	0.06	67	10.8
KASENA-NANKANA	47.1	0.09	34	18.5
BOLGATANGA	47.1	0.09	34	18.5
BONGO	75.0	0.16	8	21.8
BAWKU WEST	45.5	0.16	11	34.6
REGIONAL TOTAL	**56.4**	**0.04**	**172**	**6.7**
UPPER WEST				
WA	50.8	0.06	63	12.5
JIRAPA-LAMBUSSIE	60.6	0.09	33	14.3
SISSALA	53.3	0.09	30	17.4
NADAWLI	51.7	0.09	29	18.3
LAWRA	37.1	0.08	35	22.3
REGIONAL TOTAL	**50.5**	**0.04**	**190**	**7.2**
OVERALL TOTAL	**41.8**	**0.01**	**2002**	**2.6**

Table 4.3: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Mistimed Pregnancy

Region/District	Direct Estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
MPOHOR-WASSA EAST	30.0	0.15	10	50.9
JUABESO-BIA	7.7	0.08	13	100.0
SEFWI BIBIANI	12.5	0.13	8	100.0
JOMORO	0.0	0.00	9	-
NZIMA EAST	0.0	0.00	7	-
AHANTA WEST	0.0	0.00	7	-
SHAMA-AHANTA EAST	0.0	0.00	22	-
WASSA WEST	0.0	0.00	11	-
WASSA AMENFI	0.0	0.00	8	-
AOWIN-SUAMAN	0.0	0.00	2	-
SEFWI WIASO	0.0	0.00	8	-
REGIONAL TOTAL	**4.8**	**0.02**	**105**	**43.8**
CENTRAL				
GOMOA	10.0	0.10	10	100.0
AGONA	10.0	0.10	10	100.0
ASSIN	9.1	0.09	11	100.0
LOWER DENKYIRA	20.0	0.20	5	100.0
KOMENDA-EDINA-EGYAFO-ABIREM	0.0	0.00	5	-
CAPE COAST	0.0	0.00	4	-
ABURA-ASEBU-KWAMANKESE	0.0	0.00	6	-
MFANTSIMAN	0.0	0.00	8	-
EFUTU-EWUTU-SENYA	0.0	0.00	5	-
ASIKUMA-ODOBEN-BRAKWA	0.0	0.00	6	-
AJUMAKO-ENYAN-ESIAM	0.0	0.00	7	-
UPPER DENKYIRA	0.0	0.00	5	-
REGIONAL TOTAL	**4.9**	**0.02**	**82**	**49.1**
GREATER ACCRA				
GA	5.6	0.04	36	69.7
DANGBE WEST	10.0	0.10	10	100.0
ACCRA METROPOLITAN	0.0	0.00	89	-
TEMA	0.0	0.00	32	-
DANGBE EAST	0.0	0.00	4	-
REGIONAL TOTAL	**1.8**	**0.01**	**171**	**57.4**
VOLTA				
KADJEBI	33.3	0.21	6	63.3
HO	7.4	0.05	27	69.3
KETU	6.3	0.06	16	100.0
KRACHI	12.5	0.13	8	100.0
SOUTH TONGU	0.0	0.00	8	-
KETA	0.0	0.00	5	-
AKATSI	0.0	0.00	12	-
NORTH TONGU	0.0	0.00	8	-
KPANDU	0.0	0.00	10	-
HOHOE	0.0	0.00	6	-
JASIKAN	0.0	0.00	10	-
NKWANTA	0.0	0.00	7	-
REGIONAL TOTAL	**4.9**	**0.02**	**123**	**39.9**

Table 4.3 cont.: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Mistimed Pregnancy

Region/District	Direct Estimate (%)	Standard error	Sample size	RSE (%)
EASTERN				
AFRAM PLAINS	25.0	0.16	8	65.5
EAST AKIM	14.3	0.10	14	67.9
BIRIM NORTH	7.1	0.07	14	100.0
KOFORIDUA	12.5	0.13	8	100.0
AKWAPIM SOUTH	16.7	0.17	6	100.0
AKWAPIM NORTH	12.5	0.13	8	100.0
MANYA KROBO	9.1	0.09	11	100.0
KWAHU SOUTH	9.1	0.09	11	100.0
BIRIM SOUTH	0.0	0.00	8	-
WEST AKIM	0.0	0.00	10	-
KWAEBIBIREM	0.0	0.00	5	-
SUHUM-KRABOA-COALTAR	0.0	0.00	4	-
FANTEAKWA	0.0	0.00	5	-
YILO KROBO	0.0	0.00	5	-
ASUOGYAMAN	0.0	0.00	2	-
REGIONAL TOTAL	**8.4**	**0.03**	**119**	**30.4**
ASHANTI				
AHAFO-ANO SOUTH	23.1	0.12	13	52.7
ASHANTI AKIM SOUTH	40.0	0.24	5	61.2
AFIGYA SEKYERE	18.2	0.12	11	67.1
ATWIMA	11.8	0.08	17	68.5
KUMASI METROPOLITAN	4.1	0.03	49	70.0
AMANSIE WEST	25.0	0.25	4	100.0
ASHANTI AKIM NORTH	25.0	0.25	4	100.0
BOSOMTWI KWANWOMA	12.5	0.13	8	100.0
EJURA SEKODUMASI	20.0	0.20	5	100.0
AHAFO-ANO NORTH	33.3	0.33	3	100.0
AMANSIE EAST	0.0	0.00	17	-
ADANSI WEST	0.0	0.00	7	-
ADANSI EAST	0.0	0.00	8	-
EJISU-JUABEN	0.0	0.00	3	-
KWABRE	0.0	0.00	8	-
SEKYERE EAST	0.0	0.00	10	-
SEKYERE WEST	0.0	0.00	4	-
OFFINSO	0.0	0.00	11	-
REGIONAL TOTAL	**8.6**	**0.02**	**187**	**24.0**
BRONG AHAFO				
DORMAA	13.3	0.09	15	68.1
ASUTIFI	9.1	0.09	11	100.0
TANO	12.5	0.13	8	100.0
BEREKUM	16.7	0.17	6	100.0
WENCHI	12.5	0.13	8	100.0
KINTAMPO	6.7	0.07	15	100.0
ATEBUBU	12.5	0.13	8	100.0
ASUNAFO	0.0	0.00	22	-
SUNYANI	0.0	0.00	14	-
JAMAN	0.0	0.00	18	-
TECHIMAN	0.0	0.00	14	-
NKORANZA	0.0	0.00	10	-
SENE	0.0	0.00	8	-
REGIONAL TOTAL	**5.1**	**0.02**	**157**	**34.6**

Table 4.3 cont.: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Mistimed Pregnancy

Region/District	Direct Estimate (%)	Standard error	Sample size	RSE (%)
NORTHERN				
SAVELUGU-NANTON	50.0	0.13	16	25.8
NANUMBA	60.0	0.16	10	27.2
TOLON-KUMBUNGU	42.1	0.12	19	27.6
EAST GONJA	31.6	0.11	19	34.7
GUSHIEGU-KARAGA	44.4	0.18	9	39.5
EAST MAMPRUSI	21.7	0.09	23	40.5
BOLE	21.1	0.10	19	45.6
WEST GONJA	33.3	0.17	9	50.0
ZABZUGU-TATALI	33.3	0.17	9	50.0
YENDI	33.3	0.17	9	50.0
TAMALE	16.7	0.09	18	54.2
SABOBA-CHEREPONI	22.2	0.15	9	66.1
WEST MAMPRUSI	16.7	0.17	6	100.0
REGIONAL TOTAL	**32.0**	**0.04**	**175**	**11.1**
UPPER EAST				
BAWKU EAST	21.4	0.06	42	29.9
BAWKU WEST	33.3	0.17	9	50.0
BOLGATANGA	8.0	0.06	25	69.2
BUILSA	10.0	0.10	10	100.0
KASENA-NANKANA	7.7	0.08	13	100.0
BONGO	25.0	0.25	4	100.0
REGIONAL TOTAL	**16.5**	**0.04**	**103**	**22.3**
UPPER WEST				
WA	18.4	0.06	38	34.6
JIRAPA-LAMBUSSIE	26.3	0.10	19	39.4
LAWRA	25.0	0.10	20	39.7
NADAWLI	11.8	0.06	34	47.7
SISSALA	13.6	0.07	22	54.9
REGIONAL TOTAL	**18.0**	**0.03**	**133**	**18.5**
OVERALL TOTAL	**11.0**	**0.01**	**1355**	**7.7**

Appendix V

Table 5.1: Direct Estimates of the Proportion of Women Aged 15-19 Years Exposed to Unwanted Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
JOMORO	0.0	-	1	-
NZIMA EAST	0.0	0.00	4	-
WASSA AMENFI	0.0	0.00	3	-
AOWIN-SUAMAN	0.0	-	1	-
JUABESO-BIA	0.0	0.00	2	-
SEFWI WIASO	0.0	-	1	-
SEFWI BIBIANI	0.0	0.00	2	-
REGIONAL TOTAL	**0.0**	**0.00**	**14**	-
CENTRAL				
KOMENDA-EDINA-EGYAFO-ABIREM	0.0	0.00	3	-
ABURA-ASEBU-KWAMANKESE	0.0	-	1	-
GOMOA	0.0	-	1	-
EFUTU-EWUTU-SENYA	100.0	-	1	-
AGONA	0.0	0.00	2	-
ASIKUMA-ODOBEN-BRAKWA	0.0	-	1	-
AJUMAKO-ENYAN-ESIAM	0.0	0.00	2	-
ASSIN	0.0	-	1	-
UPPER DENKYIRA	0.0	-	1	-
REGIONAL TOTAL	**7.7**	**0.08**	**13**	**100.0**
GREATER ACCRA				
GA	50.0	0.50	2	100.0
DANGBE EAST	33.3	0.33	3	100.0
ACCRA METROPOLITAN	0.0	0.00	7	-
REGIONAL TOTAL	**16.7**	**0.11**	**12**	**67.4**
VOLTA				
JASIKAN	33.3	0.33	3	100.0
KETU	0.0	-	1	-
HO	0.0	0.00	2	-
NKWANTA	0.0	0.00	2	-
REGIONAL TOTAL	**12.5**	**0.13**	**8**	**100.0**
EASTERN				
BIRIM SOUTH	0.0	-	1	-
WEST AKIM	0.0	-	1	-
KWAEBIBIREM	100.0	-	1	-
AKWAPIM SOUTH	0.0	0.00	2	-
AKWAPIM NORTH	0.0	-	1	-
MANYA KROBO	100.0	-	1	-
AFRAM PLAINS	0.0	-	1	-
KWAHU SOUTH	100.0	-	1	-
REGIONAL TOTAL	**33.3**	**0.17**	**9**	**50.0**

Table 5.1 cont.: Direct Estimates of the Proportion of Women Aged 15-19 Years Exposed to Unwanted Pregnancy

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
ASAHNTI				
ATWIMA	0.0	-	1	-
AMANSIE EAST	0.0	-	1	-
ADANSI WEST	0.0	0.00	2	-
ADANSI EAST	0.0	-	1	-
BOSOMTWI KWANWOMA	0.0	-	1	-
KUMASI METROPOLITAN	0.0	0.00	6	-
SEKYERE WEST	0.0	-	1	-
AHAFO-ANO SOUTH	0.0	0.00	2	-
REGIONAL TOTAL	**0.0**	**0.00**	**15**	-
BRONG AHAFO				
ASUNAFO	0.0	-	1	-
SUNYANI	0.0	-	1	-
DORMAA	0.0	0.00	2	-
BEREKUM	0.0	-	1	-
WENCHI	0.0	-	1	-
NKORANZA	0.0	0.00	4	-
KINTAMPO	0.0	0.00	4	-
SENE	0.0	-	1	-
REGIONAL TOTAL	**0.0**	**0.00**	**15**	-
NORTHERN				
BOLE	0.0	-	1	-
EAST GONJA	0.0	0.00	2	-
NANUMBA	0.0	0.00	2	-
ZABZUGU-TATALI	0.0	0.00	4	-
SABOBA-CHEREPONI	0.0	0.00	4	-
YENDI	0.0	0.00	6	-
GUSHIEGU-KARAGA	0.0	0.00	2	-
SAVELUGU-NANTON	0.0	-	1	-
TOLON-KUMBUNGU	0.0	-	1	-
WEST MAMPRUSI	0.0	0.00	4	-
EAST MAMPRUSI	0.0	0.00	5	-
REGIONAL TOTAL	**0.0**	**0.00**	**32**	-
UPPER EAST				
BUILSA	0.0	-	1	-
KASENA-NANKANA	0.0	0.00	5	-
BONGO	0.0	-	1	-
BOLGATANGA	0.0	0.00	4	-
BAWKU WEST	0.0	0.00	2	-
BAWKU EAST	0.0	0.00	2	-
REGIONAL TOTAL	**0.0**	**0.00**	**15**	-
UPPER WEST				
WA	0.0	0.00	4	-
NADAWLI	0.0	0.00	4	-
SISSALA	0.0	-	1	-
JIRAPA-LAMBUSSIE	0.0	0.00	3	-
REGIONAL TOTAL	0.0	0.00	12	-
OVERALL TOTAL	**4.8**	**0.02**	**145**	**37.0**

Table 5.2: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Unwanted Pregnancy

	Direct estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
WASSA AMENFI	23.1	0.08	26	36.5
SHAMA-AHANTA EAST	18.5	0.08	27	41.1
SEFWI BIBIANI	50.0	0.22	6	44.7
AHANTA WEST	33.3	0.17	9	50.0
JOMORO	23.1	0.12	13	52.7
SEFWI WIASO	18.8	0.10	16	53.7
WASSA WEST	13.6	0.07	22	54.9
NZIMA EAST	9.1	0.09	11	100.0
AOWIN-SUAMAN	11.1	0.11	9	100.0
JUABESO-BIA	5.0	0.05	20	100.0
MPOHOR-WASSA EAST	0.0	0.00	9	-
REGIONAL TOTAL	**17.3**	**0.03**	**168**	**16.9**
CENTRAL				
EFUTU-EWUTU-SENYA	55.6	0.18	9	31.6
GOMOA	25.0	0.09	24	36.1
LOWER DENKYIRA	36.4	0.15	11	41.8
ASSIN	20.0	0.09	20	45.9
CAPE COAST	33.3	0.21	6	63.2
MFANTSIMAN	20.0	0.20	5	100.0
ASIKUMA-ODOBEN-BRAKWA	20.0	0.20	5	100.0
AJUMAKO-ENYAN-ESIAM	11.1	0.11	9	100.0
KOMENDA-EDINA-EGYAFO-ABIREM	0.0	0.00	10	-
ABURA-ASEBU-KWAMANKESE	0.0	0.00	5	-
AGONA	0.0	0.00	8	-
UPPER DENKYIRA	0.0	0.00	9	-
REGIONAL TOTAL	**19.8**	**0.04**	**121**	**18.4**
GREATER ACCRA				
TEMA	34.3	0.08	35	23.7
ACCRA METROPOLITAN	13.6	0.03	103	25.0
GA	19.1	0.06	47	30.3
DANGBE EAST	50.0	0.22	6	44.7
DANGBE WEST	15.8	0.09	19	54.4
REGIONAL TOTAL	**19.5**	**0.03**	**210**	**14.0**
VOLTA				
AKATSI	33.3	0.14	12	42.6
KETU	23.5	0.11	17	45.1
HO	15.4	0.07	26	46.9
KPANDU	25.0	0.13	12	52.2
NKWANTA	17.6	0.10	17	54.0
NORTH TONGU	33.3	0.21	6	63.2
KRACHI	15.4	0.10	13	67.7
SOUTH TONGU	12.5	0.13	8	100.0
JASIKAN	7.1	0.07	14	100.0
KETA	0.0	0.00	2	-
HOHOE	0.0	0.00	5	-
KADJEBI	0.0	0.00	3	-
REGIONAL TOTAL	**17.8**	**0.03**	**135**	**18.6**

Table 5.2 cont.: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Unwanted Pregnancy

	Direct estimate (%)	Standard error	Sample size	RSE (%)
EASTERN				
AKWAPIM NORTH	80.0	0.20	5	25.0
EAST AKIM	27.8	0.11	18	39.1
BIRIM NORTH	36.4	0.15	11	41.8
AKWAPIM SOUTH	50.0	0.22	6	44.7
SUHUM-KRABOA-COALTAR	20.0	0.11	15	53.5
MANYA KROBO	16.7	0.09	18	54.2
WEST AKIM	25.0	0.16	8	65.5
KWAHU SOUTH	22.2	0.15	9	66.1
KWAEBIBIREM	18.2	0.12	11	67.1
YILO KROBO	15.4	0.10	13	67.7
BIRIM SOUTH	11.1	0.11	9	100.0
AFRAM PLAINS	12.5	0.13	8	100.0
FANTEAKWA	0.0	0.00	8	-
KOFORIDUA	0.0	0.00	8	-
ASUOGYAMAN	0.0	-	1	-
REGIONAL TOTAL	**21.6**	**0.03**	**148**	**15.7**
ASHANTI				
SEKYERE WEST	50.0	0.17	10	33.3
KUMASI METROPOLITAN	7.2	0.03	83	39.6
SEKYERE EAST	30.8	0.13	13	43.3
AMANSIE EAST	26.7	0.12	15	44.3
BOSOMTWI KWANWOMA	21.1	0.10	19	45.6
ATWIMA	16.7	0.08	24	46.6
AMANSIE WEST	42.9	0.20	7	47.1
ASHANTI AKIM NORTH	27.3	0.14	11	51.6
ADANSI EAST	23.1	0.12	13	52.7
EJISU-JUABEN	40.0	0.24	5	61.2
AFIGYA SEKYERE	22.2	0.15	9	66.1
AHAFO-ANO SOUTH	15.4	0.10	13	67.7
OFFINSO	14.3	0.10	14	67.9
ADANSI WEST	9.5	0.07	21	68.9
ASHANTI AKIM SOUTH	9.1	0.09	11	100.0
KWABRE	7.1	0.07	14	100.0
EJURA SEKODUMASI	11.1	0.11	9	100.0
AHAFO-ANO NORTH	0.0	0.00	3	-
REGIONAL TOTAL	**16.7**	**0.02**	**294**	**13.1**
BRONG AHAFO				
SENE	38.1	0.11	21	28.5
DORMAA	21.1	0.10	19	45.6
TECHIMAN	17.4	0.08	23	46.5
JAMAN	10.3	0.05	39	48.0
ATEBUBU	10.3	0.06	29	55.6
ASUNAFO	8.8	0.05	34	56.0
TANO	28.6	0.18	7	64.5
WENCHI	10.5	0.07	19	68.7
KINTAMPO	9.1	0.06	22	69.0
ASUTIFI	14.3	0.14	7	100.0
SUNYANI	5.3	0.05	19	100.0
NKORANZA	5.9	0.06	17	100.0
BEREKUM	0.0	0.00	6	-
REGIONAL TOTAL	**13.4**	**0.02**	**262**	**15.8**

Table 5.2 cont.: Direct Estimates of the Proportion of Women Aged 20-34 Years Exposed to Unwanted Pregnancy

	Direct estimate (%)	Standard error	Sample size	RSE (%)
NORTHERN				
EAST MAMPRUSI	10.0	0.06	30	55.7
NANUMBA	12.5	0.09	16	68.3
ZABZUGU-TATALI	8.7	0.06	23	69.1
WEST GONJA	8.3	0.06	24	69.2
EAST GONJA	2.7	0.03	37	100.0
SABOBA-CHEREPONI	5.3	0.05	19	100.0
YENDI	4.8	0.05	21	100.0
GUSHIEGU-KARAGA	2.8	0.03	36	100.0
SAVELUGU-NANTON	5.9	0.06	17	100.0
TAMALE	3.7	0.04	27	100.0
BOLE	0.0	0.00	20	-
TOLON-KUMBUNGU	0.0	0.00	18	-
WEST MAMPRUSI	0.0	0.00	14	-
REGIONAL TOTAL	**5.0**	**0.01**	**302**	**25.2**
UPPER EAST				
BOLGATANGA	11.8	0.06	34	47.7
KASENA-NANKANA	8.8	0.05	34	56.0
BAWKU EAST	4.5	0.03	67	56.9
BUILSA	5.6	0.06	18	100.0
BONGO	12.5	0.13	8	100.0
BAWKU WEST	0.0	0.00	11	-
REGIONAL TOTAL	**7.0**	**0.02**	**172**	**27.9**
UPPER WEST				
WA	6.3	0.03	63	48.8
LAWRA	8.6	0.05	35	56.0
NADAWLI	6.9	0.05	29	69.4
SISSALA	3.3	0.03	30	100.0
JIRAPA-LAMBUSSIE	0.0	0.00	33	-
REGIONAL TOTAL	**5.3**	**0.02**	**190**	**30.9**
OVERALL TOTAL	**13.5**	**0.01**	**2002**	**5.6**

Table 5.3: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Unwanted Pregnancy

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
WESTERN				
SHAMA-AHANTA EAST	59.1	0.11	22	18.2
SEFWI WIASO	62.5	0.18	8	29.3
JOMORO	44.4	0.18	9	39.5
AHANTA WEST	42.9	0.20	7	47.1
WASSA AMENFI	37.5	0.18	8	48.8
MPOHOR-WASSA EAST	30.0	0.15	10	50.9
JUABESO-BIA	23.1	0.12	13	52.7
NZIMA EAST	28.6	0.18	7	64.5
SEFWI BIBIANI	25.0	0.16	8	65.5
WASSA WEST	9.1	0.09	11	100.0
AOWIN-SUAMAN	50.0	0.50	2	100.0
REGIONAL TOTAL	**38.1**	**0.05**	**105**	**12.5**
CENTRAL				
CAPE COAST	100.0	0.00	4	0.0
ASIKUMA-ODOBEN-BRAKWA	83.3	0.17	6	20.0
MFANTSIMAN	75.0	0.16	8	21.8
GOMOA	70.0	0.15	10	21.8
AGONA	70.0	0.15	10	21.8
ASSIN	54.5	0.16	11	28.9
ABURA-ASEBU-KWAMANKESE	66.7	0.21	6	31.6
AJUMAKO-ENYAN-ESIAM	57.1	0.20	7	35.4
KOMENDA-EDINA-EGYAFO-ABIREM	60.0	0.24	5	40.8
LOWER DENKYIRA	60.0	0.24	5	40.8
UPPER DENKYIRA	60.0	0.24	5	40.8
EFUTU-EWUTU-SENYA	20.0	0.20	5	100.0
REGIONAL TOTAL	**64.6**	**0.05**	**82**	**8.2**
GREATER ACCRA				
ACCRA METROPOLITAN	37.1	0.05	89	13.9
TEMA	56.3	0.09	32	15.8
GA	36.1	0.08	36	22.5
DANGBE WEST	50.0	0.17	10	33.3
DANGBE EAST	25.0	0.25	4	100.0
REGIONAL TOTAL	**40.9**	**0.04**	**171**	**9.2**
VOLTA				
HO	48.1	0.10	27	20.4
JASIKAN	70.0	0.15	10	21.8
KETU	56.3	0.13	16	22.8
KETA	80.0	0.20	5	25.0
AKATSI	58.3	0.15	12	25.5
HOHOE	66.7	0.21	6	31.6
KPANDU	50.0	0.17	10	33.3
NKWANTA	57.1	0.20	7	35.4
NORTH TONGU	50.0	0.19	8	37.8
KRACHI	50.0	0.19	8	37.8
KADJEBI	50.0	0.22	6	44.7
SOUTH TONGU	37.5	0.18	8	48.8
REGIONAL TOTAL	**54.5**	**0.05**	**123**	**8.3**

Table 5.3 cont.: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Unwanted Pregnancy

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
EASTERN				
KWAHU SOUTH	81.8	0.12	11	14.9
BIRIM NORTH	71.4	0.13	14	17.5
WEST AKIM	70.0	0.15	10	21.8
FANTEAKWA	80.0	0.20	5	25.0
YILO KROBO	80.0	0.20	5	25.0
EAST AKIM	50.0	0.14	14	27.7
MANYA KROBO	45.5	0.16	11	34.6
KWAEBIBIREM	60.0	0.24	5	40.8
AKWAPIM SOUTH	50.0	0.22	6	44.7
KOFORIDUA	37.5	0.18	8	48.8
AKWAPIM NORTH	37.5	0.18	8	48.8
SUHUM-KRABOA-COALTAR	50.0	0.29	4	57.7
AFRAM PLAINS	25.0	0.16	8	65.5
BIRIM SOUTH	25.0	0.16	8	65.5
ASUOGYAMAN	50.0	0.50	2	100.0
REGIONAL TOTAL	**54.6**	**0.05**	**119**	**8.4**
ASHANTI				
EJISU-JUABEN	100.0	0.00	3	0.0
OFFINSO	81.8	0.12	11	14.9
AMANSIE EAST	58.8	0.12	17	20.9
KUMASI METROPOLITAN	28.6	0.07	49	22.8
ATWIMA	52.9	0.12	17	23.6
EJURA SEKODUMASI	80.0	0.20	5	25.0
AHAFO-ANO SOUTH	53.8	0.14	13	26.7
ADANSI EAST	62.5	0.18	8	29.3
SEKYERE EAST	50.0	0.17	10	33.3
SEKYERE WEST	75.0	0.25	4	33.3
AFIGYA SEKYERE	45.5	0.16	11	34.6
ADANSI WEST	42.9	0.20	7	47.1
AHAFO-ANO NORTH	66.7	0.33	3	50.0
BOSOMTWI KWANWOMA	25.0	0.16	8	65.5
AMANSIE WEST	25.0	0.25	4	100.0
ASHANTI AKIM NORTH	25.0	0.25	4	100.0
KWABRE	12.5	0.13	8	100.0
ASHANTI AKIM SOUTH	0.0	0.00	5	-
REGIONAL TOTAL	**44.9**	**0.04**	**187**	**8.1**
BRONG AHAFO				
SUNYANI	64.3	0.13	14	20.7
KINTAMPO	53.3	0.13	15	25.0
TECHIMAN	50.0	0.14	14	27.7
JAMAN	38.9	0.12	18	30.4
DORMAA	40.0	0.13	15	32.7
NKORANZA	40.0	0.16	10	40.8
ASUNAFO	18.2	0.08	22	46.3
TANO	37.5	0.18	8	48.8
SENE	37.5	0.18	8	48.8
ASUTIFI	27.3	0.14	11	51.6
BEREKUM	33.3	0.21	6	63.2
WENCHI	25.0	0.16	8	65.5
ATEBUBU	25.0	0.16	8	65.5
REGIONAL TOTAL	**38.2**	**0.04**	**157**	**10.2**

Table 5.3 cont.: Direct Estimates of the Proportion of Women Aged 35+ Years Exposed to Unwanted Pregnancy

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
NORTHERN				
EAST MAMPRUSI	56.5	0.11	23	18.7
EAST GONJA	36.8	0.11	19	30.9
BOLE	31.6	0.11	19	34.7
TAMALE	22.2	0.10	18	45.4
ZABZUGU-TATALI	33.3	0.17	9	50.0
SABOBA-CHEREPONI	33.3	0.17	9	50.0
TOLON-KUMBUNGU	15.8	0.09	19	54.4
WEST MAMPRUSI	33.3	0.21	6	63.2
WEST GONJA	22.2	0.15	9	66.1
YENDI	22.2	0.15	9	66.1
NANUMBA	20.0	0.13	10	66.7
SAVELUGU-NANTON	12.5	0.09	16	68.3
GUSHIEGU-KARAGA	11.1	0.11	9	100.0
REGIONAL TOTAL	**28.6**	**0.03**	**175**	**12.0**
UPPER EAST				
BOLGATANGA	60.0	0.10	25	16.7
BAWKU EAST	42.9	0.08	42	18.0
KASENA-NANKANA	69.2	0.13	13	19.2
BUILSA	40.0	0.16	10	40.8
BAWKU WEST	33.3	0.17	9	50.0
BONGO	50.0	0.29	4	57.7
REGIONAL TOTAL	**49.5**	**0.05**	**103**	**10.0**
UPPER WEST				
SISSALA	59.1	0.11	22	18.2
WA	42.1	0.08	38	19.3
NADAWLI	26.5	0.08	34	29.0
LAWRA	25.0	0.10	20	39.7
JIRAPA-LAMBUSSIE	21.1	0.10	19	45.6
REGIONAL TOTAL	**35.3**	**0.04**	**133**	**11.8**
OVERALL TOTAL	**43.3**	**0.01**	**1355**	**3.1**

Appendix VI

Table 6.1: Direct Estimates of the Proportion of Home Deliveries to Women Aged 15-19 Years

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
WESTERN				
JOMORO	100.0	0.00	2	0.0
NZIMA EAST	100.0	0.00	4	0.0
SHAMA-AHANTA EAST	66.7	0.33	3	50.0
JUABESO-BIA	50.0	0.29	4	57.7
WASSA WEST	50.0	0.50	2	100.0
WASSA AMENFI	33.3	0.33	3	100.0
AHANTA WEST	100.0	-	1	-
MPOHOR-WASSA EAST	0.0	-	1	-
AOWIN-SUAMAN	0.0	-	1	-
SEFWI WIASO	100.0	-	1	-
SEFWI BIBIANI	100.0	-	1	-
REGIONAL TOTAL	**65.2**	**0.10**	**23**	**15.6**
CENTRAL				
CAPE COAST	100.0	0.00	2	0.0
MFANTSIMAN	100.0	0.00	4	0.0
AGONA	100.0	0.00	3	0.0
ABURA-ASEBU-KWAMANKESE	66.7	0.33	3	50.0
GOMOA	25.0	0.25	4	100.0
KOMENDA-EDINA-EGYAFO-ABIREM	100.0	-	1	-
ASIKUMA-ODOBEN-BRAKWA	100.0	-	1	-
AJUMAKO-ENYAN-ESIAM	100.0	-	1	-
ASSIN	0.0	0.00	3	-
UPPER DENKYIRA	0.0	-	1	-
REGIONAL TOTAL	**65.2**	**0.10**	**23**	**15.6**
GREATER ACCRA				
ACCRA METROPOLITAN	26.7	0.12	15	44.3
GA	25.0	0.25	4	100.0
TEMA	0.0	0.00	4	-
REGIONAL TOTAL	**21.7**	**0.09**	**23**	**40.5**
VOLTA				
KPANDU	100.0	0.00	2	0.0
KADJEBI	100.0	0.00	2	0.0
HOHOE	75.0	0.25	4	33.3
SOUTH TONGU	50.0	0.50	2	100.0
AKATSI	50.0	0.50	2	100.0
NKWANTA	50.0	0.50	2	100.0
KETA	100.0	-	1	-
KETU	100.0	-	1	-
NORTH TONGU	100.0	-	1	-
HO	0.0	0.00	3	-
JASIKAN	100.0	-	1	-
KRACHI	0.0	-	1	-
REGIONAL TOTAL	**63.6**	**0.10**	**22**	**16.5**

Table 6.1 cont: Direct Estimates of the Proportion of Home Deliveries to Women Aged 15-19 Years

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
EASTERN				
AKWAPIM NORTH	100.0	0.00	2	0.0
BIRIM SOUTH	50.0	0.50	2	100.0
AKWAPIM SOUTH	25.0	0.25	4	100.0
BIRIM NORTH	100.0	-	1	-
WEST AKIM	0.0	-	1	-
KWAEBIBIREM	0.0	0.00	2	-
SUHUM-KRABOA-COALTAR	0.0	0.00	3	-
EAST AKIM	0.0	-	1	-
YILO KROBO	100.0	-	1	-
ASUOGYAMAN	100.0	-	1	-
AFRAM PLAINS	0.0	-	1	-
KWAHU SOUTH	0.0	0.00	2	-
REGIONAL TOTAL	**33.3**	**0.11**	**21**	**31.6**
ASHANTI				
KWABRE	100.0	0.00	2	0.0
EJURA SEKODUMASI	100.0	0.00	2	0.0
KUMASI METROPOLITAN	62.5	0.13	16	20.0
ADANSI EAST	66.7	0.33	3	50.0
ATWIMA	33.3	0.33	3	100.0
ADANSI WEST	50.0	0.50	2	100.0
AMANSIE WEST	0.0	-	1	-
AMANSIE EAST	0.0	0.00	4	-
ASHANTI AKIM NORTH	0.0	-	1	-
EJISU-JUABEN	0.0	-	1	-
BOSOMTWI KWANWOMA	0.0	-	1	-
AFIGYA SEKYERE	100.0	-	1	-
OFFINSO	0.0	-	1	-
AHAFO-ANO SOUTH	0.0	-	1	-
REGIONAL TOTAL	**48.7**	**0.08**	**39**	**16.6**
BRONG AHAFO				
NKORANZA	80.0	0.20	5	25.0
JAMAN	66.7	0.33	3	50.0
KINTAMPO	33.3	0.21	6	63.2
ASUNAFO	25.0	0.25	4	100.0
TECHIMAN	33.3	0.33	3	100.0
ASUTIFI	0.0	-	1	-
TANO	0.0	0.00	2	-
SUNYANI	0.0	0.00	3	-
DORMAA	100.0	-	1	-
REGIONAL TOTAL	**39.3**	**0.09**	**28**	**23.9**

Table 6.1 cont: Direct Estimates of the Proportion of Home Deliveries to Women Aged 15-19 Years

Region/District	Direct estimate (%)	Standard error	Sample size	RSE (%)
NORTHERN				
SABOBA-CHEREPONI	100.0	0.00	4	0.0
YENDI	100.0	0.00	2	0.0
SAVELUGU-NANTON	100.0	0.00	2	0.0
WEST MAMPRUSI	100.0	0.00	3	0.0
BOLE	66.7	0.33	3	50.0
WEST GONJA	50.0	0.50	2	100.0
EAST GONJA	50.0	0.50	2	100.0
ZABZUGU-TATALI	50.0	0.50	2	100.0
EAST MAMPRUSI	50.0	0.50	2	100.0
GUSHIEGU-KARAGA	100.0	-	1	-
REGIONAL TOTAL	**78.3**	**0.09**	**23**	**11.2**
UPPER EAST				
BOLGATANGA	87.5	0.13	8	14.3
BAWKU EAST	71.4	0.18	7	25.8
BUILSA	66.7	0.33	3	50.0
BAWKU WEST	50.0	0.50	2	100.0
KASENA-NANKANA	100.0	-	1	-
REGIONAL TOTAL	**76.2**	**0.10**	**21**	**12.5**
UPPER WEST				
SISSALA	100.0	0.00	3	0.0
NADAWLI	83.3	0.17	6	20.0
WA	71.4	0.18	7	25.8
JIRAPA-LAMBUSSIE	25.0	0.25	4	100.0
LAWRA	100.0	-	1	-
REGIONAL TOTAL	**71.4**	**0.10**	**21**	**14.1**
OVERALL TOTAL	**55.3**	**0.03**	**244**	**5.8**

Table 6.2: Direct Estimates of the Proportion of Home Deliveries to Women Aged 20-34 Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
WESTERN				
SEFWI WIASO	93.3	0.07	15	7.1
WASSA WEST	81.0	0.09	21	10.8
NZIMA EAST	70.0	0.11	20	15.0
SHAMA-AHANTA EAST	53.6	0.10	28	17.9
JUABESO-BIA	47.8	0.11	23	22.3
WASSA AMENFI	44.4	0.12	18	27.1
SEFWI BIBIANI	60.0	0.16	10	27.2
AOWIN-SUAMAN	62.5	0.18	8	29.3
MPOHOR-WASSA EAST	40.0	0.16	10	40.8
JOMORO	37.5	0.18	8	48.8
AHANTA WEST	25.0	0.16	8	65.5
REGIONAL TOTAL	**58.6**	**0.04**	**169**	**6.5**
CENTRAL				
LOWER DENKYIRA	100.0	0.00	5	0.0
KOMENDA-EDINA-EGYAFO-ABIREM	91.7	0.08	12	9.1
GOMOA	76.9	0.12	13	15.8
ASIKUMA-ODOBEN-BRAKWA	85.7	0.14	7	16.7
AGONA	70.0	0.15	10	21.8
AJUMAKO-ENYAN-ESIAM	60.0	0.16	10	27.2
ASSIN	46.7	0.13	15	28.6
ABURA-ASEBU-KWAMANKESE	54.5	0.16	11	28.9
MFANTSIMAN	50.0	0.17	10	33.3
EFUTU-EWUTU-SENYA	37.5	0.18	8	48.8
UPPER DENKYIRA	14.3	0.14	7	100.0
CAPE COAST	100.0	-	1	-
REGIONAL TOTAL	**62.4**	**0.05**	**109**	**7.5**
GREATER ACCRA				
ACCRA METROPOLITAN	20.4	0.04	103	19.6
TEMA	21.6	0.07	37	31.7
GA	14.3	0.06	35	42.0
DANGBE WEST	9.1	0.09	11	100.0
DANGBE EAST	25.0	0.25	4	100.0
REGIONAL TOTAL	**18.9**	**0.03**	**190**	**15.0**
VOLTA				
KPANDU	80.0	0.13	10	16.7
KADJEBI	83.3	0.17	6	20.0
KETU	66.7	0.14	12	21.3
NORTH TONGU	58.3	0.15	12	25.5
HO	47.1	0.12	17	26.5
JASIKAN	46.7	0.13	15	28.6
SOUTH TONGU	62.5	0.18	8	29.3
NKWANTA	57.1	0.20	7	35.4
AKATSI	33.3	0.13	15	37.8
HOHOE	36.4	0.15	11	41.8
KETA	37.5	0.18	8	48.8
KRACHI	33.3	0.21	6	63.2
REGIONAL TOTAL	**52.0**	**0.05**	**127**	**8.6**

Table 6.2 cont.: Direct Estimates of the Proportion of Home Deliveries to Women Aged 20-34 Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
EASTERN				
SUHUM-KRABOA-COALTAR	91.7	0.08	12	9.1
KWAHU SOUTH	84.6	0.10	13	12.3
AKWAPIM NORTH	75.0	0.13	12	17.4
BIRIM SOUTH	57.9	0.12	19	20.1
BIRIM NORTH	53.8	0.14	13	26.7
KOFORIDUA	54.5	0.16	11	28.9
MANYA KROBO	41.7	0.15	12	35.7
WEST AKIM	36.4	0.15	11	41.8
AFRAM PLAINS	50.0	0.22	6	44.7
EAST AKIM	33.3	0.17	9	50.0
FANTEAKWA	40.0	0.24	5	61.2
YILO KROBO	28.6	0.18	7	64.5
ASUOGYAMAN	50.0	0.50	2	100.0
KWAEBIBIREM	0.0	0.00	4	-
AKWAPIM SOUTH	0.0	0.00	6	-
REGIONAL TOTAL	**52.8**	**0.04**	**142**	**8.0**
ASHANTI				
KUMASI METROPOLITAN	50.0	0.06	72	11.9
AMANSIE EAST	33.3	0.09	30	26.3
AMANSIE WEST	62.5	0.18	8	29.3
SEKYERE EAST	31.8	0.10	22	31.9
KWABRE	40.0	0.13	15	32.7
SEKYERE WEST	40.0	0.13	15	32.7
ATWIMA	29.4	0.11	17	38.7
ADANSI EAST	36.4	0.15	11	41.8
ADANSI WEST	26.7	0.12	15	44.3
AFIGYA SEKYERE	37.5	0.18	8	48.8
BOSOMTWI KWANWOMA	30.0	0.15	10	50.9
ASHANTI AKIM NORTH	25.0	0.13	12	52.2
AHAFO-ANO SOUTH	18.2	0.12	11	67.1
ASHANTI AKIM SOUTH	11.1	0.11	9	100.0
EJURA SEKODUMASI	33.3	0.33	3	100.0
OFFINSO	8.3	0.08	12	100.0
EJISU-JUABEN	0.0	0.00	6	-
AHAFO-ANO NORTH	0.0	0.00	4	-
REGIONAL TOTAL	**34.6**	**0.03**	**280**	**8.2**
BRONG AHAFO				
JAMAN	60.6	0.09	33	14.3
SUNYANI	70.0	0.11	20	15.0
TECHIMAN	63.6	0.10	22	16.5
ASUTIFI	62.5	0.13	16	20.0
ATEBUBU	57.9	0.12	19	20.1
DORMAA	52.4	0.11	21	21.3
WENCHI	36.4	0.10	22	28.9
SENE	46.2	0.14	13	31.2
ASUNAFO	29.2	0.09	24	32.5
NKORANZA	29.4	0.11	17	38.7
KINTAMPO	26.7	0.12	15	44.3
TANO	33.3	0.21	6	63.2
BEREKUM	0.0	0.00	7	-
REGIONAL TOTAL	**47.7**	**0.03**	**235**	**6.9**

Table 6.2 cont.: Direct Estimates of the Proportion of Home Deliveries to Women Aged 20-34 Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
NORTHERN				
BOLE	100.0	0.00	33	0.0
YENDI	100.0	0.00	26	0.0
SAVELUGU-NANTON	100.0	0.00	11	0.0
NANUMBA	94.1	0.06	17	6.3
EAST GONJA	82.7	0.05	52	6.4
GUSHIEGU-KARAGA	90.0	0.07	20	7.6
ZABZUGU-TATALI	92.9	0.07	14	7.7
TAMALE	81.3	0.07	32	8.6
WEST GONJA	85.0	0.08	20	9.6
WEST MAMPRUSI	90.0	0.10	10	11.1
EAST MAMPRUSI	66.7	0.09	30	13.1
SABOBA-CHEREPONI	77.8	0.15	9	18.9
TOLON-KUMBUNGU	61.5	0.14	13	22.8
REGIONAL TOTAL	**86.1**	**0.02**	**287**	**2.4**
UPPER EAST				
BAWKU EAST	83.8	0.06	37	7.3
BUILSA	80.8	0.08	26	9.8
KASENA-NANKANA	80.8	0.08	26	9.8
BOLGATANGA	68.8	0.08	32	12.1
BAWKU WEST	84.6	0.10	13	12.3
BONGO	50.0	0.22	6	44.7
REGIONAL TOTAL	**77.9**	**0.04**	**140**	**4.5**
UPPER WEST				
NADAWLI	86.5	0.06	37	6.6
LAWRA	88.9	0.06	27	6.9
SISSALA	70.0	0.11	20	15.0
WA	46.0	0.07	50	15.5
JIRAPA-LAMBUSSIE	57.7	0.10	26	17.1
REGIONAL TOTAL	**67.5**	**0.04**	**140**	**5.5**
OVERALL TOTAL	**55.3**	**0.01**	**1839**	**2.1**

Table 6.3: Direct Estimates of the Proportion of Home Deliveries to Women Aged 35+ Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
WESTERN				
NZIMA EAST	85.7	0.14	7	16.7
WASSA WEST	85.7	0.14	7	16.7
SHAMA-AHANTA EAST	75.0	0.25	4	33.3
WASSA AMENFI	60.0	0.24	5	40.8
JUABESO-BIA	60.0	0.24	5	40.8
JOMORO	66.7	0.33	3	50.0
AHANTA WEST	66.7	0.33	3	50.0
MPOHOR-WASSA EAST	66.7	0.33	3	50.0
AOWIN-SUAMAN	50.0	0.29	4	57.7
SEFWI WIASO	50.0	0.50	2	100.0
SEFWI BIBIANI	100.0	-	1	-
REGIONAL TOTAL	**70.5**	**0.07**	**44**	**9.9**
CENTRAL				
AGONA	100.0	0.00	3	0.0
KOMENDA-EDINA-EGYAFO-ABIREM	80.0	0.20	5	25.0
ABURA-ASEBU-KWAMANKESE	75.0	0.25	4	33.3
MFANTSIMAN	66.7	0.33	3	50.0
ASIKUMA-ODOBEN-BRAKWA	66.7	0.33	3	50.0
AJUMAKO-ENYAN-ESIAM	66.7	0.33	3	50.0
ASSIN	40.0	0.24	5	61.2
CAPE COAST	50.0	0.50	2	100.0
GOMOA	25.0	0.25	4	100.0
EFUTU-EWUTU-SENYA	0.0	-	1	-
LOWER DENKYIRA	0.0	-	1	-
UPPER DENKYIRA	0.0	-	1	-
REGIONAL TOTAL	**57.1**	**0.08**	**35**	**14.9**
GREATER ACCRA				
ACCRA METROPOLITAN	31.8	0.10	22	31.9
GA	7.7	0.08	13	100.0
DANGBE WEST	25.0	0.25	4	100.0
TEMA	0.0	0.00	10	-
DANGBE EAST	0.0	-	1	-
REGIONAL TOTAL	**18.0**	**0.05**	**50**	**30.4**
VOLTA				
HOHOE	75.0	0.25	4	33.3
NKWANTA	75.0	0.25	4	33.3
HO	50.0	0.22	6	44.7
KPANDU	50.0	0.22	6	44.7
JASIKAN	42.9	0.20	7	47.1
KETA	66.7	0.33	3	50.0
KADJEBI	66.7	0.33	3	50.0
SOUTH TONGU	50.0	0.29	4	57.7
AKATSI	50.0	0.29	4	57.7
KETU	28.6	0.18	7	64.5
KRACHI	0.0	0.00	3	-
REGIONAL TOTAL	**49.0**	**0.07**	**51**	**14.2**

Table 6.3 cont.: Direct Estimates of the Proportion of Home Deliveries to Women Aged 35+ Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
EASTERN				
WEST AKIM	100.0	0.00	2	0.0
AFRAM PLAINS	100.0	0.00	2	0.0
BIRIM NORTH	83.3	0.17	6	20.0
KWAHU SOUTH	83.3	0.17	6	20.0
BIRIM SOUTH	80.0	0.20	5	25.0
SUHUM-KRABOA-COALTAR	80.0	0.20	5	25.0
AKWAPIM NORTH	80.0	0.20	5	25.0
EAST AKIM	40.0	0.16	10	40.8
KOFORIDUA	66.7	0.33	3	50.0
YILO KROBO	66.7	0.33	3	50.0
MANYA KROBO	28.6	0.18	7	64.5
FANTEAKWA	50.0	0.50	2	100.0
AKWAPIM SOUTH	33.3	0.33	3	100.0
KWAEBIBIREM	0.0	-	1	-
ASUOGYAMAN	100.0	-	1	-
REGIONAL TOTAL	**63.9**	**0.06**	**61**	**9.7**
ASHANTI				
EJURA SEKODUMASI	100.0	0.00	2	0.0
KUMASI METROPOLITAN	48.0	0.10	25	21.2
AMANSIE EAST	70.0	0.15	10	21.8
KWABRE	47.1	0.12	17	26.5
SEKYERE WEST	75.0	0.25	4	33.3
ATWIMA	60.0	0.24	5	40.8
SEKYERE EAST	50.0	0.29	4	57.7
ADANSI WEST	40.0	0.24	5	61.2
ASHANTI AKIM NORTH	40.0	0.24	5	61.2
BOSOMTWI KWANWOMA	33.3	0.21	6	63.2
ADANSI EAST	25.0	0.25	4	100.0
OFFINSO	25.0	0.25	4	100.0
ASHANTI AKIM SOUTH	0.0	0.00	3	-
EJISU-JUABEN	0.0	0.00	3	-
AHAFO-ANO SOUTH	0.0	0.00	2	-
AHAFO-ANO NORTH	0.0	0.00	2	-
REGIONAL TOTAL	**44.6**	**0.05**	**101**	**11.5**
BRONG AHAFO				
TANO	100.0	0.00	3	0.0
WENCHI	55.6	0.18	9	31.6
JAMAN	40.0	0.13	15	32.7
DORMAA	50.0	0.19	8	37.8
NKORANZA	60.0	0.24	5	40.8
SENE	50.0	0.22	6	44.7
ATEBUBU	40.0	0.24	5	61.2
ASUNAFO	33.3	0.21	6	63.2
SUNYANI	33.3	0.21	6	63.2
TECHIMAN	50.0	0.50	2	100.0
ASUTIFI	0.0	-	1	-
KINTAMPO	0.0	0.00	6	-
REGIONAL TOTAL	**43.1**	**0.06**	**72**	**13.6**

Table 6.3 cont.: Direct Estimates of the Proportion of Home Deliveries to Women Aged 35+ Years

Region/District	Direct estimates (%)	Standard error	Sample size	RSE (%)
NORTHERN				
BOLE	100.0	0.00	9	0.0
ZABZUGU-TATALI	100.0	0.00	12	0.0
YENDI	100.0	0.00	12	0.0
SAVELUGU-NANTON	100.0	0.00	5	0.0
WEST MAMPRUSI	100.0	0.00	9	0.0
WEST GONJA	94.1	0.06	17	6.3
EAST GONJA	81.8	0.12	11	14.9
EAST MAMPRUSI	68.8	0.12	16	17.4
GUSHIEGU-KARAGA	80.0	0.20	5	25.0
NANUMBA	71.4	0.18	7	25.8
TAMALE	71.4	0.18	7	25.8
TOLON-KUMBUNGU	50.0	0.22	6	44.7
SABOBA-CHEREPONI	0.0	-	1	-
REGIONAL TOTAL	**85.5**	**0.03**	**117**	**3.8**
UPPER EAST				
BAWKU WEST	100.0	0.00	6	0.0
BAWKU EAST	88.0	0.07	25	7.5
BUILSA	90.0	0.10	10	11.1
BOLGATANGA	80.0	0.11	15	13.4
KASENA-NANKANA	50.0	0.29	4	57.7
BONGO	0.0	-	1	-
REGIONAL TOTAL	**83.6**	**0.05**	**61**	**5.7**
UPPER WEST				
LAWRA	87.5	0.09	16	9.8
JIRAPA-LAMBUSSIE	75.0	0.13	12	17.4
NADAWLI	69.2	0.13	13	19.2
SISSALA	64.3	0.13	14	20.7
WA	40.7	0.10	27	23.7
REGIONAL TOTAL	**63.4**	**0.05**	**82**	**8.4**
OVERALL TOTAL	**59.8**	**0.02**	**674**	**3.2**

Appendix VII

Table 7.1: Model-Based Estimates of Proportion of Women Exposed to Mistimed Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
WESTERN				
SHAMA-AHANTA EAST	68.5	25.0	2.1	27.0
WASSA WEST	60.6	30.9	4.4	28.6
NZIMA EAST	59.5	32.0	6.1	28.8
AHANTA WEST	60.4	32.6	6.0	29.2
JOMORO	58.5	34.0	6.0	29.9
WASSA AMENFI	57.9	35.9	9.0	31.3
AOWIN-SUAMAN	48.8	38.3	9.5	32.0
JUABESO-BIA	40.9	40.1	10.9	32.1
SEFWI BIBIANI	60.3	36.6	7.2	32.4
SEFWI WIASO	59.1	37.0	8.5	32.6
MPOHOR-WASSA EAST	69.2	38.0	11.8	34.5
CENTRAL				
CAPE COAST	74.4	30.3	2.0	30.2
EFUTU-EWUTU-SENYA	62.1	35.2	5.2	31.0
MFANTSIMAN	67.9	42.2	7.8	34.8
GOMOA	67.3	41.0	7.6	35.0
LOWER DENKYIRA	62.0	42.6	9.8	35.3
AGONA	68.2	42.7	7.8	35.3
ABURA-ASEBU-KWAMANKESE	67.4	45.7	11.0	36.7
KOMENDA-EDINA-EGYAFO-ABIREM	70.7	45.3	8.9	37.4
ASIKUMA-ODOBEN-BRAKWA	68.0	45.8	11.8	37.4
ASSIN	67.3	44.4	11.1	37.5
UPPER DENKYIRA	63.1	47.1	10.3	37.9
AJUMAKO-ENYAN-ESIAM	70.7	48.1	12.1	38.2
GREATER ACCRA				
GA	66.3	21.7	1.6	25.3
TEMA	66.6	21.4	1.2	25.4
ACCRA METROPOLITAN	73.5	25.6	1.5	28.3
DANGBE WEST	59.9	42.8	8.2	34.8
DANGBE EAST	69.9	40.6	9.5	36.5
VOLTA				
AKATSI	44.5	30.1	5.3	23.9
KETU	51.3	28.3	3.9	24.3
KPANDU	58.6	25.6	3.1	24.5
HO	51.9	29.3	3.3	25.0
KADJEBI	49.5	30.6	5.2	25.2
JASIKAN	50.8	29.9	4.7	25.5
KETA	51.1	32.5	4.3	26.3
HOHOE	59.8	29.1	3.7	26.6
NORTH TONGU	52.3	29.7	5.3	26.7
KRACHI	33.0	36.7	9.3	27.5
NKWANTA	35.2	36.8	9.9	28.2
SOUTH TONGU	56.5	34.6	5.4	29.5

Table 7.1 Cont.: Model-Based Estimates of Proportion of Women Exposed to Mistimed Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
EASTERN				
KOFORIDUA	62.4	24.6	1.6	25.4
SUHUM-KRABOA-COALTAR	53.1	30.1	4.7	25.8
YILO KROBO	48.6	32.7	5.1	26.7
MANYA KROBO	53.0	33.1	5.2	27.7
ASUOGYAMAN	58.7	30.0	3.8	27.8
BIRIM SOUTH	59.8	31.7	4.8	27.9
AKWAPIM SOUTH	57.2	34.0	4.4	28.4
AKWAPIM NORTH	63.9	31.5	4.4	28.5
KWAEBIBIREM	61.8	33.2	5.6	29.3
FANTEAKWA	52.3	37.3	7.3	29.8
EAST AKIM	65.4	33.8	5.2	29.9
WEST AKIM	57.0	36.6	6.7	30.4
KWAHU SOUTH	64.5	36.6	6.1	30.8
AFRAM PLAINS	32.9	44.1	13.2	32.4
BIRIM NORTH	60.4	39.6	9.4	32.7
ASHANTI				
KUMASI METROPOLITAN	70.9	24.9	2.2	29.2
ADANSI WEST	66.7	32.9	4.4	31.4
AMANSIE EAST	63.8	36.0	9.6	31.9
EJISU-JUABEN	70.8	33.3	6.3	32.2
SEKYERE WEST	63.1	38.2	8.9	33.2
KWABRE	75.0	33.2	6.6	33.6
BOSOMTWI KWANWOMA	77.3	35.3	9.3	34.1
ASHANTI AKIM NORTH	71.7	37.7	8.3	34.8
AFIGYA SEKYERE	66.2	40.0	8.8	34.8
OFFINSO	66.5	40.5	10.0	35.9
ATWIMA	74.7	38.2	9.8	36.2
ADANSI EAST	64.1	41.5	12.3	36.5
EJURA SEKODUMASI	64.2	42.7	11.4	36.9
AMANSIE WEST	33.4	50.8	17.9	37.2
AHAFO-ANO NORTH	66.5	42.5	12.3	37.5
ASHANTI AKIM SOUTH	68.8	45.6	11.6	37.5
SEKYERE EAST	77.5	39.5	13.7	38.3
AHAFO-ANO SOUTH	78.2	39.5	20.1	39.1
BRONG AHAFO				
SUNYANI	56.8	27.4	2.8	26.5
TECHIMAN	53.3	29.8	4.7	27.3
DORMAA	55.2	30.8	5.7	27.5
NKORANZA	52.7	32.9	7.1	28.3
BEREKUM	60.8	29.8	3.6	28.3
JAMAN	57.2	31.1	5.9	28.9
SENE	36.9	37.1	12.2	29.5
TANO	58.1	33.9	6.4	29.9
ASUTIFI	62.8	33.7	7.6	30.4
ASUNAFO	56.2	34.5	8.0	30.6
WENCHI	50.8	37.6	7.6	30.9
KINTAMPO	46.6	39.6	10.2	31.4
ATEBUBU	56.1	48.0	15.1	39.9

Table 7.1 Cont.: Model-Based Estimates of Proportion of Women Exposed to Mistimed Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
NORTHERN				
TAMALE	77.9	46.5	7.1	40.7
EAST GONJA	54.0	59.2	24.7	48.1
YENDI	64.8	60.7	25.5	50.5
TOLON-KUMBUNGU	69.3	61.7	26.6	51.5
SAVELUGU-NANTON	78.0	61.0	27.1	52.1
EAST MAMPRUSI	69.7	61.9	25.9	52.3
BOLE	62.3	64.4	31.0	52.4
WEST GONJA	53.7	66.6	31.4	53.2
SABOBA-CHEREPONI	57.2	65.8	29.3	53.7
WEST MAMPRUSI	68.6	66.4	29.7	53.9
NANUMBA	48.5	70.7	35.2	55.9
ZABZUGU-TATALI	46.7	70.8	37.7	56.9
GUSHIEGU-KARAGA	38.7	76.6	46.5	60.9
UPPER EAST				
KASENA-NANKANA	66.3	52.5	13.6	40.4
BOLGATANGA	68.0	51.8	11.8	40.6
BAWKU EAST	65.7	58.2	21.4	46.6
BAWKU WEST	68.0	58.9	23.7	46.7
BUILSA	70.4	62.2	20.3	47.4
BONGO	82.5	57.3	28.1	49.0
UPPER WEST				
NADAWLI	63.6	48.6	15.7	39.4
SISSALA	45.3	52.8	15.8	39.4
LAWRA	70.9	45.8	14.3	39.5
WA	60.7	51.0	17.6	41.6
JIRAPA-LAMBUSSIE	64.5	55.7	18.8	43.6

Table 7.2: Model-Based Estimates of Proportion of Women Exposed to Unwanted Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
WESTERN				
JUABESO-BIA	2.4	9.7	37.7	16.2
WASSA WEST	4.3	10.3	35.7	16.9
MPOHOR-WASSA EAST	2.6	14.4	31.6	18.2
NZIMA EAST	3.8	11.6	39.8	19.3
AOWIN-SUAMAN	3.5	12.5	47.1	20.7
SEFWI BIBIANI	4.6	13.6	45.3	21.4
JOMORO	5.1	14.0	46.9	22.6
WASSA AMENFI	3.9	15.1	47.4	23.5
SEFWI WIASO	4.5	15.4	49.1	23.5
AHANTA WEST	5.1	14.9	47.4	23.6
SHAMA-AHANTA EAST	11.9	18.0	45.4	25.1
CENTRAL				
UPPER DENKYIRA	7.2	19.6	55.4	29.2
KOMENDA-EDINA-EGYAFO-ABIREM	7.6	18.7	55.3	29.4
ASSIN	6.7	21.8	57.6	31.0
AGONA	8.9	20.9	58.3	31.8
AJUMAKO-ENYAN-ESIAM	6.8	20.9	57.8	32.6
ABURA-ASEBU-KWAMANKESE	7.0	21.1	60.0	33.0
GOMOA	9.9	23.4	64.4	34.5
LOWER DENKYIRA	8.7	25.5	63.0	34.8
EFUTU-EWUTU-SENYA	12.0	24.3	65.3	34.9
MFANTSIMAN	10.0	23.4	63.7	35.2
ASIKUMA-ODOBEN-BRAKWA	8.0	25.5	62.6	35.8
CAPE COAST	24.6	27.6	56.7	35.9
GREATER ACCRA				
ACCRA METROPOLITAN	13.7	14.8	37.2	21.0
GA	12.5	17.6	42.8	23.4
DANGBE WEST	6.8	17.2	53.8	27.1
DANGBE EAST	6.9	22.6	56.0	30.3
TEMA	23.5	26.0	54.7	33.5
VOLTA				
SOUTH TONGU	6.5	14.9	51.6	25.3
HO	9.0	16.6	48.7	25.9
KRACHI	4.3	15.1	59.9	26.7
HOHOE	9.0	18.3	50.5	27.4
KADJEBI	6.2	16.0	53.9	27.6
NKWANTA	4.4	16.4	60.8	27.7
NORTH TONGU	6.6	18.1	56.9	28.2
KPANDU	9.4	18.8	52.4	28.4
JASIKAN	7.5	17.8	57.5	29.2
KETU	8.1	16.8	59.5	30.0
KETA	9.0	16.8	60.2	30.5
AKATSI	7.1	18.4	62.8	32.3

Table 7.2 Cont.: Model-Based Estimates of Proportion of Women Exposed to Unwanted Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
EASTERN				
KOFORIDUA	14.2	16.5	45.0	25.0
AFRAM PLAINS	3.8	15.1	55.6	25.4
BIRIM SOUTH	6.7	15.7	50.1	25.6
ASUOGYAMAN	9.7	19.4	55.4	29.0
MANYA KROBO	7.8	17.5	58.7	29.3
FANTEAKWA	6.9	18.7	59.0	30.4
SUHUM-KRABOA-COALTAR	8.0	18.7	59.4	30.6
YILO KROBO	8.8	19.6	61.4	31.2
EAST AKIM	9.4	21.3	56.0	31.3
KWAEBIBIREM	8.8	21.9	57.8	31.4
AKWAPIM SOUTH	11.4	21.5	59.1	32.3
AKWAPIM NORTH	10.6	22.1	59.4	32.8
WEST AKIM	8.7	21.7	61.8	32.8
BIRIM NORTH	8.2	26.2	63.3	36.0
KWAHU SOUTH	11.4	25.7	63.7	36.9
ASHANTI				
KUMASI METROPOLITAN	6.7	11.2	29.9	15.2
KWABRE	4.4	15.4	33.7	18.6
ADANSI WEST	6.9	14.5	44.9	21.8
ASHANTI AKIM SOUTH	3.8	13.2	43.8	22.6
BOSOMTWI KWANWOMA	4.4	19.9	37.9	23.2
ASHANTI AKIM NORTH	5.6	19.0	46.1	25.2
ATWIMA	5.0	19.7	46.7	25.4
AHAFO-ANO NORTH	4.5	18.6	49.0	25.6
AFIGYA SEKYERE	5.5	17.3	50.1	25.9
AHAFO-ANO SOUTH	2.9	27.3	37.2	26.7
AMANSIE WEST	4.2	18.8	53.7	27.1
EJURA SEKODUMASI	5.0	18.1	55.0	27.4
SEKYERE EAST	4.5	24.6	45.3	27.5
ADANSI EAST	4.7	19.2	55.7	28.1
EJISU-JUABEN	7.8	23.0	52.7	29.3
OFFINSO	6.0	20.3	57.7	29.3
AMANSIE EAST	5.4	22.1	52.8	29.7
SEKYERE WEST	7.3	24.0	58.8	32.4
BRONG AHAFO				
ASUNAFO	2.3	9.1	30.4	14.3
BEREKUM	5.0	9.9	36.6	17.0
ATEBUBU	2.3	9.8	41.1	17.5
WENCHI	3.2	9.4	40.7	17.9
ASUTIFI	2.9	10.9	37.0	18.2
JAMAN	3.4	10.6	40.2	18.2
NKORANZA	2.9	10.0	40.3	18.5
SUNYANI	7.4	12.4	42.8	20.2
TANO	4.1	11.9	43.2	20.4
KINTAMPO	3.2	12.1	43.8	20.6
DORMAA	4.1	12.3	43.9	20.9
TECHIMAN	5.1	12.5	46.4	20.9
SENE	3.2	16.0	53.8	25.0

Table 7.2 Cont.: Model-Based Estimates of Proportion of Women Exposed to Unwanted Pregnancy (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
NORTHERN				
TAMALE	2.4	5.0	20.8	9.2
TOLON-KUMBUNGU	0.8	4.1	22.5	9.5
SAVELUGU-NANTON	0.9	4.9	21.4	9.8
GUSHIEGU-KARAGA	0.7	4.2	24.3	9.8
YENDI	1.0	5.1	24.4	10.4
SABOBA-CHEREPONI	1.1	5.1	29.0	11.0
EAST GONJA	1.0	5.2	29.1	11.3
WEST GONJA	1.0	5.2	27.6	11.5
NANUMBA	1.0	5.0	29.1	11.5
BOLE	0.9	5.1	26.5	11.8
ZABZUGU-TATALI	1.0	5.5	31.0	12.0
WEST MAMPRUSI	1.0	4.7	27.5	12.1
EAST MAMPRUSI	1.8	8.5	37.8	16.2
UPPER EAST				
BAWKU EAST	1.9	7.7	41.3	18.5
BAWKU WEST	1.7	7.6	42.7	20.2
BONGO	1.9	13.8	34.0	20.5
BUILSA	2.5	7.7	45.3	21.3
BOLGATANGA	4.5	11.8	49.5	23.9
KASENA-NANKANA	3.7	10.7	49.8	24.2
UPPER WEST				
JIRAPA-LAMBUSSIE	1.1	4.3	27.8	12.5
LAWRA	1.5	7.0	27.9	13.3
NADAWLI	1.3	5.8	29.6	13.7
WA	1.8	8.7	32.5	15.4
SISSALA	2.0	6.9	44.2	17.9

Table 7.3: Model-Based Estimates of Proportion of Home Deliveries (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
WESTERN				
MPOHOR-WASSA EAST	45.2	46.8	49.5	47.4
WASSA AMENFI	50.3	49.7	52.4	50.7
JUABESO-BIA	40.6	53.2	55.9	51.7
AHANTA WEST	55.3	51.2	53.9	52.9
AOWIN-SUAMAN	52.6	57.0	59.7	57.0
JOMORO	60.1	57.9	60.5	59.1
SHAMA-AHANTA EAST	67.4	59.0	61.6	61.6
SEFWI BIBIANI	65.5	64.4	66.8	65.3
NZIMA EAST	75.3	72.5	74.6	73.7
WASSA WEST	77.5	74.9	76.9	76.0
SEFWI WIASO	77.4	76.8	78.7	77.5
CENTRAL				
UPPER DENKYIRA	34.7	39.3	41.9	39.3
ASSIN	45.7	45.4	48.1	46.4
EFUTU-EWUTU-SENYA	55.4	51.2	53.9	52.9
GOMOA	63.5	58.9	61.5	60.7
ABURA-ASEBU-KWAMANKESE	62.3	60.8	63.4	62.0
AJUMAKO-ENYAN-ESIAM	63.5	62.4	64.9	63.5
MFANTSIMAN	67.3	63.8	66.2	65.3
LOWER DENKYIRA	65.5	67.7	70.0	68.1
ASIKUMA-ODOBEN-BRAKWA	69.8	69.8	72.0	70.6
CAPE COAST	75.9	70.7	72.9	72.4
AGONA	74.6	72.9	75.0	74.0
KOMENDA-EDINA-EGYAFO-ABIREM	79.5	77.5	79.4	78.5
GREATER ACCRA				
DANGBE WEST	11.6	12.9	14.1	13.0
DANGBE EAST	14.2	12.7	14.0	13.4
GA	17.7	13.1	14.4	14.4
TEMA	19.6	15.0	16.4	16.4
ACCRA METROPOLITAN	27.5	20.6	22.4	22.5
VOLTA				
KRACHI	27.6	36.1	38.6	35.2
AKATSI	43.6	42.8	45.4	43.9
HO	43.1	45.4	48.1	45.9
JASIKAN	50.8	48.8	51.5	50.1
HOHOE	55.0	51.9	54.5	53.4
KETA	54.9	52.7	55.3	54.1
NKWANTA	47.2	56.1	58.7	55.1
SOUTH TONGU	56.5	54.9	57.5	56.1
KETU	60.0	54.4	57.1	56.4
NORTH TONGU	59.7	56.6	59.2	58.1
KPANDU	69.3	64.0	66.5	65.9
KADJEBI	66.5	66.0	68.4	67.0

Table 7.3 Cont.: Model-Based Estimates of Proportion of Home Deliveries (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
EASTERN				
KWAEBIBIREM	33.9	31.1	33.4	32.4
AKWAPIM SOUTH	32.6	33.0	35.4	33.7
EAST AKIM	44.2	39.7	42.3	41.5
MANYA KROBO	44.1	42.2	44.9	43.5
WEST AKIM	46.5	46.2	48.9	47.2
FANTEAKWA	45.2	47.4	50.1	47.9
AFRAM PLAINS	34.2	51.3	54.0	48.8
YILO KROBO	47.7	48.9	51.6	49.5
BIRIM NORTH	56.7	58.1	60.7	58.8
KOFORIDUA	61.9	57.1	59.7	58.9
BIRIM SOUTH	62.4	58.1	60.7	59.8
ASUOGYAMAN	61.7	58.2	60.8	59.9
SUHUM-KRABOA-COALTAR	69.4	66.2	68.6	67.6
KWAHU SOUTH	69.4	66.7	69.1	68.1
AKWAPIM NORTH	73.5	68.2	70.5	70.1
ASHANTI				
AHAFO-ANO SOUTH	16.5	17.3	18.9	17.7
EJISU-JUABEN	23.9	19.5	21.3	20.9
AHAFO-ANO NORTH	21.3	21.8	23.7	22.3
OFFINSO	24.3	21.4	23.3	22.6
ASHANTI AKIM SOUTH	22.9	21.9	23.8	22.8
BOSOMTWI KWANWOMA	32.3	27.8	30.1	29.4
ASHANTI AKIM NORTH	32.4	29.0	31.2	30.4
SEKYERE EAST	34.5	31.1	33.4	32.5
ATWIMA	39.1	33.2	35.6	35.1
ADANSI WEST	39.0	33.2	35.7	35.1
ADANSI EAST	37.4	35.4	37.9	36.6
AMANSIE EAST	37.0	36.1	38.7	37.2
AMANSIE WEST	19.3	41.4	44.1	38.2
AFIGYA SEKYERE	40.3	38.3	40.9	39.6
SEKYERE WEST	41.6	41.2	43.9	42.2
KWABRE	47.1	41.4	44.1	43.3
EJURA SEKODUMASI	48.8	47.2	49.9	48.4
KUMASI METROPOLITAN	57.9	48.4	51.1	51.3
BRONG AHAFO				
KINTAMPO	22.3	28.7	30.9	28.1
ASUNAFO	30.0	31.9	34.3	32.3
SENE	33.0	43.5	46.2	42.3
WENCHI	39.9	42.2	44.9	42.5
NKORANZA	45.1	43.6	46.3	44.7
TANO	47.3	44.4	47.1	45.8
ATEBUBU	44.5	49.7	52.4	49.4
ASUTIFI	54.5	49.9	52.6	51.7
DORMAA	53.5	50.3	53.0	51.8
JAMAN	56.8	52.2	54.9	54.0
SUNYANI	57.0	53.0	55.7	54.7
BEREKUM	55.4	55.9	58.5	56.6
TECHIMAN	58.5	55.2	57.9	56.7

Table 7.3 Cont.: Model-Based Estimates of Proportion of Home Deliveries (%)

REGION/DISTRICT	15-19 YEARS	20-34 YEARS	35+ YEARS	WEIGHTED AVERAGE
NORTHERN				
EAST MAMPRUSI	69.9	73.3	75.4	73.2
TOLON-KUMBUNGU	71.4	74.2	76.2	74.4
TAMALE	82.3	78.3	80.0	79.6
EAST GONJA	76.2	83.6	85.1	82.5
SABOBA-CHEREPONI	76.1	84.9	86.2	83.4
NANUMBA	72.9	87.4	88.6	85.1
GUSHIEGU-KARAGA	67.8	90.0	90.9	86.6
WEST GONJA	78.2	88.3	89.4	86.8
ZABZUGU-TATALI	79.3	91.1	92.0	89.2
WEST MAMPRUSI	88.4	90.6	91.5	90.5
BOLE	91.8	94.5	95.1	94.2
YENDI	93.2	95.1	95.6	94.9
SAVELUGU-NANTON	94.9	94.7	95.2	94.9
UPPER EAST				
BONGO	61.1	59.9	62.4	61.2
BOLGATANGA	76.8	75.8	77.7	76.7
KASENA-NANKANA	80.0	78.6	80.4	79.5
BUILSA	82.6	81.6	83.2	82.4
BAWKU WEST	83.2	82.1	83.6	82.8
BAWKU EAST	82.3	82.8	84.3	83.2
UPPER WEST				
WA	39.2	46.9	49.6	46.3
JIRAPA-LAMBUSSIE	63.9	64.0	66.5	64.9
SISSALA	59.9	67.7	70.0	66.9
NADAWLI	82.0	81.5	83.0	82.1
LAWRA	88.7	86.9	88.1	87.7