Spatial analysis of choice of place of delivery in Nigeria

Ezra Gayawan *

Department of Mathematical Sciences, Redeemer's University, Redemption City, Nigeria
Center for Regional Development and Planning (CEDEPLAR), Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

ARTICLE INFO

ABSTRACT

Objective: Access to quality healthcare during childbirth is a crucial factor for taming maternal and child mortality and morbidity. Increasing this access in developing countries depends on understanding the factors influencing maternal healthcare decision at a geographical location. This study analyzes spatial pattern in choice of place of delivery in Nigeria.
Method: Data analyzed came from Nigerian Demographic and Health Survey data set. The choice of place delivery was considered a multi-categorical response and a multinomial logistic regression model used to evaluate spatial variations in choosing a particular place to deliver against home delivery.
Results: Results show a north–south divide in choosing health facilities against homes for delivery. The likelihood of institutional delivery was significantly lower for women residing in Bayelsa and the majority of the states in northern Nigeria. As women advance in age, they have more likelihood of having institutional deliveries. Other contributing factors that favor institutional deliveries include use of antenatal care services, urban dwelling, mass media and parity.
Conclusion: Usage of mass media to campaign for institutional deliveries particularly in northern Nigeria, among younger women and those of higher parity; encouraging the use of antenatal services and even distribution of health facilities making them easily accessible to rural women are important for enhancing chances of institutional deliveries. Also, state-specific policies in this regard are indispensable.

© 2014 Elsevier B.V. All rights reserved.

Introduction

Access to quality healthcare during pregnancy and, in particular, during delivery is a crucial factor in explaining the huge disparity in maternal and perinatal mortality and morbidity between developing and the industrialized world. Globally, there has been a significant decline in maternal and child mortality with some countries already reaching the millennium development goals (MDG) targets. However, the rates are still high, with slower progress towards meeting the targets in many countries particularly in sub-Saharan Africa. The region accounts for more than half of global burden of maternal deaths in 2010. The lifetime risk of maternal deaths in sub-Saharan Africa is 1 in 39; 1 in 290 in South-eastern Asia and in developed countries, it is 1 in 3800 [1]. Among sub-Saharan African countries, Nigeria is making much slower progress in maternal and child health indicators. With an approximately two percent of the world's population, the country, which ranked second in maternal mortality ratio in the world, contributes about 14% of the world's maternal deaths [1,2].

An emerging consensus has it that the majority of these deaths can be prevented if deliveries are overseen by skilled midwives. For instance, Equatorial Guinea recorded a 72% reduction in maternal mortality during 1990–2008 by improving the proportion of births attended to by a skilled personnel from 5% in 1994 to 64.6% in 2000 [3]. Most births that take place at home are often overseen by relatives or, at best, relying on personal experience of childbirth [4]. In a study in Lagos, Nigeria, about 82% of women who had home delivery among those studied did so without any skilled attendants at delivery. However, those who had theirs in health facilities were attended to by at least a health professional [5]. Increasing the percentage of institutional deliveries is, therefore, an important factor that links the women with skilled midwives leading to reduction in deaths arising from complications during childbirth. The expectation is that if complication arises, available skilled health workers can manage it or refer the mother to the next level of care. This has been illustrated in a historical case of a religious sect in the U.S., whose women, though socioeconomically privileged than those in the developing countries, refused to utilize modern obstetric care and the outcome was a high maternal mortality rate for the group that was similar to those being experienced in developing countries [6]. Nigeria adopted the concept of Primary Health Care (PHC) with the aim of bringing healthcare services as

* Tel.: +234 8034184407.
  E-mail addresses: ezrascribe@yahoo.com, gayawane@run.edu.ng

near as possible to every household. There is also a reproductive health policy that upholds PHC as the key to health development in the country. In addition, the recent integrated maternal, newborn and child health strategy further reinforced PHC as the foundation for effective and accessible reproductive healthcare [7]. In spite of these, only 35% of deliveries were made at any heath facilities in the five-years period preceding the 2008 Nigeria Demographic and Health Survey (NDHS) [8].

There is a number of evidence that suggest that distance to healthcare facilities is a strong determinant of the choice of maternal health services [4,9,10]. However, factors other than distance have been examined and found to have significantly determined where women receive these services. Individual, household, and community level factors may determine where one receives the services at the time of need. Several studies have assessed the contributions of individual and household determinants [11–14]. For instance, distance of more than one hour to maternity hospital, low amenity score status, low education, multi-parity and not seeking antenatal care during pregnancy were found to be significantly associated with increased risk of home delivery in Nepal [4]. A study on the use of obstetric services in rural Nigeria shows that maternal educational level and occupation, religion, and occupation of the spouse were associated with the use of health institutions for delivery [15]. Other factors that have been considered important in Nigeria include women's social class, use of herbal drug in pregnancy, type of residential accommodation, and obstetric history [5,16]. Utilization of healthcare services varies substantially across geographical locations in Nigeria resulting in lopsided health indicators [8,17,18]. In the six geopolitical zones of the country, utilization of skilled health provider for antenatal services in the five-years preceding the 2008 NDHS was 31.1% in the North West (lowest) and 87.1% in the South West (highest). Deliveries at health facilities in the same period was 73.9% (highest) in the South East but only 8.4% (lowest) in the North West region [8]. The information, at zonal level, is highly aggregated since each zone consists of about six states and, therefore, may conceal state-specific effects. Moreover, no covariate has been adjusted for, which may lead to misleading conclusions. Quantifying residual spatial effects of choice of place of delivery among women in Nigeria, after taking other variables into account, broaden our knowledge of geographical variations in utilization of health facilities in the country. By highlighting health-seeking behavior of women during deliveries according to their state of residence, resource allocation, health promotion campaigns and improved delivery of services can be tailored-designed to the needs of the areas as any potential policy intervention is more effective when planned at local level [19].

Majority of previous studies on maternal healthcare utilization have considered and modeled all determinants parametrically and also neglected the possibility of any geographical variation. Such assumption of linear predictor for assessing the effects of metrical covariates on the response variable is too restrictive and rigid in realistically complex situations [20,21]. In this study, a unified multinomial modeling framework that enables investigations of the association between choice of place of delivery, individual and household characteristics as well as state specific effects is adopted. The multinomial framework is considered appropriate because it allows separate treatment of different choices versus a control or baseline group. Multinomial models have been accorded much attention and have been extended to incorporate flexible nonparametric modeling of continuous covariates while, at the same time, controlling for spatial random effects to deal with possible heterogeneity that might be present in the data, and spatially structured variations within the framework of generalized linear models [22–24]. Apart from allowing any geographical variations to be quantified, the approach allows for possible jumps and peak

in the covariates to be properly observed which would not be possible if parametric models are assumed.

Material and method

Data

The data analyzed in this study were collected as part of the 2008 NDHS. This data set is considered more appropriate for the study because it is a nationally representative sample with a relatively large number of observations on the outcome variable. Moreover, it contains detailed geographical information that would facilitate spatial modeling. In addition to collecting information about fertility and family planning, knowledge and current use of contraceptive methods and sexually transmitted diseases, the survey was designed to gather information on maternal health and obstetric fistula from women of reproductive age (15–49 years). These are provided at national and regional levels; urban and rural areas and at state (district) level. The 2008 NDHS employed a two-stage sampling design. Details of the sampling procedure and number of selected households have been made available in the survey report [8]. A total of 34,596 women were identified to be eligible for the individual interview, and 97% of them were successfully interviewed.

Data on place of delivery are contained in the Pregnancy and Postnatal Section of the Women's Questionnaire. Information was collected, among other things, on where the last child was given birth to and who attended to the woman during delivery. The alternative place of delivery available and analyzed in this study are: (1) home, which includes respondent's home and other homes; (2) public sector which encompasses government hospitals, government health centers/health posts and other public health facilities; (3) private sector which incorporates private hospitals/centers and other private health facilities; and (4) others; that is, births that took place in any other place not covered by any of the other three categories. These include births that take place in the farm, market place and so on.

Data analyzed came from 28,362 women who had a live birth in the last five years preceding the survey. For women with two or more live births during the period, data referred to the most recent birth. The following individual level covariates were included in the analysis: mother's age at birth, marital duration, type of place of residence, woman's educational attainment, and religion. Others are wealth index, partner's educational attainment, and whether or not the woman reads newspaper, listens to radio and watches television at least once a week. All categorical variables were effect-coded. Table 1 presents detailed descriptions of all covariates included in the analyses and the percentage distributions by place of delivery. Nigeria is divided into six geopolitical zones with each comprising of about six states making thirty-six altogether and a Federal Capital Territory, Abuja (Fig. 3).

2. Data analysis

We used multinomial logit model within the framework of generalized linear model [23,25] to investigate choice of place of delivery in Nigeria. The following four categories were defined for the response variable, Y_{ij}:

$$Y_{ij} = \begin{cases} 1 & \text{home delivery} \\ 2 & \text{public sector} \\ 3 & \text{private sector} \\ 4 & \text{others} \end{cases} \tag{1}$$

for woman j in state i. The response variable, Y_{ij}, is considered as a realization of some latent variable $U_{ij} = \eta_{ij} + \varepsilon_{ij}$, which the jth