

Contextual influences on the use of health facilities for childbirth in Africa

According to the World Health Organization, approximately half a million women die each year due to complications in pregnancy or childbirth, and the level of maternal mortality is disproportionately high in Africa with a regional Maternal Mortality Ratio of 1000 per 100,000 live births. The majority of maternal deaths occur during childbirth, and the presence of trained medical staff has the potential to substantially reduce the number of maternal deaths. There thus exists the need to understand the factors that encourage childbirth in a health facility attended by a trained medical professional. Previous studies have approached this issue by examining individual and household level influences on the decision to deliver a child in a medical institution, yet the role of community factors in this decision have been largely ignored. Recent years has witnessed a growing recognition of the importance of contextual influences on health outcomes and in particular several studies have found significant effects of community level factors on reproductive health outcomes. Furthermore the application of multilevel modelling techniques has shown that spatial variations in reproductive health outcomes remain after controlling for individual and household factors. This study examines the influence of individual, household and community level factors on the decision to deliver a child in a health facility in six African countries, extending upon previous studies by including the role of the community in the analysis.

Six African countries were selected for analysis, divided into two regions: West, Ivory Coast, Burkina Faso, Ghana, and East, Kenya, Malawi and Tanzania. The selection of neighboring countries allows the identification of spatial variations in childbirth at a health facility that may transcend political boundaries. The selection of the countries was also informed by the availability of data that contained Global Positioning System (GPS) data that allows the mapping of spatial variations. The data used in this analysis are from the Demographic and Health Surveys (DHS) conducted in the six study countries (Kenya 1998, Malawi 2000, Tanzania 1999, Burkina Faso 1998, Ivory Coast 1998 and Ghana 1998). The DHS use a stratified multi-stage cluster sample design to collect nationally representative samples of women of reproductive age (15-45). Questionnaires are conducted with all eligible women (15-45) in each sampled household, collecting data on fertility, family planning, and health care seeking during pregnancy, in addition to demographic and socioeconomic data. Full descriptions of the study designs used in each country can be found at <http://www.measuredhs.com/>. In addition, each of these data sets collected Global Positioning System (GPS) locators for each of the Primary Sampling Units

(PSU) included in the sample. This allows the mapping of the PSUs, to facilitate the identification of spatial variations in the use of health facilities for childbirth.

The samples for analysis are women of reproductive age who had a birth in the three years prior to the survey, resulting in sample sizes of Burkina Faso 3, 167, Ghana 1, 785, Ivory Coast 1, 131, Kenya 3, 058, Malawi 6, 318, and Tanzania 1, 710. The DHS data provide the individual and household level data for the analysis. Two approaches are used to obtain community data for the analysis. Some community factors are taken from the DHS data; this entailed averaging individual data to the PSU level (the PSU denotes the community in this analysis) thus producing derived community level factors. Secondly, international and sub-national boundary data were obtained from the African Population Database and rainfall, road and rail network data from the Digital Chart of the World, ArcView 8.2 (© ESRI International).

The dependent variable for analysis is a binary variable coded one if the woman delivered her last child in a health facility (including public and private facilities). Each of the DHS data sets has a hierarchical structure, with women nested within households and households within PSUs, thus violating the assumption of independence of ordinary logistic regression models. A multilevel modelling technique was employed to account for the hierarchical structure of the data and to facilitate the estimation of community (PSU and district) level influences on the outcome. The multilevel modelling strategy accommodates the hierarchical nature of the data and corrects the estimated standard errors to allow for clustering of observations within units. Multilevel models allow the identification of clustering in the outcome (also known as the random effect) which represents the extent to which the outcome of interest varies between each level of interest (PSU or district). A significant random effect may represent factors that influence the outcome variable that cannot be quantified in a large scale social survey (e.g. variation in health beliefs). A random effects model thus provides a mechanism for estimating the degree of correlation in the outcome that exists at the community level (PSU or district), while also controlling for a range of individual and household level factors thought to influence the outcome. Separate multilevel logistic models are fitted for each of the six countries. Two levels of variance are considered, the PSU and the district.

The main focus of this research is on the role of community level factors on the decision to deliver a child in a health facility, and the results point to several pathways through which the

community can influence individual behavior. The significant positive relationship between the percentage of women in the community with secondary education and above in Malawi, Kenya and Tanzania points to two potential pathways of influence: the role of community economic development and the influence of community attitudes to female roles. In less developed societies such as those analyzed here, levels of female education are often low, and the attainment of education of secondary level or above often reflects higher socioeconomic status. Hence, communities in which a higher percentage of women are achieving these levels of education are likely to be communities with higher percentages of socioeconomically advantaged households. Greater household wealth may enable women to seek care during pregnancy, with the costs of seeking care acting as a significant barrier to women from poorer households. Higher levels of female education in the community may also point to greater awareness of the need for care during childbirth. Although the content of formal education may not include health information, higher levels of education may create a greater awareness of health services and the need for care.

In more traditional societies, higher levels of female education may also indicate greater female autonomy, as education is often restricted to male children, and earlier ages at marriage may restrict female access to higher levels of education. The positive association between the percentage of husbands in the community who approve of family planning and a woman's decision to deliver her child in a health facility also highlights the influence of female autonomy on health behavior. High levels of approval of family planning are associated with less conservative communities, which may also be less conservative in their attitudes towards women's roles. Hence, women living in communities with higher levels of female education and approval of family planning may also be living in climates of greater autonomy, allowing them greater decision-making power and the opportunity to seek care during pregnancy and labour. The significance of education at the individual and community levels suggests the importance of both individual autonomy and the climate of autonomy that exists in the community, and that the influences on health behavior extend to beliefs and practices of others in the community.

There was a strong positive influence of the percentage of women in the community who had delivered a child in a health facility on a woman's decision to seek care during labor in Tanzania, Ghana, Burkina Faso and Ivory Coast, reflecting several possible pathways of influence. The high percentage of women in the community who had delivered their child in a hospital may simply reflect the presence of maternal health services in the community. Data was not available to

measure the actual presence of health services, so this variable may be acting as a proxy for service availability. Previous studies have shown that women's decisions surrounding health seeking are strongly influenced by the practices of others in the community, and thus in a community in which a high percentage of women are using health services for child birth the practice is likely to be seen as a norm, influencing individual behavior.

The mean number of children per woman in the community had a negative influence on a woman's decision to deliver her child in a health facility. Communities with higher fertility may be more conservative in their attitudes towards service use, the expected roles of women, and have a lower level of economic development, all of which have influences on a woman's ability to seek care during labor. High fertility may also reflect a lack of reproductive health services, and a lack of awareness of such services, both of which have obvious implications for maternal health service utilization.

After controlling for individual, household and community factors in the models, significant variation in the outcome still exists at the PSU level in all six countries, indicating that the models do not fully explain the community level variation in the decision to deliver a child in a health facility. This residual variation may be due to factors omitted from the models, or factors that cannot be measured in a large scale social survey. The latter may include cultural influences on service utilization, which are not only difficult to quantify, but may also vary across the six study settings. The community level education, family planning approval and fertility measures have captured some of these cultural influences, but others such as traditional views on childbearing are harder to record in a survey. The residual variation may also reflect omitted factors, the most obvious been the presence of maternal health services in the community. Other factors that were not measured, but may have helped to reduce this variation, include the type and quality of health services and the financial accessibility of services. The models were, however, more successful in explaining district level residual variation, with significant variation remaining only in Kenya and Tanzania. It seems that the contextual variables chosen are more appropriate for explaining larger area variations, and that more research is needed to understand the factors influencing health behavior at the local community level.