

What does access to maternal care mean among the urban poor? Factors associated with use of appropriate maternal health services in the slum settlements of Nairobi, Kenya

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Abstract

Objectives: The study seeks to improve understanding of maternity health seeking behaviors in resource-deprived urban settings. The objectives are 1) to identify the factors which influence the choice of place of delivery among the urban poor, with a distinction between sub-standard and “appropriate” health facilities; and 2) to formulate recommendations aimed at improving maternal health.

Methods: The data are from a maternal health project carried out in two slums of Nairobi, Kenya. A total of 1,927 women were interviewed, and 25 health facilities where they delivered, were assessed. Facilities were classified as either inappropriate or appropriate. Place of delivery is the dependent variable. Ordered logit models were used to quantify the effects of covariates on the choice of place of delivery, defined as three-category ordinal variable.

Results: Although 70 percent of women reported that they delivered in a health facility, only 48 percent delivered in a facility with skilled attendant. Besides education and wealth, the main predictors of place of delivery included being advised during antenatal care to deliver at a health facility, pregnancy “*wantedness*”, and parity. The effect of being advised during antenatal care visits was significantly higher among the poorest women.

Conclusion: Interventions to improve the health of urban poor women should include improvements in the provision of, and access to, quality obstetric health services. Women should be encouraged to attend antenatal care where they can be given advice on delivery care and other pregnancy-related issues. Target groups should include poorest, less educated and higher parity women.

Key Words: Maternal health; Urban poor; Health facility delivery; Kenya

Introduction

Despite the various international efforts that have been initiated to improve maternal health, more than half a million women worldwide die each year as a result of complications arising from pregnancy and childbirth (1,2). Most maternal deaths occur during labor, delivery, or the immediate postpartum period, with hemorrhage, sepsis, eclampsia, obstructed labor and complications from unsafe abortion being the main direct causes. Indirect causes like malaria, HIV and AIDS, and anemia also contribute to maternal deaths (2). Almost all these deaths occur in the developing countries, with sub-Saharan Africa accounting for almost 47 percent of the toll (3). Additionally, many more women are estimated to suffer pregnancy-related illnesses, life threatening complications, and other potentially devastating consequences after birth, that can affect them for the rest of their lives (4,5). Most of these deaths and disabilities could be averted if women had access to appropriate maternal health care, including antenatal and delivery care (2,6). Pregnancy “*wantedness*” is also important in protecting maternal health as it is likely to be associated with maternal health seeking behavior and satisfactory pregnancy outcome (7).

Are there any signs of progress towards reducing maternal mortality?

In 1987, the ‘Safe Motherhood Initiative’ was launched with the aim of reducing maternal deaths by 50 percent in one decade (8). After 10 years of implementation, a review noted that little progress was achieved, but recognized that with political commitment, maternal morbidity and mortality could be reduced with existing knowledge and technology, particularly attendance of all deliveries by a skilled health professional (5,9). Despite the lack of reliable trend data for countries with high maternal mortality, recent investigators believe that progress in achieving improvements in maternal health has been very slow in the developing world, and in some instances especially in sub-Saharan, has reversed (10,11). In 2000, the Millennium Development Goals (MDGs) were adopted by the United Nations member states. In recognition of maternal health as one of the priority development challenges that need to be addressed, the international community endorsed the reduction of maternal mortality ratio by three-quarters between 1990 and 2015, as one of the eight MDGs (12). This commitment arose not only from the overwhelming evidence of the huge burden of maternal deaths, but also from the far reaching ramifications on child survival, the family and community at large. The death or disability of a mother, which is disproportionately experienced by the poor, has adverse effects at the individual, family, community and country levels. In particular, poor maternal health has a strong impact on child survival, contributing to an estimated 3 million stillbirths and 3 million early neonatal deaths per year, and affecting the care of other children in the family (13).

Why should we pay attention to urban resource-deprived settings?

Over the last decades, the world has witnessed a dramatic growth of its urban population, with sub-Saharan Africa representing a striking example of the shift from a predominantly rural to an urban population. The region's urban population was 15 percent in 1950, 32 percent in 1990, and is projected at 54 percent for 2030 (14). The essential feature of current Africa urbanization is that cities have been growing despite poor macroeconomic performance, making it difficult for national and urban authorities to provide affordable housing, quality social services, or sufficient employment to the growing urban populations (15). Between 1980 and 2000, the region's urban population grew by about 4.7% per year (14), while at the same time per capita gross domestic product (GDP) dropped by 0.8% per annum (16). Progressive decay in basic infrastructure such as piped water, electricity, sewerage, and roads have prompted people in large African cities to move to unplanned settlements on the urban periphery (17). A recent report observed that urbanization and cities in Africa are not serving as engines of growth and structural transformation, but are part of the cause and major symptom of the economic and social crisis that has enveloped the continent (18).

Overall, even by conservative standards, urban poverty in the region is high and is growing rapidly; making it plausible that in the near future most of the poor people in the region will live in urban areas (14). Recent estimates report that about 42 percent of the urban population in most sub-Saharan African countries are living in "life and health threatening" homes or neighborhoods where they lack the basic material resources and amenities necessary for a decent standard of living (19). The consequences of growing urban poverty on health are now emerging, with evidence of increasing intra-urban health disparities between the poor and the non-poor (20,21,22). Other studies have shown that the rural/urban ill-health and mortality gaps have narrowed in recent years, mainly as a result of stalling and even upturn in urban trends, as urban economic and environmental conditions have sharply deteriorated in rapidly growing cities (23,24). These widening intra-urban and narrowing urban-rural health inequities suggest that the urban bias in the allocation and concentration of health-care resources does not translate into health advantages for all urban dwellers. Despite close proximity to health facilities, urban poor women may not readily use them. Because of lack of stable and regular sources of income, coupled with high cost of living in cities, poor women may not afford to lose hours of economic activities to seek health care services under less than emergency circumstances (20).

As sub-Saharan Africa's urban poor and marginalized populations grow quickly - both in absolute numbers and in terms of their share of the urban and the total population - investigating and documenting their health conditions is essential to the efforts aimed at improving maternal health at the national level, and get the country on track to meeting the maternal health MDG.

The Kenya context

Kenya's capital city typifies the current urban population boom and associated urban health and poverty problems. Its population increased from about 120,000 in 1980 to about 3 million in 2000, with majority estimated to be living in slum settlements. It is estimated that while absolute poverty increased from 48 to 53 percent in rural areas of Kenya between 1992 and 1997, it almost doubled from 27 to 50 percent over the same period in Nairobi city (25). Nairobi has indeed grown into a poverty hub with about 60 percent of its population estimated to be residing in slum settlements, and occupying only 5 percent of the city's residential land area (26). Other dimensions of poverty include inadequate access of urban dwellers to appropriate health care services, with Nairobi slums being served mainly by private-owned, sub-standard, unlicensed and informal health facilities (27). Young people in informal settlements face unique challenges as they transition to adolescence and adulthood in such a hostile environment characterized by high levels of unemployment, crime and substance abuse, poor schooling facilities, and poor sexual and reproductive health outcomes (28). For instance, adolescents in the slums of Nairobi initiate sex about three years earlier, and they are two times more likely to have multiple sexual partners than adolescents who are resident in non-slum parts of the city, thus contributing to unplanned childbearing which already accounts for a substantial proportion of births in Kenya (29). Moreover, it is perplexing that Kenya, a country with one of the highest female literacy rates in Africa and better economic performance than many countries, has been recording one of the highest maternal mortality levels. Recent estimates indicate that the country's maternal mortality ratio was 1,000 per 100,000 live births in 2000, against 920 in sub-Saharan Africa as a whole (3).

Paradoxically, our understanding of the problems urban poor women in sub-Saharan Africa encounter when seeking care, remains limited. Less attention has been paid to the reproductive health problems of urban poor populations than to those of rural residents. This is probably in relation with the fact that most income-earning opportunities, the major hospitals and a disproportionate high share of health budgets are concentrated in cities and towns (29). Specifically, not much is known about the challenges and barriers that childbearing poses for

women in urban slums, where extreme poverty, coupled with lack of basic services creates unfavorable conditions for both mothers and their children. Despite the vast amount of research on maternal health in Africa (30,31,32,33), very few have focused on the urban poor. One of the rare studies on urban sub-Saharan Africa referred to previously defined the urban poor as those who lacked electricity in their home and do not use piped water and do not use flush toilet (20), thus making no reference to the actual geographic areas where the urban poor live. Indeed, data available from nationally representative Demographic Health Surveys (DHS) and other population-based surveys remain largely inadequate to answer questions relevant to the growing urban poor populations. In addition to being underserved, slums are not well represented in national surveys since these areas are considered illegal by governments. As a result, average health indicators for Nairobi and other urban areas mask huge disparity in terms of health outcomes between the urban poor and the other sub-populations.

Against this backdrop, this study was designed in an attempt to improve understanding of women's health seeking behaviors in poor resource settings. The specific objectives are 1) to identify the factors which influence the choice of place of delivery among the urban poor in Nairobi, Kenya, with a distinction between sub-standard and "*appropriate*" health facilities; and 2) to formulate recommendations aimed at improving maternal health among the urban poor.

Data and Methods

Study setting

The study setting is the Viwandani and Korogocho informal settlements of Nairobi where the African Population and Health Research Center (APHRC) conducts demographic surveillance of about 60,000 inhabitants, referred to as the Nairobi Urban Health and Demographic Surveillance System (NUHDSS). Located on a long and narrow stretch of reserve land owned by the Nairobi City Council, Viwandani is bordered by an industrial area. It covers about 0.52 km² with a population density estimated at about 52,583 inhabitants per km². *Korogocho* is located about 12 kilometers east of the city center and covers a smaller area than Viwandani (0.45 km²) but has higher population density (63,318 inhabitants per km²). These two areas are among a growing number of informal settlements in Nairobi that house more than 60 percent of the city's population on five percent of the land (34).

Like other Nairobi slum settlements, these two communities are under-served with regard to health infrastructure and services; they have high unemployment, poverty, crime, poor sanitation and generally poorer health indicators when compared to Nairobi as a whole. A study

conducted by APHRC in 2000 in the slums of Nairobi revealed that under-five mortality rate in Nairobi's informal settlements was 134.2 per 1,000 live births in Nairobi slums, while the 2003 KDHS reported rates of 95 in Nairobi as a whole, 93.5 in urban Kenya, 116.9 in rural Kenya (21). Moreover, the two communities exhibit structural differences that provide opportunity for comparisons between communities facing similar poverty and health challenges, but operating under different livelihood settings. Viwandani, home to many industrial workers, attracts migrants with relatively higher education levels, and exhibits higher levels of economic activity for both men and women. The population in Korogocho is more stable and show more co-residence of spouses.

Data

The data used in this study are from a maternal health project carried out by APHRC in Korogocho and Viwandani in 2006. The data were collected through household interviews and health facility survey. From the NUHDSS all women who had a pregnancy outcome in 2004-2005 were selected and interviewed. A total of 1,927 interviews were successfully conducted, giving a response rate of 84 percent. The questionnaire covered various topics including background characteristics, reproductive history, perceived access and quality of care, antenatal care, delivery care, obstetric complications, antenatal, delivery and postnatal expenditure, postnatal care, and household characteristics. All health facilities where women in the household survey delivered were audited with the goal of assessing the adequacy to provide obstetric care to the study population. The health facility audit covered the number, training and competency of obstetric staff; the services offered; the physical infrastructure; and the availability, adequacy and functional status of equipments and other essentials for safe delivery. The referral and communication system was also assessed.

The research was conducted in accord with prevailing ethical principles: The study was approved by the Ethical Committee of the Kenya Medical Research Institute, and informed consent was sought before interviewing each respondent.

Study variables

The outcome variable used in this paper is the place of delivery. From the health facility survey, health facilities were classified as either “*appropriate*” or “*inappropriate*”. The former group comprised health facilities run/owned by government, large NGOs, religious and missionary groups that provide at least the basic essential obstetric care. They are larger; some are hospitals - two of which serve as referral facilities - and are located in the outskirts of the slums.

The remaining facilities were substandard health clinics that do not provide the minimum requirements for obstetric care. They are small, often ramshackle, private-owned and often unlicensed clinics located within the two slum communities. They were labeled as “*inappropriate*”. Based on this grouping, the dependent variable is defined as follows:

$$Y = \begin{cases} 0 & \text{if respondent did not deliver at a health facility} \\ 1 & \text{if respondent delivered at an inappropriate health facility} \\ 2 & \text{if respondent delivered at an appropriate health facility} \end{cases}$$

The first category comprised women who either delivered at home, at a traditional birth attendant's, on the way to health facility, or at other places out of a health facility. For the purpose of this study, the predictors were grouped into three broad categories that cover the individual (woman), household and community levels. Individual- and household-level socioeconomic covariates include education, working status, ethnicity, household wealth and husband's or partner's education. Given the small proportion of residents with no education, primary education serves as the reference category. Single women formed a separate category. Principal component analysis (PCA) was used to generate household wealth tertiles from household possessions, namely, presence of electricity, material of the dwelling floor, source of drinking water, type of toilet facility and type of cooking fuel. PCA is a statistical technique that linearly transforms an original set of observed variables into a substantially smaller and more coherent set of uncorrelated variables that capture most of the information through maximizing the variance accounted for in the original variables (35). The second category is comprised of bio-demographic and health-related variables, namely, parity; pregnancy wantedness; antenatal care visit; whether the respondent was advised during antenatal care to deliver at health facility; and age at birth. Finally, a community-level variable, the slum residence was included, since the two slum areas have important socioeconomic and demographic differences. About 90 percent of respondents were Christians and exploratory analysis showed that they did not differ with Muslims in terms of health seeking.

Methods of analysis

Univariate analysis was performed to provide descriptive statistics for the sample of women interviewed. To quantify the effects of the identified covariates on the choice of place of delivery, bivariate and multivariate ordered logistic regressions were fitted using partial proportional odds models. Using multinomial regression would mean that the information conveyed by the ordered nature of the outcome variable is discarded. In addition, not treating the variable as ordered, may lead to loss of efficiency (36). The partial proportional odds model is a special case of the

generalized ordered logit model that is less restrictive than the proportional odds model. Though proportional odds models are suited for the analysis of ordinal response variables, a critical assumption is that of *parallel slopes*. It is assumed that the coefficients that describe the relationship between, say, women who did not deliver in a health facility, compared to those who delivered in a health facility, are the same as those that describe the relationship between respondents who delivered at appropriate health facilities, compared to those who either did not deliver at health facilities, or delivered in inappropriate facilities. This assumption was assessed in preliminary analyses, using Brant test. The test showed that woman's level of education, working status, household wealth, age at birth and area of residence violate the parallel regression assumption ($\chi^2=212.99$, $p\text{-value}<0.001$). Details on the statistical theory behind the partial proportional odds model can be found in several sources (36,37).

The specification of the partial proportional model used in this study is given by:

$$\Pr(Y \leq y_j | x) = \frac{\exp(-\alpha_j - \mathbf{X}'\boldsymbol{\beta} - \mathbf{T}'\mathbf{g}_j)}{1 + \exp(-\alpha_j - \mathbf{X}'\boldsymbol{\beta} - \mathbf{T}'\mathbf{g}_j)} \quad j = 1, \dots, k$$

where Y is the outcome variable, in this case the place of delivery, representing an ordinal ranking, and k is the number of different values that Y can have ($k = 3$ in this case); $\mathbf{X}$ is a vector of explanatory variables that meet the parallel slopes assumption; α_j are the unknown intercept parameters; and $\mathbf{T}$ is a vector of explanatory variables for which the parallel regression assumption is not found to hold. Therefore, $\mathbf{g}_j$ represents deviations from proportionality for the particular variable in category j . When $\mathbf{g}_j = 0$ for all j , the model reduces to proportional odds model. This model is also referred to as the unconstrained partial proportional odds model. For every observation, we form two logits, the first of which compares outcome 0 to 1 and 2 (i.e. no health facility versus inappropriate and appropriate health facility), while the second compares outcome 0 and 1 versus 2. We can then consider the two logits to be separate response functions for every individual. The STATA command `ologit2` (38) was used to fit the partial proportional odds model.

The analysis was carried out in three phases. First, we used bivariate models to explore the crude effect of each predictor variable, without any control. Second, multivariate model allow us to identify factors associated with place of delivery and quantify their effects when controlling for other variables. Third, interaction models are examined to test the extent to which the effects of respondents' education and household wealth on the choice of place of delivery vary by area of

residence (Korogocho and Viwandani), given the area differentials in maternal care expected from the multivariate analysis. Other interactive models are designed to test whether the effect of being advised during antenatal care to deliver at a health facility, which is one of the actionable variables, varies by respondent education or household wealth.

Results

Sample characteristics

Figure I compares the percentage of health facility deliveries in the study population (Nairobi slums) with that of Nairobi as a whole and urban Kenya based on the 2003 Kenya DHS. While it may be estimated that nearly 70 percent of slum dwellers deliver at health facilities, a figure which is not far from that of Nairobi as a whole (about 78%), only about 48 percent deliver in facilities with at least minimum standards. These results indicate that it may be misleading if the two categories of facilities examined in this study are not treated separately.

[Figure I about here]

Background characteristics of the 1,927 women interviewed are presented in Table I. About two-thirds of women have primary education, and only one-quarter reached or went beyond secondary education. Less than 37 percent of respondents were employed at the time of the interview. In terms of ethnic affiliation, Kikuyu respondents account for 25.9 percent of the sample, followed by Luo (22.4%), Kamba (18.9%), and Luhya (14.8%). Sixteen percent of women were not in union at the time of interview (not shown), while 10.5 percent had husbands/partners with no or unknown education status, making a total of 26.5 percent for this category; nearly 39 percent had husbands/partners with primary level education; and the remaining 35 percent had husbands/partners with secondary or higher education.

[Table I about here]

For a quarter of women, it was their first pregnancy; about 46 percent had two or three children, while the remaining 29 percent had four or more children. About 12 percent of pregnancies were unwanted and 19 percent were mistimed, while 69.4 percent were wanted then. This provides an indicator of the extent to which women successfully control fertility. Only about 3 percent of women did not receive antenatal care from doctors/nurses/midwives (not shown). About 9 percent only made one visit during the course of the pregnancy; thirteen percent made two or three visits; and 52 percent made four or more visits. During antenatal visits about 77 percent respondents were advised to deliver at a health facility. Finally, 57 percent of women were from Korogocho and 43 percent in Viwandani.

Bivariate and Multivariate Analyses

Table II shows the estimated log-odds ratios for the bivariate and multivariate analyses. For each analysis, the first column shows the parameter estimates for the model comparing women who did not deliver in a health facility, to those who delivered in a health facility, regardless of its appropriateness. The second column shows the estimated log-odds ratios for delivering out of or in an inappropriate health facility, compared to delivering in appropriate health facility. A “-“ indicates that the parallel line assumption was met.

Bivariate analysis

As can be seen, the proportionality assumption in the bivariate analysis is met for only a few covariates. All predictors considered in the analysis have significant unadjusted effects of the place of delivery. Further, the directions of most associations are in line with expectation: the likelihood of health facility delivery increases with women's and partner's education, household wealth and number of antenatal care visits; it decreases as parity increases; Kikuyu women are more likely than all others to deliver at a health facility; planned pregnancies and women who were advised during antenatal visits, are more likely to be delivered at a health facility. Women who are currently working are more likely to seek standard obstetric care services than their non-working counterparts, even though there is no significant difference in terms of whether they deliver in a health facility or not. Appropriate health facility deliveries are highest among women aged 20 years or younger, and lowest among their counterparts aged 30 years or older. While there was no difference by slum of residence in terms of health facility delivery, women residing in Viwandani were substantially less likely to use appropriate obstetric care services, than their counterparts from Korogocho ($p < 0.01$).

[Table II about here]

Multivariate analysis: Main effects

Multivariate results in Table II show that apart from the place of residence, the parallel line assumption is fully or partially met for all covariates. It is fully met for five variables (ethnicity, partner's education, parity, pregnancy wantedness and advice to deliver at a health facility), and partially met for respondents' education, household wealth, antenatal visits and women's age. As expected, respondents' own education was associated with place of delivery, controlling for all other identified covariates. Compared with their counterparts with primary education, women with secondary/higher education were about 40 percent more likely to deliver at appropriate health facilities ($p < 0.05$). While women with primary education tended to deliver more frequently at health facilities, compared to those with no education (difference not significant), there was no difference with regard to delivering at appropriate health facilities. Women employed at the

time of the survey had a higher likelihood to deliver at a health facility, compared with those who were not working ($p<0.01$); however, there was no difference in the likelihood to deliver at appropriate health facility. With regards to ethnicity, Kikuyu women were about 5.8 times, 4.3 times and 2.6 times to use health facilities in general and the qualified ones in particular, compared with their Luo, Luhya and Kamba counterparts, respectively ($p<0.01$).

The positive and graded effect of household wealth whereby the likelihood to use health facility for delivery steadily increases as household wealth status increases, remains in the multivariate results. Respondents from the least poor households were about 2.2 times more likely to deliver at health facility ($p<0.01$), and more than 40 percent to deliver at appropriate health facilities, compared with their counterparts from the poorest households ($p<0.01$). Women married to partners with secondary/higher education tended to deliver in health facilities in general and the appropriate ones in particular, than their counterparts married to husbands with only primary education ($p<0.01$).

The likelihood to deliver at a health facility in general and in the well-equipped facilities in particular, significantly decreases as parity increases ($p<0.01$). As expected, pregnancies that were wanted then were more likely to be delivered at appropriate health facilities, compared with those that were either mistimed or unwanted ($p<0.10$). The number of antenatal visits remains associated with place of delivery: women who attended 2-3 antenatal care visits were more likely to have health facility delivery ($p<0.01$), or to deliver at appropriate facility ($p<0.05$), compared with their counterparts who made at most one visit. Respondents who made four antenatal visits or more (the recommended number) tended to use health facility for delivery more frequently than those who made only 2-3 visits, but the difference did not reach statistical significance at the level of 0.10. Importantly, respondents who were advised during antenatal care to deliver at health facility were more likely to use health facilities in general and the well-equipped ones in particular, compared with those who were not advised ($p<0.01$). Though age differentials were insignificant in the model comparing health facility deliveries to delivery out of health facility, women aged 25-29 years and those aged 30 years or older were more likely to deliver at appropriate health facility, compared with their younger counterparts ($p<0.05$ and $p<0.10$, respectively).

Noticeably, differentials in health facility deliveries by slum residence have substantially widened from the bivariate to the multivariate analyses. Controlling for other covariates, Korogocho women are about twice more likely to deliver at health facility in general ($p<0.01$), and more

than six times more likely to do so in an appropriate facility ($p<0.01$), compared to women living in Viwandani.

Multivariate analysis: Interaction effects

Given the wide disparities in the use of obstetric services by slum residence, as depicted in Table II, we investigate whether the effects of respondents' education and household wealth - two of the well-known health determinants in developing countries - on the choice of place of delivery significantly vary by area of residence. We also investigate whether the effect of having been advised during antenatal care to deliver at health facility - one of the actionable covariates - differs by respondent education or household wealth. Results of these interactions are shown in Table III and Table IV, respectively, and summarized in terms of odds ratios in Figure II. The parallel line assumption being met for all interaction terms in Tables III and IV, Figure II displays the odds ratios of using health facilities (both appropriate and inappropriate).

[Table III about here]

[Table IV about here]

[Figure II about here]

In Table III, the coefficients for education therein indicate the effect of education in Korogocho (the reference category). Korogocho women with secondary or higher education are more likely than their counterparts with primary education, to seek appropriate care ($p<0.10$). The interaction coefficient between residence and secondary/higher education is -0.075 and not statistically significant at the level of 0.10, indicating that the effect of secondary education on the place of delivery does not vary by slum residence, as illustrated more vividly in the upper left graph of Figure II. Interaction between area of residence and household wealth in influencing the place of delivery is quite stronger. The effect of household wealth is large and statistically significant in Korogocho ($p<0.01$), and the interaction terms are negative and statistically significant ($p<0.10$), indicating a substantially weaker effect of household wealth in Viwandani. This pattern is highlighted in the upper right graph of Figure II.

Table IV shows that the effect of being advised to deliver at health facility is strong (0.397) and statistically significant ($p<0.01$) among women with primary education. It tends to be stronger among respondents with no education (difference not significant), and to remain similar in respondents with secondary/higher education. The pattern of interaction with household wealth is clear. Being advised during antenatal care to delivery at health facility has a huge and statistically significant effect on place of delivery among the poorest (0.887, $p<0.01$). The effect is substantially weaker in the middle-wealth category ($p<0.05$), and somehow weaker among the least poor (not significant).

Overall, it is notable in Figure II that the effect of wealth on health facility delivery is stronger in Korogocho than in Viwandani; and that the effect of being advised during antenatal care to deliver at health facility is highest among the non-educated and poorest women. By contrast, there seems to be no residential differences in the effect of women's education on their choice of place of delivery.

Discussion

This paper has examined the factors which influence the choice of place of delivery among women in the informal settlements in Nairobi, Kenya. Its novelty is to use a unique dataset that links women's reported health seeking behaviour to the health facility where care was sought; and to define and use health facility delivery variable that distinguishes the small, informal and often unlicensed clinics, from appropriate health facilities for delivery. A number of key findings emerge from this study.

The covariates in the analysis included four socioeconomic variables defined at the individual (education and working status) and household (wealth and husband/partner's education) levels. Our results on the effects of women's education and household wealth conform to expectation and lend support to the vast amount of studies that have consistently shown that these two socioeconomic covariates affect women's health (20, 30-32). The influence of household wealth was significant after including all control variables, suggesting the importance of the economic dimension of poverty on health, even in resource-deprived settings.

Our model allows a rough comparison of the effects of wealth and education on women's health seeking and thus shed some light on the extent to which the education-health relationship merely reflects the impact of economic advantage (39). The results show that household wealth tends to be more robust and to have higher power than respondent's education in predicting the place of delivery. In particular, the effect of wealth went down by only about 8 percent from the bivariate to the multilevel models (from 0.861 to 0.788), whereas the effect of education dropped by 52 percent (from 0.664 to 0.321). This finding corroborates an earlier finding in the analysis of child health (40,41). Some studies on child health have argued that father's education only operates through the income effect (42). The result of the study reported in this paper shows that the influence of husband/partner's education is important above and beyond the income effect. This finding supports the view that husbands generally make decisions regarding use of

health care services, so that certain health seeking behaviors depend on their level of education.

As expected, pregnancy *wantedness* is significantly associated with the choice of place of delivery. To a large extent, unplanned childbearing is an indicator of non-use of family planning services by women in need of them (20). While the effects of parity (or birth order) and antenatal care visits have been abundantly reported in other maternal health studies (20,30-32), of special significance in this study is the strong and statistically significant effect of whether a woman was advised to deliver at a health facility. This finding is in line with a recent study in India which showed that educational activities promoting the benefits of maternal care services are important factors for their use (43). Our results further indicate that this effect of *health education* is very strong among the poorest women, strong among the least poor, and weak in the middle wealth category. This pattern of association which is also observed for the education categories deserves further investigation. It suggests that to be the most effective, health education should target the poorest and non-educated women, mainly.

Residential differences in the use of obstetric services are strikingly large, with Korogocho women significantly more likely to use obstetric services. Notably, these differentials increased by two-fold from the bivariate to the multivariate models. Further, the effect of household wealth, - but not that of education - was stronger in Korogocho than in Viwandani. Other studies in the same communities have shown considerable advantage of Viwandani residence in terms of child health (44). These contextual effects above and beyond the composition of the populations, deserve further investigation.

Conclusion and Policy Implications

Though numerous studies have examined maternity care utilization, little effort has been made to assess the appropriateness of these facilities and their capability to deliver women and handle or refer complications when they occur. This paper linked women's reported use of obstetric care to the facilities where women reported to have delivered, and assessed these facilities in terms of their ability to offer skilled birth attendance. Increased skilled birth attendance is one of the recognized strategies of reducing maternal mortality, since current consensus is that all pregnancies are at a risk of developing complications (45). Importantly, skilled birth attendance as a process indicator for monitoring progress towards the maternal health MDG, needs to be measured accurately. For example in this survey, about 70 percent of deliveries were reported to have occurred in health facilities, however only 48 percent took place in appropriate health facilities in terms of staffing, equipment and drugs; yet these are

crucial factors in averting potential morbidity and mortality. The Kenya Demographic and Health Survey also reported a relatively high proportion of women in Nairobi delivering in Health facilities (46). These figures might be over-estimating this particular indicator and thus giving false impression of levels and progress over time.

The findings of this study urgently call on the local authorities to improve the quality of health services available to the growing urban poor populations. Even though slums may be considered illegal, they are home to a rapidly growing proportion of urban dwellers. Most of the facilities in the slums are not registered; they are not supervised and regulated in anyway; they lack trained staff, equipment and life saving drugs; and as a result, cannot handle obstetric complications or do not have functioning referral procedures and system. Emergency obstetric care has been singled out as a key intervention in averting maternal mortality, and yet these services remain a dream to many; maternal mortality cannot be substantially reduced in the absence of access to emergency obstetric care (33). There is need to set minimum standards for all providers and frequently check their compliance to these standards.

Our results suggest the need to set up and strengthen maternal health education campaigns geared towards the marginalized population groups. Women should be educated to attend antenatal care services, and during the visits, they should be provided advice on delivery and postnatal care, recognition of complications, and other pregnancy-related issues. Women of high parity are also less likely to deliver in health facilities, probably assuming that they are seniors at the exercise. All these perceptions and misconceptions can be corrected through continued and focused health education during antenatal visits and through the mass media. Target groups should include poorest, lower-educated and higher parity women.

Our results also show that unwanted pregnancies tend to be delivered outside of health facilities. There is urgent need to limit the occurrence of unwanted pregnancies especially among young girls as they are big contributors to abortions in general, and unsafe abortions in particular. This may be achieved by availing effective contraceptive technologies to all girls at risk of unwanted pregnancies. The affected individuals are psychologically, socially and financially not prepared to handle the pregnancy as it ought to be handled. Consequences such as unsafe abortions, delivery by *“affordable but unqualified personnel”*, still births and maternal deaths, are more likely to occur.

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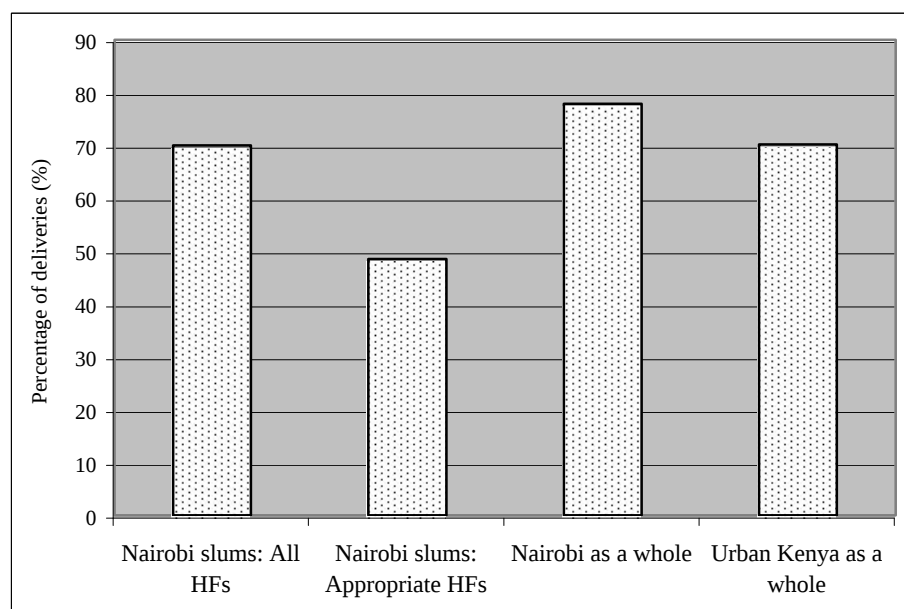
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Figure I. Health facility deliveries in Kenya



Source: Figures for Nairobi and urban Kenya are from 2003 KDHS.

Table I. Characteristics of women from the slums of Nairobi, Kenya who delivered in 2004-2005

Variables	%	N
Panel 1: Individual- and household-level socioeconomic variables ^a		
Education		
None	8.6	166
Primary	66.0	1,272
Secondary or higher	25.4	489
Working status		
Not working	63.4	1,222
Currently working	36.6	705
Ethnicity		
Kikuyu	25.9	499
Kamba	18.9	365
Luhya	14.8	285
Luo	22.4	431
Others	18.0	347
Husband/partner's education		
None/not in union	26.5	510
Primary	38.6	743
Secondary or higher	35.0	674
Panel 2: Individual biodemographic and health-related covariates		
Parity		
1	25.0	481
2-3	45.8	883
4+	29.2	563
Wanted index pregnancy then		
No	30.6	590
Yes	69.4	1,337
Antenatal care visits		
0-1	12.0	231
2-3	36.0	694
4+	52.0	1,002
Advised to deliver with a health professional		
No	23.2	448
Yes	76.8	1,479
Age at birth		
<20	8.8	170
20-24	35.1	677
25-29	27.5	530
30+	28.5	550
Panel 3: Community-level variables (Slum residence)		
Korogocho	57.0	1,098
Viwandani	43.0	829
N		1,927

^aAlso include household wealth tertiles (not shown)

Table II. Coefficients of unconstrained partial proportional ordered logistic regression models on the determinants of health facility delivery in the slums of Nairobi, Kenya

	Bivariate Analysis		Multivariate Model	
	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)
Panel 1: Individual- and household-level socioeconomic variables				
Education (Ref: Primary)				
None	-0.112	0.439 **	-0.275	0.034
Secondary or higher	0.664 **	0.193 †	0.321 **	--
Working status (Ref: Not working)				
Currently working	0.243 *	0.003	0.330 **	-0.039
Ethnicity (Ref: Kikuyu)				
Kamba	-1.012 **	-1.539 **	-0.968 **	--
Luhya	-1.340 **	--	-1.463 **	--
Luo	-1.600 **	-1.353 **	-1.758 **	--
Others	-0.530 **	-0.530 **	-0.464 **	--
Household wealth (Ref: Poorest)				
Middle	0.343 **	0.084	0.238 *	--
Least poor	0.861 **	0.284 *	0.788 **	0.354 **
Husband/partner's education (Ref: Primary)				
None/not in union	0.543 **	--	0.366 **	--
Secondary or higher	0.841 **	0.335 **	0.576 **	--
Panel 2: Individual biodemographic and health-related covariates				
Parity (Ref: 1)				
2-3	-0.511 **	--	-0.646 **	--
4+	-1.033 **	-0.488 **	-0.844 **	--
Wanted index pregnancy then (Ref: No)				
Yes	0.431 **	0.058	0.203 †	--
Antenatal care visits (Ref: 2-3)				
0-1	-0.529 **	--	-0.636 **	-0.342 *
4+	0.236 *	--	0.134	--
Advised to deliver with a health professional (Ref: No)				
Yes	0.449 **	--	0.403 **	--
Age (Ref: 20-24 years)				
<20	0.138	0.450 **	0.120	--
25-29	0.045	--	0.075	0.326 *
30+	-0.401 **	0.016	-0.236	0.277 †
Panel 3: Community-level variables				
Slum residence				
Viwandani	-0.024	-1.097 **	-0.704 **	-1.839 **

†p<.10; *p<.05; **p<.01

Table III. Interactions between slum residence and household wealth and maternal education in influencing the choice of place of delivery in the slums of Nairobi, Kenya

	Area of residence and - Maternal education		Area of residence and Household wealth	
	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)
Education (Ref: Primary)				
None	-0.124	0.170		
Secondary or higher	0.362 [†]	--		
Household wealth (Ref: Poorest)				
Middle			0.387 *	--
Least poor			0.963 **	0.520 **
Interaction of area and Education				
Viwandani-None	-0.704	--		
Viwandani-Secondary+	-0.075	--		
Interaction of area and Household wealth				
Viwandani-Middle			-0.385	--
Viwandani-Highest			-0.423 [†]	--

[†]p<.10; *p<.05; **p<.01

Table IV. Interactions between household wealth and maternal education, and health awareness in influencing the choice of place of delivery in the slums of Nairobi, Kenya

	Maternal education and Health advice		Household wealth and Health advice	
	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)	All types of HF vs Not HF	Appropriate HF vs (Inappropriate or not HF)
Advised to deliver with a health professional (Ref: No)				
Yes	0.397 **	--	0.746 **	--
Interaction of Education and Advice to deliver				
None-Advised	0.258	--		
Secondary+ - Advised	-0.070	--		
Interaction of Household wealth and Advice to deliver				
Middle - Advised			-0.636 *	--
Highest - Advised			-0.390	--

[†]p<.10; *p<.05; **p<.01

Figure II. Interactions between slum residence, household wealth, education and health advice in influencing the choice of place of delivery in the slums of Nairobi, Kenya

