Global Health Matters

This article by Stephenson and Elfstrom is a thoughtful look at a community's contribution to a mother's care during pregnancy and at the time of delivery. The authors reviewed data from three very diverse countries: Bangladesh, Egypt, and Rwanda. The research focused on four pregnancy outcomes to build a model, and the outcomes align with the World Health Organization-recommended minimum package of antenatal care for women in resource-poor settings. The authors found that influences extend to the community as a whole and beyond simply the individual or her household.

A considerable body of evidence shows a positive association between the receipt of antenatal care and improved maternal and child health outcomes. As might be expected, the antenatal care-seeking behavior differed significantly in the three countries studied. The most interesting findings were that (*1*) women in communities with a higher mean knowledge of human immunodeficiency virus were more likely to have delivered in a health institution; (*2*) in communities where more men were employed than women, women had a greater likelihood of delivering in a health institution; and (*3*) in communities with a higher mean decision-making autonomy score, women had an increased likelihood of delivering in a health institution. This research, like almost all public health community-level research, emphasizes the need for interventions that are culturally and contextually relevant and applicable.

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COMMUNITY INFLUENCES ON ANTENATAL AND DELIVERY CARE IN BANGLADESH, EGYPT, AND RWANDA

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There were an estimated 358,000 maternal deaths worldwide in 2008, of which 99% occurred in resource-poor countries. Taken together, sub-Saharan Africa and South Asia account for 87% of maternal deaths.[1] In addition to the significant burden of maternal mortality, for every maternal death, more than 20 women suffer from short- or long-term illness as a result of pregnancy or childbirth.[2] Evidence suggests a positive association between receiving antenatal care and improved maternal and child health outcomes.[3,4] While there are differing views on the appropriate components of antenatal care, there is agreement that antenatal care provides an important means to administer tetanus immunizations, iron and folic acid supplements, and malaria prophylactics in low-resource settings.[5–9] Additionally, antenatal care presents an opportunity to link women to clinics for delivery care. Studies have shown that women who receive antenatal care are more likely to deliver in a health institution,[10–12] and childbirth in a health institution has been consistently associated with a reduced risk of maternal and neonatal mortality, as complications can be addressed in a timely fashion.[3,4,13,14] Therefore, it is critical to understand the factors associated with care-seeking behavior during labor and delivery to encourage greater utilization of services.

Describing the impact of community-level factors on health outcomes is an area of growing interest. Multiple studies have attempted to understand the influence of the socioeconomic and cultural environment on individual health outcomes, while adjusting for individual- and household-level factors.[15–18] While some studies have addressed contextual influences on maternal health-care-seeking behavior, they have focused on a limited number of community-level factors, fewer maternal health-care-seeking outcomes, and one country of analysis.[19–21] The quality of the health infrastructure in the community and the community's socioeconomic status (SES) have been the focus of previous studies investigating the influence of community-level factors on maternal health-care-seeking behavior.[19,22–25] Logistical barriers to seeking care for women are lessened for those in communities with higher SES and a more developed health infrastructure; however, the presence of health facilities in a community alone does not necessarily result in an increase in utilization.[13,19,26–28]

Other studies have highlighted an association

between knowledge and beliefs held in a community regarding health services and health service utilization.[20,24,29,30] In particular, cultural norms regarding the responsibilities of motherhood and perceptions of the quality and effectiveness of care provided in a health facility can influence a woman's decision to deliver in a health institution.[13,14,19,20,31,32] Furthermore, women's status, as measured by the level of women's decision-making autonomy and mobility within a community, has been associated with care-seeking behavior.[13,31,33]

Previous studies have focused predominantly on the availability and accessibility of health services in a community and the SES of the community when investigating community-level influences on maternal health-care-seeking behavior.[17,19,22,23,25,28] This study incorporates a broader range of community-level factors and offers a cross-cultural comparison of three countries: Bangladesh, Egypt, and Rwanda. The results of this analysis will contribute to a more nuanced understanding of the community-level factors influencing antenatal and delivery care-seeking behavior.

METHODS

The three countries examined in this analysis have diverse demographic, health, and cultural environments. With a population of 11.37 million, Rwanda is the most densely populated country in Africa. Demographic and health indicators for Rwanda are poor, with an age structure in which 42.9% of the population is younger than 14 years of age and the adult human immunodeficiency virus (HIV) prevalence rate is 2.9%.[34] According to new estimates, the maternal mortality ratio was 540 maternal deaths for every 100,000 live births in 2008, and the total fertility rate was 4.90 in 2011.[1,34] The uptake of prenatal care in Rwanda is high, with 94.5% of women receiving care during their last pregnancy. However, prenatal care often comprises too few visits timed late in the pregnancy. There is a strong reliance on home births, with 70.4% of births recorded in the 2005 Demographic and Health Survey (DHS) delivered at home.[35]

With a population of 80.47 million, Egypt represents the largest population in the Arab world.[36] The maternal mortality ratio is low compared with the other two study countries, at 82 maternal deaths for every 100,000 live births in 2008. The total fertility rate was 2.97 in 2011, which is somewhat higher than in Bangladesh.[1,37] Compared with Rwanda, a smaller proportion of the population is younger than 14 years of age (32.7%) and the adult prevalence of HIV is <0.1%.[36] Levels of maternal health-care-seeking behavior are relatively high, with 94.4% of women receiving prenatal care and 71.7% of births delivered by trained medical professionals in health facilities.[38]

In Bangladesh, the population is estimated at 158.57 million and declines have been observed in the total fertility rate, which now stands at 2.60; however, the maternal mortality ratio was 340 per 100,000 live births in 2008.[1,37] The age structure of the population and the adult prevalence of HIV in Bangladesh are similar to Egypt: 34.3% of the population is younger than 14 years of age and the HIV prevalence is <0.1%.[37] The use of maternal health-care services is low, with only 14.6% of deliveries taking place in a health facility and 60.3% of women receiving prenatal care.[39]

In addition to the demographic differences among these three countries, they also differ with respect to maternal health-care-seeking behavior as seen by the variation in the proportion of women seeking antenatal and delivery care in each of the three countries. Significant emphasis has been placed on reducing maternal mortality rates as part of the 5th Millennium Development Goal (MDG). The 5th MDG focuses on improving maternal health by reducing the maternal mortality ratio and achieving universal access to reproductive health, including increased access to antenatal care.[40] Therefore, of particular interest for this analysis was the range of maternal mortality ratios represented by the study countries.

Maternal health-care provision systems and access to care in the three countries chosen for this analysis differed significantly. In response to the 5th MDG, Bangladesh instituted the Support for Safer Motherhood Program, which was designed to fuel health infrastructure and health personnel development. More than one-third of women (35.5%) receive antenatal care from a qualified doctor. The location of antenatal care varies by area of residence and wealth; however, overall 44% of women receive care through the public sector, 37% receive care through the private sector, 16% receive care through nongovernmental organizations, and 12% receive care at home.[39] The health-care infrastructure in Rwanda has undergone dramatic changes since the genocide in 1994. Significant focus has been placed on strengthening health system infrastructure, and recently, a national campaign to register all health facilities was completed.[41]

More than half (54.5%) of women in Egypt receive antenatal care through the private sector and 73.3% receive care from a doctor. With regard to delivery care, a significantly greater proportion of women give birth in a private facility than in a public facility (44.8% and 26.9%, respectively).[38] This use of health facilities may be a result of Egypt's efforts in the 1990s to invest resources and energy into strengthening maternal

health provision and building awareness about the benefits of seeking care during pregnancy and delivery.[42] In contrast with Bangladesh, the majority of women in Egypt (88.0%) receive antenatal care from nurses, midwives, or trained traditional birth attendants, while few women receive care from a doctor; women in urban areas are more likely to receive care from a doctor due to the higher concentration of doctors in urban areas. During delivery, more than half of the women do not have trained assistance, relying instead on traditional birth attendants or having no assistance at all.[35]

The data used in this analysis are from the nationally representative DHS for Bangladesh (2007), Egypt (2008), and Rwanda (2005). The DHSs were carried out by ORC Macro (now ICF Macro, Calverton, Maryland) in conjunction with local governments and institutions. The sampling systems used in each country were similar and were based on a two-stage sampling design. First, primary sample units (PSUs) were selected using the most recent census in each country as the sample frame. In the second stage, households were selected from a listing of households in each PSU. All ever-married women of reproductive age (15–49 years) were eligible to be included. Overall response rates for each country were high: 98.4% in Bangladesh, 99.7% in Egypt, and 98.1% in Rwanda. The DHS asks respondents for information on each birth in the three years prior to the survey, including prenatal, delivery, and labor care. The samples for this analysis were restricted to the last birth only, to limit recall bias in the reporting of prenatal care utilization. The resultant sample sizes were 4,910 women in Bangladesh, 7,813 women in Egypt, and 4,914 women in Rwanda.

Four dependent variables were chosen to represent different elements of antenatal and delivery care utilization and to reflect the World Health Organization-recommended minimum package of antenatal care for women in resource-poor settings:

1. Whether the respondent reports that she received antenatal care from a medically trained practitioner in her last pregnancy
2. Whether the respondent reports that she received four or more antenatal care visits in her last pregnancy
3. Whether the respondent reports that she received her first prenatal care visit in the first trimester of pregnancy
4. Whether the respondent reports delivering her last child in a medical institution

Women who did not receive any antenatal care were also coded as "no" for having at least four visits and for having the first visit within the first trimester.

The analysis considered three levels of influence: individual, household, and community. Individual- and household-level variables were chosen based on previous studies of factors influencing maternal health service utilization for antenatal and delivery care. Individual- and household-level factors included age, marriage duration, partner age difference, education level of respondent and partner, having ever used contraceptives, number of living children, whether any children had died, sex ratio of living children, employment status of the respondent and partner, and household wealth in quintiles. The DHS does not directly collect information on the communities in which the respondents live. Community-level data were created by averaging individual-level data to the PSU level. In this analysis, the PSU acted as a proxy for the respondent's community and consisted of approximately 30 households sampled from census enumeration areas. The use of derived community-level variables has been shown to be effective in understanding a range of health outcomes and behaviors.[19,22,24,25] The analysis examined the knowledge, economic, and gender elements of the community environment (Table 1).

Community-level variables were selected based on the findings of previous studies exploring factors associated with antenatal and delivery care-seeking behavior and conceptualized into three domains:

1. Community health knowledge: Previous studies have shown that increased levels of health knowledge are associated with reproductive health outcomes.[43] To measure community levels of health knowledge, the analysis used the mean community score on an index of HIV knowledge and the mean community score on an index of reproductive knowledge. The HIV knowledge index was used only in Bangladesh and Rwanda, as questions regarding HIV knowledge were not included in the women's questionnaire in the 2008 Egypt DHS. The same six variables were used for the index in both Bangladesh and Rwanda (a higher score on a scale of 0–6 indicated greater knowledge of HIV). The reproductive health knowledge index included different variables in each country to account for regional differences. A higher score indicated greater reproductive health knowledge.
2. Community economic prosperity: Increased household wealth and SES positively impact care-seeking behavior by ensuring greater economic resources available to allocate for health.[32,44,45] At the household level, the analysis included an index measuring the ownership of household goods categorized into quintiles. An

Table 1. Operational definitions for community-level variables used to model determinants of maternal health-care-seeking behavior outcomes in Bangladesh (2007), Egypt (2008), and Rwanda (2005)[a]

Variable	*Description*	*Bangladesh Mean (range)*	*Egypt Mean (range)*	*Rwanda Mean (range)*
Community HIV knowledge index score	Seven-point scale of knowledge of HIV, where a higher score indicates greater knowledge of HIV[b]	2.42 (0.00–5.33)	NA[c]	5.29 (3.54–6.00)
Community reproductive knowledge index score	Seven-point scale of reproductive health knowledge, where a higher score indicates greater knowledge of reproductive health[d]	3.49 (1.39–5.13)	4.01 (1.00–6.00)	3.15 (2.00–4.30)
Community decision-making autonomy index score	Five-point scale of decision-making, where a higher score indicates higher decision-making control[e]	0.65 (0.00–1.91)	0.79 (0.00–4.00)	1.25 (0.00–3.50)
Community employment ratio	Ratio of men to women employed in the community, where currently employed = 1 and not employed = 0. The proportion of men employed in the community was divided by the proportion of women employed in the community to obtain a ratio measure.	5.46 (0.00–23.00)	3.55 (0.00–18.00)	1.75 (0.00–16.00)
Community education ratio	Ratio of men to women in the community with at least a primary school education, where 0 = no and 1 = yes. The proportion of men in the community with at least a primary school education was divided by the proportion of women with at least a primary school education to obtain a ratio measure.	0.94 (0.33–3.25)	1.31 (0.00–9.00)	0.98 (0.11–5.00)
Community wealth index[f]	Mean wealth index factor score reflects ownership of durable goods and housing characteristics, where positive and negative scores represent greater and lesser wealth, respectively.	−4,651.71 (−85,842.13–299,467.80)	−12,247.59 (−183,760.00–271,261.50)	−3,498.04 (−44,031.27–761,561.80)

[a]Data were from the Demographic and Health Survey—Women's Questionnaire: Bangladesh (2007), Egypt (2008), and Rwanda (2005).

[b]The variables included were three questions about reducing risk for infection (through abstinence, using condoms, and having just one uninfected partner who has not had other partners) and three questions regarding transmission (can people get AIDS virus from mosquitoes, can people get AIDS virus by sharing food with a person who has AIDS, and can a healthy person have AIDS). Correct responses were coded as 1 and incorrect responses were coded as 0 and added together to create the index. Respondents who had no knowledge of AIDS were coded as 0 for all variables; the index was created by adding the variables together.

[c]Information about HIV was not collected in the 2008 Egypt Demographic and Health Survey—Women's Questionnaire.

[d]Variables used in Bangladesh included knowledge of contraceptive methods, STIs, AIDS, menstrual regulation, syphilis, and gonorrhea. Variables used in Egypt included knowledge of ovulatory cycle, contraceptive methods, signs and precautions for safer pregnancy, STIs, premarital gynecological exam, and a specific kind of pill for women to use while breastfeeding. Variables in Rwanda included knowledge of ovulatory cycle, contraceptive methods, STDs, and three variables describing potential symptoms of STDs. Correct knowledge was coded as 1 and incorrect or lack of knowledge was coded as 0; the variables were then added together to create the index.

[e]Variables used in the decision-making autonomy index included final say on own health care, final say on making large household purchases, final say on making household purchases for daily needs, and final say on visits to family or relatives. Women who made the decision on their own were coded as 1; all others were coded as 0. The variables were then added together to create the index.

[f]The individual wealth index was based on the ownership of 12 durable goods and created through principal component analysis. These factor scores were then categorized into quintiles to give individual wealth categories. For the community wealth index, the individual factor score for the wealth index was averaged for individuals in the primary sample unit (PSU). Thus, the numbers are the mean and range of the wealth factor score for the PSU.

HIV = human immunodeficiency virus

NA = not available

AIDS = acquired immunodeficiency syndrome

STI = sexually transmitted infection

STD = sexually transmitted disease

index of household goods has to be shown to be an efficient proxy for household wealth.[46,47] To measure community-level wealth, the analysis used the mean score for household wealth in each PSU.

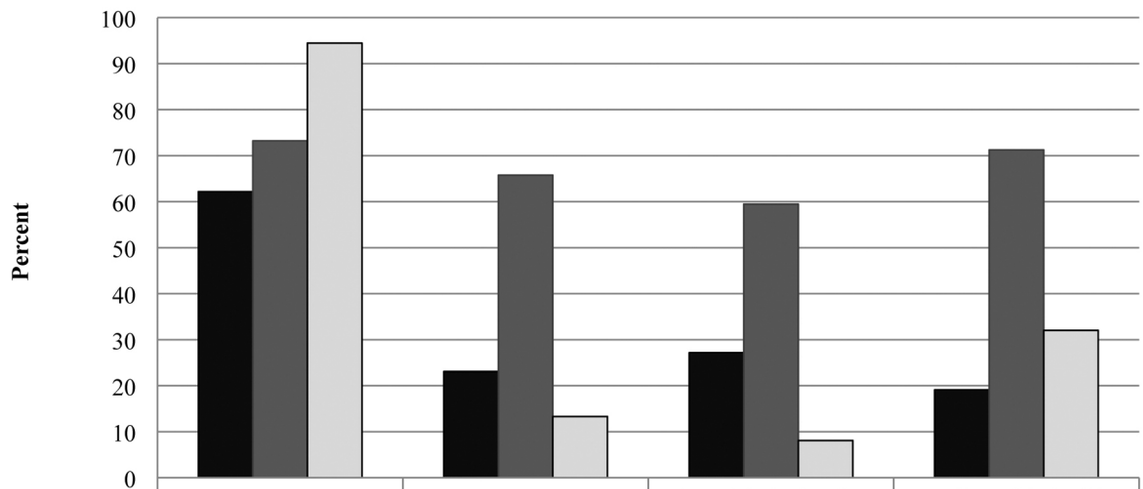
3. Community gender norms: Women who have higher levels of educational attainment and women who are employed may have greater social and economic independence to make health decisions.[11,43,45,48,49] To measure the gender norms at the community level, the analysis used the mean community score on an index of decision-making autonomy, the ratio of men to women in the community with at least a primary education, and the ratio of men to women currently employed in the community. The index for decision-making autonomy included the same variables across the three countries, where a higher score indicated greater decision-making autonomy among female respondents.

The hierarchical structure of the DHS data violates the assumption of independence, as women are clustered within PSUs and, if this is ignored, the standard errors are underestimated. Additionally, women in the same community are likely more similar to each other than women in different communities.[50,51] A random intercept was fitted to account for this hierarchical data structure and to estimate the inter- and intra-cluster variance.[15] Random effects were examined at the PSU level; cross-level effects were not considered. Multilevel logistic regression models were fitted separately for each outcome in each country. We reported the sigma mu values for the multilevel models for each country to show the remaining unexplained random variance. The results present only those variables that were significantly associated with the four outcomes in at least one country.

RESULTS

Overall, antenatal care-seeking behavior differed across the three countries (Figure). In Bangladesh, 62.2% of women received any antenatal care, 23.1% of women received at least four antenatal care visits, and 27.2% of women received the first antenatal care visit during the first trimester. A greater proportion of women in Egypt received any antenatal care (73.2%), at least four antenatal care visits (65.8%), and the first antenatal care visit during the first trimester (59.5%). While 94.5% of women received any antenatal care in Rwanda, only 13.3% received at least four antenatal care visits and 8.1% received their first antenatal care

Figure. Distribution of health-care-seeking behavior outcomes among women in Bangladesh (2007), Egypt (2008), and Rwanda (2005)



	Any antenatal care	At least 4 visits	First visit during first trimester	Delivered in health institution
Bangladesh (n=4,926)	62.17	23.09	27.16	19.09
Egypt (n=8,036)	73.23	65.75	59.48	71.25
Rwanda (n=5,387)	94.46	13.32	8.09	32.02

visit within the first trimester. Delivery care-seeking behavior also varied: for example, 19.1% of women in Bangladesh, 71.3% of women in Egypt, and 32.0% of women in Rwanda delivered their last child in a health institution.

After controlling for individual- and household-level variables, several community-level variables remained significantly associated with the four outcomes of interest. Women in communities with a higher mean HIV knowledge index score were more likely to have received any antenatal care (Bangladesh odds ratio [OR] = 1.32, 95% confidence interval [CI] 1.06, 1.63) (Table 2). Additionally, women in communities with a greater mean decision-making autonomy index score were more likely to have received any antenatal care (Egypt OR=1.28, 95% CI 1.08, 1.50). With regard to the outcome of receiving at least four antenatal care visits, women in communities with a greater mean knowledge of HIV were more likely to have received the recommended number of visits (Bangladesh OR=1.52, 95% CI 1.20, 1.93).

A greater number of community-level factors were associated with the outcome of receiving the first antenatal care visit within the first trimester. Women in communities with a higher mean HIV knowledge index score and women in communities with a higher reproductive health knowledge index score were more likely to have received the first visit during the first trimester (Bangladesh mean community HIV knowledge index score: OR=1.24, 95% CI 1.02, 1.50; Egypt mean community reproductive health knowledge index score: OR=1.18, 95% CI 1.04, 1.34). In communities where more men were employed than women, women were more likely to have received care early in the pregnancy (Rwanda OR=1.20, 95% CI 1.10, 1.32). Finally, women in communities with a greater mean decision-making autonomy index score were more likely to have received their first antenatal care visit during the first trimester (Egypt OR=1.27, 95% CI 1.11, 1.46).

Women in communities with a higher mean HIV knowledge index score were more likely than women in communities with a lower mean HIV knowledge index score to have delivered in a health institution (Bangladesh OR=1.31, 95% CI 1.11, 1.55; Rwanda OR=1.30, 95% CI 1.03, 1.64). Women had a greater likelihood of delivering in a health institution in communities where more men were employed than women as compared with communities with fewer men than women employed (Rwanda OR=1.16, 95% CI 1.08, 1.24). Finally, women had an increased likelihood of delivering in a health institution in communities with a higher mean decision-making autonomy score than in communities with a lower mean decision-making autonomy score (Egypt OR=1.31, 95% CI 1.10, 1.56) (Table 3). Although individual-, household-, and community-level variables were included in the model, significant PSU-level variation was still present in all four models (Tables 2 and 3).

DISCUSSION

The results point to the different pathways through which the community may influence maternal health-care-seeking behavior and the distinctiveness of each country's setting. In Bangladesh, HIV knowledge surfaced as the only significant community-level factor associated with the four maternal health-care-seeking behavior outcomes. Community-level factors associated with the outcomes of interest in Egypt were somewhat more varied. Decision-making autonomy at the community level was associated with receiving any antenatal care, receiving the first antenatal care visit within the first trimester, and delivering in a health institution, while reproductive health knowledge was associated with receiving the first antenatal care visit in the first trimester.

In Rwanda, the ratio of men to women employed in the community was significantly associated with both receiving the first antenatal care visit within the first trimester and delivering in a health institution, and HIV knowledge was associated with receiving the first antenatal care visit within the first trimester. Interestingly, at the community level, education and wealth were not significantly associated with the maternal health-care-seeking outcomes examined; rather, the measures of wealth and education used were not associated with care-seeking behavior. It is possible that more refined measures of wealth (e.g., mean income levels and participation in non-agricultural employment) and education (e.g., inclusion of sexual and reproductive health information in local curricula) are needed to detect the mechanisms through which individual decisions are shared by community levels of wealth and education.

The level of HIV knowledge in the community was the only community factor that was significantly associated with all four outcomes (HIV knowledge was associated with all four outcomes in Bangladesh and was associated with delivering in a health institution in Rwanda). It is unlikely, however, that the HIV knowledge itself is influencing maternal health-care-seeking behavior. Rather, communities with high levels of HIV knowledge may have been host to several public health campaigns or improvements in service quality; thus, the level of HIV knowledge in a community may be acting as a proxy for the quality of the health service

Table 2. Community-level results of a multilevel logistic regression model for the outcomes of any antenatal care, at least four antenatal care visits, and first visit during first trimester among women in Bangladesh (2007), Egypt (2008), and Rwanda (2005)[a]

	Any antenatal care AOR (95% CI)		
Community-level factors	*Bangladesh*	*Egypt*	*Rwanda*
Mean community HIV knowledge index score	1.32 (1.06, 1.63)[b]	NA[c]	1.15 (0.78, 1.68)
Mean community reproductive health knowledge index score	0.99 (0.74, 1.32)	1.04 (0.90, 1.21)	0.78 (0.46, 1.34)
Mean community wealth index score	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Ratio of men to women employed in the community	1.00 (0.98, 1.03)	1.00 (0.98, 1.02)	1.04 (0.91, 1.18)
Ratio of men to women with at least a primary education in the community	0.93 (0.64, 1.36)	1.00 (0.91, 1.10)	0.78 (0.51, 1.19)
Mean community decision-making index score	0.97 (0.74, 1.26)	1.28 (1.08, 1.50)[b]	0.78 (0.57, 1.07)
Sigma mu (SE)	0.66 (0.06)	0.70 (0.05)	0.82 (0.12)
	≥4 antenatal care visits AOR (95% CI)		
Community-level factors	*Bangladesh*	*Egypt*	*Rwanda*
Mean community HIV knowledge index score	1.52 (1.20, 1.93)[b]	NA[c]	1.01 (0.77, 1.32)
Mean community reproductive health knowledge index score	0.86 (0.62, 1.20)	0.98 (0.86, 1.12)	1.13 (0.78, 1.63)
Mean community wealth index score	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Ratio of men to women employed in the community	0.99 (0.97, 1.02)	1.00 (0.98, 1.02)	1.08 (1.00, 1.16)
Ratio of men to women with at least a primary education in the community	1.06 (0.63, 1.80)	0.97 (0.89, 1.06)	1.07 (0.77, 1.47)
Mean community decision-making index score	1.05 (0.77, 1.43)	1.11 (0.96, 1.29)	1.04 (0.84, 1.29)
Sigma mu (SE)	0.75 (0.07)	0.57 (0.05)	0.70 (0.07)
	First antenatal care visit during first trimester AOR (95% CI)		
Community-level factors	*Bangladesh*	*Egypt*	*Rwanda*
Mean community HIV knowledge index score	1.24 (1.02, 1.50)[b]	NA[c]	1.15 (0.81, 1.62)
Mean community reproductive health knowledge index score	0.82 (0.63, 1.07)	1.18 (1.04, 1.34)[b]	0.92 (0.58, 1.46)
Mean community wealth index score	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Ratio of men to women employed in the community	0.99 (0.97, 1.01)	0.99 (0.98, 1.01)	1.20 (1.10, 1.32)[b]
Ratio of men to women with at least a primary education in the community	1.06 (0.71, 1.57)	1.00 (0.92, 1.09)	0.89 (0.57, 1.40)
Mean community decision-making index score	1.18 (0.92, 1.51)	1.27 (1.11, 1.46)[b]	1.05 (0.80, 1.38)
Sigma mu (SE)	0.55 (0.06)	0.54 (0.05)	0.85 (0.09)

[a]The model controlled for the following individual-level factors: age, marriage duration, partner age difference, death of a child, number of living children, sex ratio of children (number of living boys to girls), education (respondent and partner), employment status (respondent and partner), household wealth, reproductive health knowledge, media exposure, violence justification, and decision-making autonomy.

[b]Significant at $p=0.05$

[c]Information about HIV was not collected in the 2008 Egypt Demographic and Health Survey—Women's Questionnaire.

AOR = adjusted odds ratio

CI = confidence interval

HIV = human immunodeficiency virus

NA = not available

SE = standard error

Table 3. Community-level results of multilevel logistic regression model for the outcome of women delivering infants in a health institution in Bangladesh (2007), Egypt (2008), and Rwanda (2005)[a]

	Delivered in a health institution AOR (95% CI)		
Community-level factors	*Bangladesh*	*Egypt*	*Rwanda*
Mean community HIV knowledge index score	1.31 (1.11, 1.55)[b]	NA[c]	1.30 (1.03, 1.64)[b]
Ratio of men to women employed in the community	0.98 (0.96, 1.01)	0.99 (0.97, 1.01)	1.16 (1.08, 1.24)[b]
Mean community wealth index score	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)	1.00 (1.00, 1.00)
Ratio of men to women with at least a primary education in the community	0.81 (0.45, 1.47)	0.95 (0.85, 1.06)	1.12 (0.84, 1.50)
Mean community decision-making index score	1.07 (0.78, 1.45)	1.31 (1.10, 1.56)[b]	1.17 (0.97, 1.41)
Sigma mu (SE)	0.72 (0.07)	0.94 (0.05)	0.72 (0.06)

[a]The model controlled for the following individual-level factors: age, religion, marriage duration, partner age difference, number of living children, sex ratio of children (number of living boys to girls), household wealth, education (respondent and partner), having ever used contraception, and media exposure.

[b]Significant at $p=0.05$

[c]Information about HIV was not collected in the 2008 Egypt Demographic and Health Survey—Women's Questionnaire.

AOR = adjusted odds ratio

CI = confidence interval

HIV = human immunodeficiency virus

SE = standard error

environment, which was not captured in the current analysis. The levels of HIV knowledge are measured among women, and perhaps the mechanisms through which women access and obtain knowledge are also influencing maternal health-care-seeking behavior. That is, women with high levels of HIV knowledge may have been exposed to health-care services and have access to information through social networks and exposure outside the home. Thus, levels of HIV knowledge among women may also reflect the opportunities for women to access information in their communities in Bangladesh and Rwanda.

Similarly, the level of reproductive health knowledge in a community was significantly associated with the timing of prenatal care in Egypt. Again, it is possible that this knowledge is acting as a proxy for the service and information environments. However, it is also possible that women with higher levels of reproductive health knowledge are more aware of the danger signs in pregnancy and the need to receive timely care. The community effect of reproductive health knowledge was significant even when controlling for individual levels of reproductive health knowledge; thus, it is not only the woman's own level of knowledge that may influence her behavior, but it is also beneficial to maternal health to be living in a community where women in general have more reproductive health knowledge. This finding coincides with results by Habibov and Fan, who found that higher levels of sexual health knowledge obtained outside of the immediate family positively impacted antenatal care-seeking behavior.[43]

Women who resided in communities in which a greater number of men than women were employed were more likely to receive prenatal care in their first trimester in Rwanda. While higher levels of male employment may reflect greater economic resources for health-care utilization, it is interesting that prenatal care utilization increases when the ratio of male-to-female employment increases. Previous studies have found that women's employment is positively associated with reproductive health outcomes and is further influenced by type of employment and level of work autonomy.[48,49] As shown in the results, the association between employment and maternal health-care-seeking behavior was only found to be significant in Rwanda with two of the four outcomes. Further research is needed to understand why this indicator of gender inequity is, in fact, positively associated with increased maternal health-care use.

Finally, women who resided in a community in which the mean decision-making score for women was higher were more likely to have received timely prenatal care in Egypt. While this result seems obvious—women with a greater ability to make decisions in general may also have more power to make decisions about childbirth—the result also demonstrates that it is not just the individual woman's level of decision-making that shapes her health. More specifically, some evidence suggests that decision-making autonomy surrounding movement outside the home may be particularly influential in supporting a woman's ability to seek antenatal care.[11] The association between decision-making autonomy at the community level and seeking prenatal care early in pregnancy was significant after controlling for individual levels of decision-making in Egypt. This finding suggests that climates in which women are afforded greater decision-making power, which also may be communities with more egalitarian gender views, may be protective of all women's health.

Limitations

One limitation of this research was the inability to control for the presence of health-care services in each community; it is likely that the absence of such data is reflected in the remaining variation in each model. While Service Provision Assessment Surveys collect information on health service provisions, they are not publicly available and, therefore, could not be included in this analysis. Additionally, some of the associations found with contextual-level variables may be acting as proxies for the effect of health services on contraceptive use. For example, higher levels of HIV knowledge may be reflective of the presence of public health interventions or quality reproductive health. With regard to the measurement of specific variables, all forms of employment may not be recorded as employment in the ratio of men to women employed in the community. Therefore, this variable may not fully represent the employment status of men and women in the community. The residual variation points to the need to improve the collection of health service data that can be linked to population-based data such as the DHS.

There is also a scarcity of data collected directly at the community level on variables related to maternal health-care-seeking behavior, which results in a dependence on community-level indicators derived from individual-level responses. For this analysis, the PSU was used as a proxy for the respondent's community. The PSU is a geographic representation of community, which may or may not fully represent the community's social dynamic. However, given the lack of data collected at the community level, using the PSU as a measure of community and averaging individual responses to the community level was the best approximation available.

CONCLUSIONS

The identification of community-level characteristics that are significantly associated with a woman's health-care-seeking behavior during pregnancy and delivery highlights the potential for such factors to be harnessed for the development of public health interventions that aim to increase service utilization. The range of community factors identified in this analysis and their variation across the study settings demonstrates that any such interventions must be context-specific, and should reflect the characteristics and dominant influences present in the community. The methodology used in this research can be applied to other health outcomes, and provides policy makers and researchers with an opportunity to incorporate existing data sources.

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