

Providing information on pregnancy complications during antenatal visits: unmet educational needs in sub-Saharan Africa

Béatrice Nikiéma,^{1*} Gervais Beninguisse² and Jeannie L Haggerty³

Accepted 6 January 2009

Introduction Lack of information on the warning signs of complications during pregnancy, parturition and postpartum hampers women's ability to partake fully in safe motherhood initiatives. We assessed the extent to which women in 19 countries of sub-Saharan Africa recall receiving information about pregnancy complications during antenatal care for the most recent pregnancy, and examined the impact of advice receipt on the likelihood of institutional delivery.

Methods A cross-sectional, cross-country analysis was performed on data from the most recent Demographic and Health Surveys (DHS) of 19 countries of sub-Saharan Africa. Multilevel logistic regressions were used to predict the probability of receiving information and delivering in a health centre, by clinical risk factors (age, parity, previous pregnancy termination), social factors (area of residence, education), and the frequency of service utilization (number of visits).

Results The percentage of women recalling information about potential complications of pregnancy during antenatal care varied widely, ranging from 6% in Rwanda to 72% in Malawi, and in 15 of the 19 countries, less than 50% of women reported receiving information. Institutional delivery ranged from 29% (Ethiopia) to 92% (Congo Brazzaville). Teenagers (OR=0.84), uneducated (OR=0.65) and rural women (OR=0.70) were less likely to have been advised, compared with women aged 20–34 years, women with secondary education and urban women, respectively. Likelihood of recalling information increased with the number of antenatal visits. Advice reception interacts with the number of antenatal visits to increase the likelihood of institutional delivery.

Conclusion There is a high level of unmet need for information on pregnancy complications in sub-Saharan Africa, particularly among those who face significant barriers to accessing care if complications occur. Educational interventions are critical to safe motherhood initiatives; health providers must fully use the educational opportunity in antenatal care.

¹ Research professional, Groupe de recherche interdisciplinaire en santé (GRIS), Faculté de médecine, département de Médecine sociale et préventive, Université de Montréal, Canada.

² Professor, Regional Institute for Demographic Training and Research (IFORD), P.O. BOX 1556 Yaounde, Cameroon. E-mail: gbeninguisse@yahoo.fr

³ Associate Professor, Department of Community Health Sciences, Université de Sherbrooke, Quebec, Canada, and Canada Research Chair on Population Impacts of Healthcare.

* Corresponding author. GRIS, Faculté de médecine, département de Médecine sociale et préventive, Université de Montréal, C.P. 6128, succ. Centre-ville, Montréal, Québec, H3C 3J7, Canada. Tel: +1 514 343-6111, ext. 15482. Fax: +1 514 343-2207. E-mail: B.Nikiema@UMontreal.ca

Keywords Pregnancy complications, advice provision, antenatal care, institutional delivery, sub-Saharan Africa

KEY MESSAGES

- Pregnant women are not routinely advised on pregnancy complications during prenatal visits in sub-Saharan Africa.
- A lower proportion of rural than urban women are informed of potential complications despite their greater likelihood of being distant from emergency obstetric services and needing to have contingency plans to avoid death in the case of complication.
- Receiving advice about pregnancy complications not only increases the likelihood of institutional delivery, it also enhances the positive impact of the number of antenatal visits on institutional delivery.
- Since antenatal visit coverage is relatively high in sub-Saharan Africa, increasing providers' awareness and ability in alerting users to the danger signs of potential complications and developing emergency contingency plans should be a priority for public policies.

Introduction

In sub-Saharan Africa, despite many decades of public health interventions, pregnancy-related complications continue to be a leading cause of death and disability for women of reproductive age (United Nations Population Fund 2005). Pregnancy is potentially risky for all women worldwide. However, the lifetime risk for African women is heightened by the conjunction of a high fertility rate, poor nutritional status and vulnerable health conditions. In addition, women in sub-Saharan Africa most often face suboptimal management of pregnancy and delivery complications, as only 46.5% and 39.6% in Eastern and Western Africa, respectively) compared with 83.2% in Latin America and the Caribbean and virtually all births (>99%) in industrialized countries (World Health Organization 2007).

Pregnancy complications and their inadequate management also threaten the survival and the health of too many African babies. In sub-Saharan Africa, there are 41 neonatal deaths per 1000 live births, of which 75% occur within the first 7 days of life; and 32 stillbirths per 1000 deliveries, of which 24–37% are intrapartum deaths (Stanton *et al.* 2006; World Health Organization 2006). These rates are among the highest worldwide.

Although debate continues over the most effective ways to improve maternal and child health and survival in developing countries, programmes are currently conceived with the understanding that the vast majority of complications are unpredictable, and that when they occur, prompt professional intervention is critical for survival. Accordingly, main approaches target the reduction of the various delays in timely access to adequate obstetrical care: delays in deciding to seek care, delays in reaching care, and delays in receiving appropriate care (Thaddeus and Maine 1994; Del Barco 2004). Beyond the well-known economic, transportation and provider-related barriers to obtaining emergency obstetric care, lack of

awareness of the danger signs of complication during pregnancy and delivery contributes to harmful delays in the decision to seek care (Prevention of Maternal Mortality Network 1992; Thaddeus and Maine 1994; Prevention of Maternal Mortality Network 1995; Kyomuhendo 2003; Ronsmans *et al.* 2003; Pettersson *et al.* 2004; Mills and Bertrand 2005; Pearson and Shoo 2005). Vaginal bleeding, abdominal pain, generalized oedema, blurred vision, fever, excessive fatigue, headache, breathlessness, loss of consciousness, convulsions, labour lasting more than 12 hours, and retained placenta are examples of symptoms that should alert pregnant women or their families to seek help with a skilled provider (Del Barco 2004).

The Safe Motherhood Initiative currently advocates the provision of advice during antenatal care about potential pregnancy complications, and specifically about how to seek medical care for pregnant women and their families. This is viewed as central to the strategy to reduce delays in seeking skilled care. Although antenatal care does not diminish the likelihood of complications, the number of visits is a predictor of institutional delivery (Islam *et al.* 2006; Gage 2007; Fotso *et al.* 2008) and these visits provide a natural opportunity for conveying this critical health information.

This study estimates the proportion of women in 19 sub-Saharan Africa countries who receive advice on potential pregnancy complications during antenatal care, and whether the likelihood of receiving advice is higher among women traditionally considered at greater risk of complication (young age and old age; primiparity and grand-multiparity; history of pregnancy complication), or vulnerable to context-induced delays (rural vs. urban areas). We hypothesized that 'high-risk' women would be more likely to receive advice. This study also evaluates whether receipt of advice modifies the well-known positive association between the frequency of antenatal visits and the likelihood of institutional delivery.

Methods

Data

We performed a cross-country analysis on data from the most recent cross-sectional Demographic and Health Surveys (DHS) of 19 countries. Included were surveys conducted in 2000 or later that collected data on reception of advice about pregnancy complications. The selected countries and year of survey were (in alphabetical order): Benin (2001); Burkina Faso (2003); Cameroon (2004); Chad (2004); Congo Brazzaville (2005); Ethiopia (2000); Ghana (2003); Guinea (2005); Kenya (2003); Lesotho (2004); Madagascar (2004); Malawi (2000); Mali (2001); Mozambique (2003); Namibia (2000); Nigeria (2003); Rwanda (2005); Uganda (2001); and Zimbabwe (1999).

DHS are methodologically comparable across countries in terms of sampling and measures of information on pregnancy complications. The surveys are designed to be representative at the country, regional and urban-rural levels using two-stage probabilistic sampling where clusters of communities are first selected then households. All mothers aged 15–49 years in selected households were interviewed, *inter alia*, on antenatal visits during the pregnancy of children born in the previous 3 or 5 years (depending on country). For this analysis, we included only women who received at least one antenatal visit during the pregnancy of their youngest child within the preceding 5 years. The DHS interview asked these women to report whether they were advised about pregnancy complications during antenatal care, using the following questions: “Sometimes a pregnancy can have complications that lead to miscarriage or even death. Were you told about the signs of pregnancy complications? If yes, were you told where to go or what to do if you had any of these signs?” Women reported also on where they delivered: at home, or a public, private, confessionnal or community health centre, or other health institution (Demographic and Health Surveys 2003).

Variables

The outcome or dependant variables were defined dichotomously as whether a woman received information about pregnancy complication and whether she delivered in a health centre or at home.

The main independent variables of interest were indicators of highest risk of pregnancy complications, though we were limited to those that were available in the database for all 19 countries: primigravida or grand multigravida; history of terminated pregnancy; adolescence (<20 years) or advanced age (>34 years). For parity, we defined four risk categories (one, two to three, four to five, six and more). Age had three categories (<20 years, 20–34 years, 35 years and over). History of terminated pregnancy was dichotomous (any, none).

We also examined whether advice provision varied according to women’s education (none, primary, secondary and above) and location of residence (rural, urban). We anticipated that likelihood of advice would increase with the frequency of contacts with medical staff, using as a proxy the number of antenatal visits. Since we were concerned that reporting may be biased by the period of recall, we tested whether the likelihood of advice differed systematically by the interval between the last

delivery and time of reporting (within 12 months, 13–24 months, 25–36 months, 37–48 months and 49–60 months).

Analysis

The prevalence of advice and of institutional delivery among antenatal care users were calculated for each country. We also explored the univariate associations between the dependant variables and predictors by country, using the Chi-square test, with an Alpha level of 0.05 as decision criterion, to detect statistically significant differences.

The data from the 19 countries were merged for multivariate analysis to examine the multivariate associations between each outcome variable and predictors of interest. Because of the nested structure of data, we used multilevel logistic regression modelling where individual women (level 1) were nested in clusters of communities (level 2), and clusters in countries (level 3). The reception of advice on pregnancy complication was first modelled. After a first model with a constant, we assessed the effects of women’s level predictors (age, parity, history of terminated pregnancy, education, frequency of antenatal visits), and thirdly added the type of residence which is linked to cluster by the study design. We then added time intervals between pregnancy and reporting. No independent variables were included at country level but we allowed random variation at country level for the type of area.

Both dependant variable models were fitted with MLwin 2.02, specifying second order penalized-quasi-likelihood (PQL) linearization with Restricted Iterative Generalized Least Square (RIGLS) procedures (Goldstein 2003). These permit unbiased estimation, especially the random components, despite the clustered data. To analyse whether the magnitude of the known positive association between antenatal visits and institutional delivery differs by advice reception (effect modification), we included in the final regression model an interaction term which multiplies advice by antenatal visits; if statistically significant, the effect of advice on institutional delivery is modified by number of antenatal visits.

Results

Being told about pregnancy complications

A total of 69 073 women attended antenatal visits during the pregnancy of their youngest child in the 19 countries (ranging from 1811 to 7398 by country). Table 1 shows the distribution of predictors overall as well as statistical differences between countries and a summary comment on the most remarkable between-country differences. Between-country ranges were greatest for level of education and number of prenatal visits.

Figure 1 shows the percentage of women recalling advice on pregnancy complications. This varies widely between countries, ranging from less than 25% of women in Rwanda, Burkina Faso, Benin, Chad and Uganda to a high of 72% in Malawi. The lowest percentage was in Rwanda with only 6% of women reporting having been told about pregnancy complications. On a positive note, among women who had been informed about potential complications, the vast majority (range 84% to 98%) were specifically told where to go to seek help in the case of complications.

Table 1 Distribution of women's characteristics across countries (non-weighted percentages)

	All (N = 69 073) %	Minimum (country) %	Maximum (country) %	Between county difference χ^2 (df), P-value	Comments
Mother's age (years)					
<20	8.3	1.5 (Rwanda)	12.2 (Mozamb.)	1236.4 (36), 0.000	Women were more likely to be older in Benin, Burkina, Ghana, Guinea, Nigeria & Rwanda
20-34	68.4	60.4 (Guinea)	73.5 (Kenya)		
>34	23.3	18.3 (Uganda)	32.0 (Rwanda)		
Parity					
1	22.2	16.2 (Rwanda)	33.8 (Lesotho)	1800.8 (54), 0.000	Women were of higher parity in Burkina, Chad, Guinea, Mali, Nigeria, Rwanda & Uganda
2-3	33.6	29.0 (Chad)	40.2 (Congo)		
4-5	21.6	16.6 (Lesotho)	24.4 (Guinea)		
≥6	22.6	11.1 (Lesotho)	30.6 (Mali)		
Ever had a terminated pregnancy					
Yes	16.4	8.3 (Namibia)	32.6 (Congo)	1527.1 (18), 0.000	Women were more likely to have had a terminated pregnancy in Benin, Cameroon & Congo
Mother's education					
None	37.8	2.6 (Lesotho)	84.1 (Guinea)	28 677.3 (36), 0.000	Women were more likely to be less educated in Benin, Burkina, Guinea & Mali
Primary	40.8	9.8 (Guinea)	63.5 (Lesotho)		
≥Secondary	21.4	5.6 (Burkina)	63.1 (Congo)		
Number of antenatal visits					
1	6.2	1.2 (Zimbabwe)	18.9 (Ethiopia)	10 103.2 (90), 0.000	More than 25% of women received less than 3 antenatal visits in Burkina, Ethiopia & Rwanda
2	12.1	3.6 (Congo)	32.3 (Rwanda)		
3	22.3	9.7 (Namibia)	40.4 (Burkina)		
4	17.9	9.9 (Nigeria)	25.8 (Madag.)		
≥5	38.1	2.7 (Rwanda)	67.5 (Congo)		
Don't know	3.3	0.2 (Rwanda)	12.7 (Zimbabwe)		
Residential area					
Rural	65.8	33.8 (Congo)	81.0 (Malawi)	5916.6 (18), 0.000	Women were more likely to live in rural areas in Burkina, Guinea, Kenya, Lesotho, Malawi, Rwanda, Uganda & Zimbabwe
Time from birth to interview					
<12 months	33.6	26.8 (Zimbabwe)	38.3 (Nigeria)	790.8 (72), 0.000	Time from birth to interview tended to be longer in Lesotho, Namibia & Zimbabwe
12-24 months	27.7	24.6 (Lesotho)	31.7 (Uganda)		
24-36 months	19.6	17.2 (Madag.)	21.4 (Burk., Guin.)		
36-48 months	12.0	8.9 (Rwanda)	15.5 (Zimbabwe)		
48-60 months	7.1	4.4 (Chad)	10.4 (Zimbabwe)		

Data period: DHS 1999 for Zimbabwe; DHS 2000 for Ethiopia, Malawi & Namibia; DHS 2001 for Benin, Mali & Uganda; DHS 2003 for Burkina Faso, Ghana, Kenya, Mozambique & Nigeria; DHS 2004 for Cameroon, Chad, Lesotho & Madagascar; DHS 2005 for Congo Brazzaville, Guinea & Rwanda.

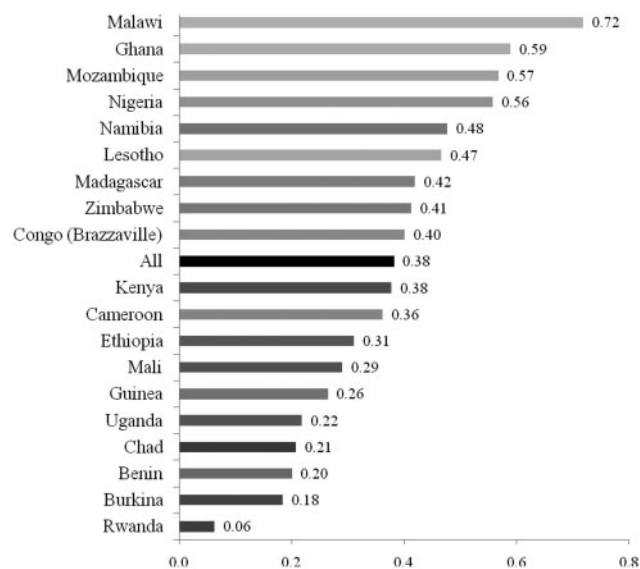


Figure 1 Percentage of antenatal care users who were told about pregnancy complications during their most recent pregnancy in 19 countries of sub-Saharan Africa

Results of the univariate analysis are summarized in Table 2 (detailed quantitative results are available from the authors). They suggest a certain cross-country consistency in variables that predict the likelihood of receiving information. Likelihood of receiving information on pregnancy complications increases with more antenatal visits (except in Benin and Congo), with higher level of education (except for Benin, Chad and Mozambique), and among urban women (except in Benin, Cameroon, Congo, Ghana and Rwanda). Disturbingly, women considered at higher clinical risk were not consistently more likely to report reception of advice compared with low-risk women. In fact, advice was least likely among teenagers in nine of the countries. In most of the countries, a woman's parity and whether she had ever had a terminated pregnancy did not seem to be associated with her being told about pregnancy complications.

Table 3 presents multivariate results obtained from multi-level logistic regressions on pooled data. After taking into account the hierarchical structure of data and controlling for the effect of all other predictors, teenagers were less likely ($OR=0.84$) to be told about potential pregnancy complications and women aged 35 years and older were more likely to receive this information ($OR=1.13$), compared with women aged 20–34 years. Neither primipara nor grand multipara women were more likely to receive complication advice. In fact, primipara were less likely to receive advice, albeit a small effect ($OR=0.94$). A positive but small ($OR=1.08$) effect is also detected for women with a prior history of pregnancy termination.

Receipt of information and advice also differs significantly by non-clinical factors that may affect ability to make timely decisions around emergency obstetrical care. A consistently lower proportion of rural than urban women were informed of potential complications. Although the odds ratio is attenuated when all risk factors are entered simultaneously, it still remains statistically significant ($OR=0.70$). The presence of significant

random effect at country level suggests that rural-urban disparities may be considerably higher in some countries than in others.

Likewise, compared with women with at least secondary education, women with just primary education were only 0.78 as likely to have received information and advice about pregnancy complications; women with no education 0.64 as likely (Table 3). The profile of health service use also influences the likelihood of receiving advice. Compared with women with one visit, women with three visits were 1.90 times as likely to receive advice and those with at least five visits were 2.72 as likely.

The random part of the model shows that variances remained unexplained at cluster as well as at country level (Table 3). These residual variances reflect the effects of unobserved variables, or the portion of variance in information reception on pregnancy complications, that variables included in our model did not capture.

Receiving advice on pregnancy complications and institutional delivery

The proportion of antenatal care users who delivered their youngest child in a health centre varied widely between countries, ranging from 29% in Ethiopia to 92% in Congo Brazzaville. Receiving advice and information on pregnancy complications increases the likelihood of institutional delivery in all countries except Congo Brazzaville and possibly Chad (Table 4).

Multilevel multivariable regressions confirm the positive effects of both receiving advice and number of antenatal visits on the likelihood of delivering in a health centre (Model 1, Table 5). There is a clear gradient that the probability of delivering in a health centre increases with each additional antenatal visit. These effects still hold after controlling for the effects of age, parity, history of miscarriage, education and location. We found a statistically significant interaction between receipt of advice and number of antenatal visits on the likelihood of institutional delivery.

As shown by Model 2 in Table 5, the receipt of advice increases the impact of additional antenatal visits. Among women who attended just one antenatal visit, those who received advice were 70% more likely to have institutional deliveries ($OR=1.70$) compared with single-antenatal-care users with no advice. Likewise, compared with those who had only one antenatal visit but no advice, women who had at least five antenatal visits were 3.82 times more likely to have institutional deliveries, whereas those who additionally received advice were 4.81 times more likely to deliver institutionally.

Discussion and policy implications

The overall pattern shown in our results is that providers do not routinely provide women with information and advice on pregnancy complications as part of antenatal care, or at least information is not conveyed in a way that women remember having received it. In 15 of the 19 countries studied, more than 50% of women reported receiving no information during antenatal visits. We suspect that this finding extends beyond

Table 2 Univariate associations of independent variables with reported receipt of advice about pregnancy complications during the antenatal consultations of the latest pregnancy in 19 countries of sub-Saharan Africa

	Nature of the association, where statistically significant	Countries where the association is not statistically significant
Mother's age	<ul style="list-style-type: none"> - Receipt of advice about complications increased with increasing age in Burkina Faso, Ghana, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Nigeria & Zimbabwe - In Rwanda the youngest and the oldest groups were most likely to receive advice 	Benin, Cameroon, Chad, Congo, Ethiopia, Guinea, Namibia, Uganda
Parity	<ul style="list-style-type: none"> - Receipt of advice increased with parity in Burkina Faso, Lesotho, Malawi, Mali and Mozambique; and decreased with parity in Kenya, Madagascar, Namibia and Uganda - In Rwanda, multipara with 4 to 5 children had the lowest proportion of informed women 	Benin, Cameroon, Chad, Congo, Ethiopia, Ghana, Guinea, Nigeria, Zimbabwe
Ever had a terminated pregnancy	<ul style="list-style-type: none"> - Women with a history of abortion were more likely to receive advice about pregnancy complications in Burkina Faso, Congo, Ethiopia, Ghana & Rwanda 	Benin, Cameroon, Chad, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Nigeria, Uganda, Zimbabwe
Mother's education	<ul style="list-style-type: none"> - Receipt of advice increased with higher education in Burkina Faso, Cameroon, Congo, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Namibia, Nigeria, Uganda & Zimbabwe 	Benin, Chad, Mozambique, Rwanda
Number of antenatal visits	<ul style="list-style-type: none"> - Receipt of advice increased with increasing visits in Burkina Faso, Cameroon, Chad, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Nigeria, Rwanda, Uganda & Zimbabwe 	Benin, Congo
Type of residential area	<ul style="list-style-type: none"> - Receipt of advice about pregnancy complications was higher in urban than rural women in Burkina Faso, Chad, Ethiopia, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mozambique, Namibia, Nigeria, Uganda & Zimbabwe 	Cameroon, Congo, Rwanda
Time from birth to interview	<ul style="list-style-type: none"> - Receipt of advice was higher among rural women in Benin - Reported receipt of advice about pregnancy complications increased with increasing interval between birth and interview in Burkina Faso, Ethiopia, Kenya, Madagascar, Malawi, Nigeria, Rwanda & Uganda 	Benin, Cameroon, Chad, Congo, Ghana, Guinea, Lesotho, Mali, Mozambique, Namibia, Zimbabwe

Data period: DHS 1999 for Zimbabwe; DHS 2000 for Ethiopia, Malawi & Namibia; DHS 2001 for Benin, Mali & Uganda; DHS 2003 for Burkina Faso, Ghana, Kenya, Mozambique & Nigeria; DHS 2004 for Cameroon, Chad, Lesotho & Madagascar; DHS 2005 for Congo Brazzaville, Guinea & Rwanda.

Table 3 Likelihood of receiving advice about pregnancy complications during antenatal visits in 19 sub-Saharan African countries: parameter estimates from a multilevel multivariable logistical model ($N=69\,073$)

	Odds Ratio	95% Confidence Interval
Fixed effects		
Mother's age; reference = 20–34 years		
<20 years	0.84	(0.78, 0.91)
>34 years	1.13	(1.07, 1.21)
Parity; reference = 2–3		
1	0.94	(0.89, 1.00)
4–5	n.s.	
≥ 6	n.s.	
Ever had a terminated pregnancy; reference = no		
Yes	1.08	(1.02, 1.15)
Mother's education; reference = ≥ secondary		
None	0.64	(0.60, 0.68)
Primary	0.78	(0.73, 0.83)
Number of antenatal visits; reference = 1		
2	1.52	(1.35, 1.71)
3	1.90	(1.72, 2.09)
4	2.08	(1.88, 2.29)
≥5	2.72	(2.47, 3.00)
Residence area; reference = urban		
Rural	0.70	(0.60, 0.82)
Time from birth to interview; reference = <12 months		
12–24 months	n.s.	
24–36 months	n.s.	
36–48 months	n.s.	
48–60 months	n.s.	
Random effects^a		
Cluster level variance		
Constant	0.55*	(0.02)
Country level variance		
Constant	0.79*	(0.26)
Area of residence	0.11*	(0.04)

*Significant at 5% level.

^aVariances are in Logit scale.

ns = not significant.

these 19 countries and that lack of information may be a widespread unmet need in reproductive care in Africa (Kyomuhendo 2003; Pettersson *et al.* 2004). Gay *et al.* (2003) note that providers in Egypt do not routinely inform women about pregnancy complications. Anya *et al.* (2008) reached the same conclusion in Gambia after surveying 457 pregnant women who attended six rural and six urban antenatal clinics. In another study that rated care provided during prenatal visits in 49 developing countries, including 21 from sub-Saharan Africa, advice on danger signs of pregnancy complications was given the fourth lowest rank among six items evaluated (Bulatao and Ross 2002).

In our study, low rates do not appear to be due to faulty recall, since the rates in Malawi demonstrate that a high

proportion of women can recall receiving advice. In addition, the likelihood of advice does not systematically differ according to the interval between the last delivery and time of reporting. Instead, low rates may be partly explained by the too short time that providers spend with each woman during antenatal visits (von Both *et al.* 2006; Anya *et al.* 2008). However, uncertainties remain and further studies are needed to investigate in depth why so many women are not advised on complications, particularly in countries with high levels of maternal mortality (Kayongo *et al.* 2006). It would also be helpful for other African countries to better understand how and why Malawi has achieved such rates of educational communication in antenatal care.

For many decades, antenatal care has been designed around the logic of giving more attention to women with higher risk of pregnancy or delivery-related complications. We anticipated therefore that 'high risk' women would be more likely to receive information about potential pregnancy complications. This was not the case for the risk variables that were available in the DHS datasets: young or older age, primipara or grand multipara, and history of terminated pregnancy. In fact, our findings support those of other studies which have found that reproductive health services do not meet the needs of very young mothers (Treffers *et al.* 2001; Magadi *et al.* 2007).

Consistent with previous results (Bloom *et al.* 1999; Barber 2006; Ram and Singh 2006; Yanagisawa *et al.* 2006), increasing the number of antenatal visits achieved is associated with higher probability of institutional delivery. Our results particularly establish that receipt of advice not only increases the likelihood of institutional delivery but it also heightens the effects of antenatal care on institutional delivery. The causal interpretation of the effect of number of visits is difficult. Women receiving more visits may already have had pregnancy complications and thus be more likely to have received information about them. Clearly, the likelihood of receiving advice about complications increases with each antenatal visit, and advice increases the likelihood of institutional delivery. However, we also observe that institutional delivery increases with the number of antenatal visits even in the absence of advice. We cannot rule out the possibility that women who have decided on institutional delivery are more likely to be frequent attendees of antenatal care, or that number of antenatal visits is a marker for a tendency toward professionalized pregnancy care rather than having any causal relation. We cannot either rule out the possibility that women who have been told about potential complications of pregnancy but subsequently do not develop any of them, become confident that home-delivery is safe for them and thus develop a tendency towards non-institutional delivery. Nonetheless, the observation that advice has an independent effect and potentiates the effect of antenatal visits on institutional delivery suggests that the content of antenatal visits does indeed matter over and above this marker and women's characteristics. A limitation of our data is that we did not have information on whether women experienced complications during the studied pregnancy. In support of our interpretation, one study that specifically explored the relationship between content of prenatal care and skilled delivery in Mexico observed that higher scores in quality of care received during prenatal visits

Table 4 The likelihood of institutional delivery among women and its association with having been told about pregnancy complications, among antenatal care users in 19 countries of sub-Saharan Africa

Country	Overall rate of institutional deliveries among antenatal care users %	Rate of institutional deliveries by receipt of advice about pregnancy complications				P-value for difference*
		No		Yes		
		n	(%)	n	(%)	
Benin ³	85.4	2118	(86.1)	510	(82.7)	0.019
Burkina ⁴	54.7	2338	(52.1)	670	(66.3)	0.000
Cameroon ⁵	70.8	1823	(68.1)	1146	(75.6)	0.000
Chad ⁵	41.6	582	(40.6)	172	(45.6)	0.044
Congo (Brazzaville) ⁶	92.4	1656	(92.3)	1116	(92.7)	0.357
Ethiopia ²	29.1	376	(24.1)	285	(40.4)	0.000
Ghana ⁴	46.5	386	(37.3)	787	(52.9)	0.000
Guinea ⁶	36.9	861	(33.2)	437	(46.9)	0.000
Kenya ⁴	49.2	890	(42.6)	763	(60.2)	0.000
Lesotho ⁵	59.9	728	(53.8)	792	(66.8)	0.000
Madagascar ⁵	45.0	745	(41.4)	649	(50.0)	0.000
Malawi ²	59.5	1029	(49.4)	3376	(63.5)	0.000
Mali ³	61.0	1837	(58.2)	873	(67.7)	0.000
Mozambique ⁴	64.5	1504	(58.9)	2305	(68.8)	0.000
Namibia ²	80.1	1065	(77.5)	1040	(82.9)	0.000
Nigeria ⁴	54.3	481	(44.7)	842	(62.0)	0.000
Rwanda ⁶	33.1	1519	(32.2)	149	(47.2)	0.000
Uganda ³	47.1	1275	(42.9)	518	(62.3)	0.000
Zimbabwe ¹	75.8	1033	(69.6)	884	(84.7)	0.000
Mean percentages	57.2 (SD = 17.7)	52.9 (SD = 18.7)		64.2 (SD = 14.8)		

Data period: 1 = DHS 1999; 2 = DHS 2000; 3 = DHS 2001; 4 = DHS 2003; 5 = DHS 2004; 6 = DHS 2005.

*Significance of χ^2 statistic.

were associated with adherence to institutional delivery (Telfer *et al.* 2002).

Although the observed urban-rural gap might be expected because of lack of human and material resources in rural areas (Gerein *et al.* 2006), it is a matter of concern that those who are the most disadvantaged in terms of access to emergency obstetrical services (Bulatao and Ross 2002) are the least likely to be advised on the risks they are facing. Women in rural areas face longer distances to health services, more precarious transportation options, tend to be poorer (Pearson and Shoo 2005) and are more exposed to decision-related delays (Maine 1994). For all these reasons, alerting women to the danger signs of potential complications and developing an emergency contingency plan is more important in rural areas.

Several studies have reported that targeted educational interventions in communities result in higher and timelier use of medical services for pregnancy complications (Measham and Kallianes 1995; Olaniran *et al.* 1997; Koblinsky *et al.* 1999; Katende *et al.* 2000; ORC Macro 2002). The educational opportunity offered in antenatal care cannot be ignored as a contributing strategy in reducing maternal and child mortality and morbidity through increasing appropriate use of obstetrical services and skilled birth attendants. While the effectiveness of many components of routine antenatal care is questioned,

informing women and their families about pregnancy-related complications is widely accepted as a necessary part of the public health strategy to reduce maternal and child mortality and morbidity. Our results provide additional justification for adopting the spirit of 'Focused Antenatal Care' (Del Barco 2004). In particular, adopting individualized provision of care and ensuring continuity of care can facilitate progression towards greater access to skilled care through mobilizing what already exists. Coverage of antenatal care in sub-Saharan Africa has increased over the past decade (albeit it is still low compared with other regions of the world). By 2005, health professionals had the opportunity to advise three-quarters of pregnant women, who meet with them at least once (UNICEF 2007). We recognize that the full provision of information and advice as recommended within the framework of Focused Antenatal Care may require important material, human and time resources that are currently lacking in many of the studied African countries and may be out of reach in the near future for them (Chege *et al.* 2005; Birungi and Onyango-Ouma 2006; Nyarko *et al.* 2006; von Both *et al.* 2006). However, we should also acknowledge that the current efforts to improve technical skills in obstetrical care may have only limited effect if women cannot be the full agents of their own health. Apart from the public health considerations, it may be argued that

Table 5 Effects of being told about pregnancy complications and number of antenatal visits on the likelihood of health centre utilization for delivery in sub-Saharan Africa: results from multilevel logistic regressions adjusted for women's age, parity, education, previous history of terminated pregnancy and residence area

	Odds Ratio	95% Confidence Interval
Model 1: Main effects		
Told about pregnancy complications		
No = Reference category		
Yes	1.35	(1.29, 1.41)
Number of antenatal visits		
1 = Reference category	1	
2	1.56	(1.41, 1.72)
3	2.13	(1.93, 2.32)
4	2.54	(2.30, 2.79)
≥5	3.53	(3.20, 3.88)
Model 2: Interaction effects		
Effect of number of antenatal visits among women NOT told about pregnancy complications		
1 = Reference category	1.00	
2	1.60	(1.43, 1.79)
3	2.22	(1.98, 2.45)
4	2.69	(2.38, 2.98)
≥5	3.82	(3.39, 4.22)
Effect of number of antenatal visits among women told about pregnancy complications		
1	1.70	(1.38, 2.08)
2	2.34	(2.03, 2.70)
3	3.00	(2.66, 3.39)
4	3.56	(3.15, 4.03)
≥5	4.81	(4.29, 5.38)

women have the right to be knowledgeable of the potential risks they are facing, particularly when they are visiting health professionals specifically for their pregnancy. Having information is part of their right to make informed decisions about their health.

Acknowledgement

The data were kindly provided by the Demographic and Health Surveys from Macro international.

References

- Anyia SE, Hydera A, Jaiteh LE. 2008. Antenatal care in the Gambia: missed opportunity for information, education and communication. *Pregnancy and Childbirth* **8**: 9.
- Barber S. 2006. Does the quality of prenatal care matter in promoting skilled institutional delivery? A study in rural Mexico. *Maternal and Child Health Journal* **10**: 419–25.
- Birungi H, Onyango-Ouma W. 2006. Acceptability and sustainability of the WHO focused antenatal care package in Kenya. FRONTIERS Final Report. Washington, DC: Population Council. Online at: http://www.popcouncil.org/pdfs/frontiers/FR_FinalReports/Kenya_ANC.pdf, accessed 1 November 2008.
- Bloom S, Lippeveld T, Wypij D. 1999. Does antenatal care make a difference to safe delivery? A study in urban Uttar Pradesh, India. *Health Policy and Planning* **14**: 38–48.
- Bulatao R, Ross J. 2002. Rating maternal and neonatal health services in developing countries. *Bulletin of the World Health Organization* **80**: 721–27.
- Chege JN, Askew I, Mosery N *et al.* 2005. Feasibility of introducing a comprehensive integrated package of antenatal care services in rural public clinics in South Africa. FRONTIERS Final Report. Washington, DC: Population Council. Online at: http://www.popcouncil.org/pdfs/frontiers/FR_FinalReports/SA_ANC.pdf, accessed 1 November 2008.
- Del Barco RC. 2004. Monitoring birth preparedness and complication readiness tools and indicators for maternal and newborn health. Baltimore, MD: JHPIEGO0.
- Demographic and Health Surveys. 2003. Demographic and health surveys: Women's questionnaire, Version 8.9 (April 18). Online at: <http://www.measuredhs.com/pubs/pdf/FR139/Woman.pdf>, accessed 7 June 2008.
- Gay J, Hardee K, Judice N *et al.* 2003. *What Works: A policy and program guide to the evidence on Family Planning, Safe Motherhood, and STI/HIV/AIDS interventions. Module 1: Safe Motherhood*. Washington, DC: Policy Project.
- Gerein N, Green A, Pearson S. 2006. The implications of shortages of health professionals for maternal health in Sub-Saharan Africa. *Reproductive Health Matters* **14**: 40–50.
- Goldstein H. 2003. *Multilevel Statistical Models*. London: Edward Arnold.
- Katende C, Bessinger R, Gupta N, Knight R, Lettenmaier C. 2000. *Uganda Delivery of Improved Services for Health (DISH) Evaluation Surveys 1999. MEASURE Evaluation Technical Report Series No. 6*. Chapel Hill, NC: University of North Carolina at Chapel Hill, Carolina Population Center.
- Kayongo M, Rubardt M, Butera J *et al.* 2006. Making EmOC a reality—CARE's experiences in areas of high maternal mortality in Africa. *International Journal of Gynecology & Obstetrics* **92**: 308–19.
- Koblinsky M, Campbell O, Heichelheim J. 1999. Organizing delivery care: what works for safe motherhood? *Bulletin of the World Health Organization* **77**: 399–406.
- Kyomuhendo GB. 2003. Low use of rural maternity services in Uganda: impact of women's status, traditional beliefs and limited resources. *Reproductive Health Matters* **11**: 16–26.
- Magadi MA, Agwanda AO, Obare FO. 2007. A comparative analysis of the use of maternal health services between teenagers and older mothers in sub-Saharan Africa: Evidence from Demographic and Health Surveys (DHS). *Social Science & Medicine* **64**: 1311–25.
- Maine D. 1994. Too far to walk: maternal mortality in context. *Social Science & Medicine* **38**: 1091–110.
- Measham D, Kallianes V. 1995. Issues in essential obstetric care: Report of a technical meeting of the Inter-Agency Group for Safe Motherhood. New York: The Population Council and Family Care International.
- Mills S, Bertrand JT. 2005. Use of health professionals for obstetric care in northern Ghana. *Studies in Family Planning* **36**: 45–56.
- Nyarko P, Birungi H, Armar-Klemesu M *et al.* 2006. Acceptability and feasibility of introducing the WHO focused antenatal care package in Ghana. FRONTIERS Final Report. Washington, DC: Population Council. Online at: http://www.popcouncil.org/pdfs/frontiers/FR_FinalReports/ghana_who_anc.pdf, accessed 1 November 2008.
- Olaniran N, Offiong S, Ottong J, Asuquo E, Duke F. 1997. Mobilizing the community to utilize obstetric services, Cross River State,

- Nigeria. The Calabar PMM Team. *International Journal of Gynaecology & Obstetrics* **59** (Suppl. 2): S181–9.
- ORC Macro. 2002. *Reproductive health of young adults in Uganda: a report based on the 2000–2001 Uganda Demographic and Health Survey*. Calverton, MD: ORC Macro.
- Pearson L, Shoo R. 2005. Availability and use of emergency obstetric services: Kenya, Rwanda, Southern Sudan, and Uganda. *International Journal of Gynecology & Obstetrics* **88**: 208–15.
- Pettersson KO, Christensson K, de Freitas ED, Johansson E. 2004. Adaptation of health care seeking behavior during childbirth: focus group discussions with women living in the suburban areas of Luanda, Angola. *Health Care Women International* **25**: 255–80.
- Prevention of Maternal Mortality Network. 1992. Barriers to treatment of obstetric emergencies in rural communities of West Africa. *Studies in Family Planning* **23**: 279–91.
- Prevention of Maternal Mortality Network. 1995. Situation analyses of emergency obstetric care: Examples from eleven operations research projects in West Africa. *Social Science & Medicine* **40**: 657–67.
- Ram F, Singh A. 2006. Is antenatal care effective in improving maternal health in rural Uttar Pradesh? Evidence from a district level household survey. *Journal of Biosocial Sciences* **38**: 433–48.
- Ronsmans C, Etard JF, Walraven G *et al.* 2003. Maternal mortality and access to obstetric services in West Africa. *Tropical Medicine & International Health* **8**: 840–8.
- Stanton C, Lawn JE, Rahman H, Wilczynska-Ketende K, Hill K. 2006. Stillbirth rates: delivering estimates in 190 countries. *The Lancet* **367**: 1487–94.
- Telfer ML, Rowley JT, Walraven GE. 2002. Experiences of mothers with antenatal, delivery and postpartum care in rural Gambia. *African Journal of Reproductive Health* **6**: 74–83.
- Thaddeus S, Maine D. 1994. Too far to walk: maternal mortality in context. *Social Science & Medicine* **38**: 1091–110.
- Treffers PE, Olukoya AA, Ferguson BJ, Liljestrand J. 2001. Care for adolescent pregnancy and childbirth. *International Journal of Gynecology & Obstetrics* **75**: 111–21.
- UNICEF. 2007. Multiple Indicator Cluster Survey (MICS) statistics by area/maternal health. New York: UNICEF. Online at: http://www.childinfo.org/antenatal_care_progress.html, accessed 4 June 2008.
- United Nations Population Fund. 2005. *State of World Population 2005. The promise of equality: gender equity, reproductive health and the Millennium Development Goals*. New York: UNFPA.
- Von Both C, Flessa S, Makuwani A, Mpembeni R, Jahn A. 2006. How much time do health services spend on antenatal care? Implications for the introduction of the focused antenatal care model in Tanzania. *BMC Pregnancy and Childbirth* **6**: 22.
- World Health Organization. 2006. *Neonatal and perinatal mortality: Country, regional and global estimates*. Geneva: World Health Organization.
- World Health Organization. 2007. Skilled attendant at birth – 2007 updates. Online at: http://www.who.int/reproductive-health/global_monitoring/skilled_attendant.html, accessed 7 May 2008.
- Yanagisawa S, Oum S, Wakai S. 2006. Determinants of skilled birth attendance in rural Cambodia. *Tropical Medicine & International Health* **11**: 238–51.