

ORIGINAL RESEARCH ARTICLE

Utilization of Non-Skilled Birth Attendants in Northern Nigeria: A Rough Terrain to the Health-Related MDGs

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ABSTRACT

Non-skilled birth attendants (NSBAs) are likely to deliver low quality maternity care compared with skilled health workers. A total of 6,809 women (15-49 years) were interviewed in a survey of which 5,091 had delivery information. Among women with a last live birth delivered anytime within the five years prior to the survey, 89% had been assisted by NSBAs. Compared to older women (35+), middle-aged women (20–34 years) were 21% more likely to be assisted by NSBAs. For women ≤ 20 years, the odds of being assisted by NSBAs more than doubled (AOR=2.14) when compared with older women. Residents of Yobe State were 42% more likely to be assisted by NSBA compared with residents of Katsina State. Key interventions should focus on strengthening health services delivery, radio messages and other communication channels to encourage supervised deliveries and intensifying provision of formal education to enable women better understand information given (*Afr. J. Reprod. Health* 2010; 14[2]: 37-45).

RÉSUMÉ

Utilisation des accoucheurs traditionnels non-qualifiés au nord du Nigéria : Un terrain difficile pour les objectifs du millénaire liés à la santé. Les accoucheurs traditionnels non qualifiés (ATNQ) ont la possibilité d'assurer des soins de maternité de basse qualité par rapport aux membres du personnel soignant qualifiés. Au total, 6809 femmes (15 – 49 ans) ont été interviewées dans une enquête à laquelle 5091 avaient l'information sur l'accouchement. Parmi les femmes dont la dernière naissance viable a eu lieu au cours de cinq ans avant l'enquête, 89% ont été aidées par les ATNQs. Par rapport aux femmes plus âgées (35⁺), les femmes d'âge moyen (20 – 34 ans) avaient 21% plus la possibilité d'être aidées par les ATNQs. Pour les femmes qui ont ≤ 20 ans la possibilité d'être assistées avait plus que doublée par rapport aux femmes plus âgées. Les habitantes de l'état de Yobe avaient 42% plus la possibilité d'être assistées par les SFNQs par rapport aux habitantes de l'état de Katsina. Les interventions clé doivent concentrer sur le renforcement de la prestation de soins et l'intensification de l'assurance de l'éducation formelle pour permettre aux femmes de mieux connaître l'information donnée (*Afr. J. Reprod. Health* 2010; 14[2]:37-45).

KEYWORDS: Antenatal Care; Education Needs; Reproductive Health; Skilled Birth Attendants; Northern Nigeria.

INTRODUCTION

Maternal and newborn morbidity and mortality in many sub-Saharan African countries and northern Nigeria in particular is an important global concern. Often, these high morbidity and mortality rates are associated with inadequate health services and dysfunctional primary health care (PHC) systems. In the last decade, the importance of maternal, newborn and child health has been reiterated and included in the Millennium and Development Goals (MDGs). Specifically, MDG 4 focuses on reduction of child mortality whereas MDG 5 focuses on reduction in maternal mortality^{1,2}.

While a number of studies³⁻⁸ have found that majority of women in less developed countries utilize antenatal care (ANC) during their pregnancy, their deliveries often lack skilled supervision. The importance of skilled attendance at delivery has long been recognised⁹⁻¹¹, and ANC visits also serve to encourage women to have skilled attendants at birth at a facility, who can provide life-saving emergency obstetric care (EOC) interventions to women who develop serious complications. Nevertheless, distance to health facilities, inadequate transportation, lack of husband permission to go to the hospital, socio-cultural beliefs and the need for immediate and specialized services have hampered women's ability to access these services in many low- and middle-income countries, including Nigeria¹²⁻¹⁵. Attention to clean and hygienic delivery practices¹⁶ and the provision of essential care for the newborn, such as thermal protection and early and exclusive breast-feeding^{4,17,18}, are important interventions which can improve health outcomes of all infants, whether born at home or in a health facility.

Achievement of MDGs 4 and 5 in many countries in the less developed world call for, *inter alia*, investment in the health systems in order to provide a continuum of care beginning with ANC and including delivery in a health facility that provides EOC effectively and efficiently¹⁹⁻²². Community and primary

care level interventions aimed at increasing these critical elements of ANC and health systems have been found to be highly cost-effective.

Nigeria's population based on the 2006 census was estimated at 140 million which is unevenly distributed across the country. The average population density in 2006 was estimated at 150 people per square kilometer with Lagos, Anambra, Imo, Abia, and Akwa Ibom being the most densely populated states. Most of the densely populated states are found in the South East. Kano state, with an average density of 442 persons per square kilometre, is the most densely populated state in the north²³. Regional disparities exist in health service delivery and resource availability²⁴. The southern states enjoy more health services than the northern states. This disparity is reflected in a number of health outcomes. For example, the 2008 Nigeria Demographic and Health Survey (DHS) report a child mortality rate ranging from a low of 32 in the South West zone to 139 in the North West zone. In order to improve, *inter alia*, child survival, the current priorities in the health sector focus on childhood immunization, malaria and diarrhoea prevention and treatment, and HIV/AIDS prevention²⁵.

The latest United Nations inter-agency estimates place the 2005 average national Maternal Mortality Ratio (MMR) at 1,100 deaths per 100,000 live births, giving a lifetime risk of maternal death of 1 in 18²⁵. The situation in northern Nigeria is critical where strong cultural beliefs and practices on childbirth and related fertility-related behaviors partly contribute significantly to the maternal morbidity and mortality picture¹² compared to southern Nigeria. Estimates of MMR for the North East and North West zones were estimated at 1,549 and 1,025 respectively in 2003²⁶. Although these estimates come from different years, they demonstrate the dismal picture associated with maternal mortality in northern Nigeria.

Recognizing the unacceptably high maternal, newborn and child mortality rates in

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northern Nigeria and the virtually dysfunctional PHC services, the Maternal, Newborn and Child Health (MNCH) Programme targets three northern states (Katsina, Yobe and Zamfara), to provide innovations related to improvement in the health services provided to women, babies and children. In the context of the aforementioned maternal and child health challenges, a quantitative baseline survey was conducted in April and May 2009 to develop an evidence base to support the selection of appropriate programme strategies to reduce the unacceptably high rates of maternal, newborn and child mortality. In order to measure service coverage and prevailing knowledge, attitudes, behaviours and practices in the programme intervention areas, population-based data were collected. Baseline data were also needed to assess the impact of the programme on improving health outcomes and survival rates, and thereby contributing to achievement of the national health-related MDGs. Repeating the survey periodically will enable an assessment of the contribution of the interventions and systemic changes on health systems strengthening and improvement of health outcomes.

METHODS

Survey design

The baseline survey was conducted in the three northern Nigerian states of Katsina, Yobe and Zamfara. Based on the 2006 population census, Katsina has 34 Local Government Areas (LGAs) with a total population of 5.8 million whereas Yobe (with 17 LGAs) and Zamfara (with 14 LGAs) have 2.3 million and 3.3 million people respectively. The population of these states is largely concentrated in the state capitals, the economic hub of the states. The most recent national representative data by geographical zone on infant and child mortality come from the 2008 Nigeria DHS which shows that the infant mortality rate (IMR) in the North West zone (i.e., location of Katsina and Zamfara states) was 91 deaths per 1,000 live births. In the North East zone (i.e., location of Yobe state), the IMR was 109 deaths per 1,000 live births. The corresponding child mortality rates for the North West and North East zones were 139 and

126 deaths per 1,000 children respectively. The most recent data on MMRs for the two zones have been presented earlier (see "Introduction" section).

In each state, the MNCH Programme is implemented through an approach that phases capacity building of health personnel and health system strengthening activities in the programme's target areas (referred to as 'clusters') within each LGA. The sample design therefore needed to include enough respondents in these clusters to allow estimation of programme impact in these clusters. For this reason, a *stratified two-stage cluster, random sample survey* was employed. The sample was designed to be representative of all women of reproductive age (15–49 years) in the three states. Each of the states was divided into two strata: LGAs with intensive MNCH activities (core clusters) and the LGAs with less intensive MNCH activities (other clusters). The core clusters were oversampled to facilitate impact evaluation. An Enumeration Area (EA) within a stratum was the first stage; with this first-stage EA selected using probability proportional to size. From the core cluster and other clusters, 30 EAs and 15 EAs were selected respectively. For the second stage or selection process, in each of the selected EAs, 47 households were selected at random for interviews. Thus, the household was the ultimate sampling unit. Within each randomly selected household, all ever-married women of reproductive age were eligible for interview (n= 7,442).

In the survey, a household was defined as a family with one head of household, eating and sleeping under the same roof. Families were defined as all those who live and eat together, including non-relatives, such as domestic servants or fostered children. From houses including one to three households, one household was randomly chosen for interviews; from houses with four to six households, two were surveyed; from houses with seven or more households, three were surveyed. Regardless of the number of households selected for interview within a compound, all eligible women within the selected households were interviewed. Criteria for eligibility of individual respondents included having ever been married and being aged 15–49 at the time of the survey.

Questionnaire administration

A modified version of the DHS-type of questionnaire was administered which included translation of key concepts and terms in the local languages (e.g., Hausa, Kanuri). Of the 7,442 women who were sampled 91.5% were interviewed (n=6,809). The non-response consists of women who were not present at home after three visits (0.5%), postponed interview (0.1%), refusals (0.9%), partly completed (1.6%), not eligible (5.0%), eligible person incapacitated (0.2%), and missing forms (0.2%).

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Table 1. Socio-demographic description of women who delivered within the last 5 years prior to the MNCH Baseline Survey (MNCH-BS) 2009.

Characteristics	n	Percent
Age (years)^a		
<20	246	4.9
20-34	2,655	52.5
35+	2,155	42.6
Has formal schooling		
Yes	919	18.3
No	4,101	81.7
Residence		
Urban/Semi-urban	1,578	31.2
Rural	3,478	68.8
Occupation		
Food processing	1,864	37.1
Agricultural processing	228	4.5
Farming	181	3.6
Trading	880	17.5
Housewife	1,465	29.1
Other	411	8.2
Has mobile phone		
Yes	396	7.9
No	4,641	92.2
Number of deliveries		
1	633	12.6
2-4	2,106	41.8
5+	2,295	45.6
Ethnicity		
Hausa	3,637	72.2
Kanuri	319	6.3
Fulani	798	15.8
Other	283	5.6
State		
Katsina	2,372	46.9
Yobe	1,111	22.0
Zamfara	1,574	31.1
Level of accessibility		
Easy to reach	2,762	54.6
Hard to reach	2,294	45.4
Delivery assisted by non-skilled birth attendant^{**}		
No	570	11.2
Yes	4,521	88.8

Notes: ^aMean age was 28.6 years; Numbers may not add up because of non responses to some variables; Some percentages may not add up to 100 due to rounding off numbers; ^{**}Non-skilled birth attendants included traditional birth attendants at 60.2% (n=3,065), 'other person' accounting for 23.2% (n=1,181), and health extension workers at 5.4% (n=274).

Data analysis

The probability of selection of a household/woman between clusters within a state was not the same since the number of EAs in the two strata (core clusters vs. other clusters) was not the same and the population size in each of the clusters may not be the same. As a result, we used sampling weights in Stata version 10 to correct for the oversampling in the core cluster areas and make the data statistically representative.

Frequencies and proportions were used to describe the sample with regard to the outcome of interest (having being assisted during delivery by non-skilled birth attendants (NSBAs)) and other socio-demographic characteristics. The outcome variable was categorised into being assisted by NSBAs—which included traditional birth attendants, 'other person', and health extension workers) and being assisted by skilled health professional (doctor or nurse/midwife).

Bivariate logistic regression analysis was used to identify factors associated with assisted delivery by NSBAs. Variables significant (with cut-off point as $p < 0.05$) in the bivariate analysis were then entered into a multivariate logistic regression analysis. The associations between being assisted by NSBAs and each independent variable were estimated by odds ratio (OR) and 95% confidence interval (CI). A CI was considered statistically significant when the interval between the upper and lower values did not include one.

RESULTS

Of the 6,809 women who were successfully interviewed, 5,091 had delivery information and whether they were assisted by NSBAs or not during delivery (Table 1). More than half (52.5%) of the women were aged 20-34 years, and 81.7% of them had no formal schooling. This finding is consistent with the general characteristics of women in northern Nigeria as being less educated. Most of the respondents resided in rural areas (68.8%) where health services are generally deficient. As a proxy for socioeconomic status, we found that occupation status for most of the women was food processing (37.1%) and housewife (29.1%). This demonstrates the inability of women to earn a decent living since they are less likely to purchase life enhancing resources. In order to assess access to communication facilities, we found that mobile ownership was very low at 7.9% indi-

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cating that majority of women may not be able to effectively communicate any health problems with their friends or relatives—either to seek advice or support. Majority of women had 5 or more births at the time of the survey, an indicator of high fertility which is associated with poor maternal and child health outcomes particularly in poor and under-resourced settings. Hausa was the dominant ethnic group (72.2%) followed by Fulani (15.8%). More women came from Katsina (46.9%) than the other states and more than half (54.6%) came from easy to reach areas. About 9 in 10 women were assisted during delivery by NSBAs.

There were no differences in assistance during delivery as related to formal schooling, occupation, mobile phone ownership, number of deliveries, and ethnicity ($p < 0.05$) (Table 2). Table 3 shows factors associated with delivery assisted by NSBAs that were considered in the analysis. The independent variables formal schooling, occupation, mobile phone ownership, number of deliveries, and ethnicity were not associated with assistance during delivery (Table 2) and were excluded in the multivariate logistic regression. Only level of accessibility was not significantly associated with NSBA assisted delivery in the bivariate analysis. In the multivariate analysis, area of residence and level of accessibility were not significantly associated with NSBA assistance during delivery. Compared to women aged 35 years and above, women of age 20-34 years were 21% (AOR = 1.21, 95%CI [1.03, 1.43]) more likely to be assisted by NSBA whereas those aged 20 years and below were more than twice (AOR = 2.14, 95% CI [1.33, 3.45]) more likely to be assisted by NSBA. Women who resided in Yobe State were 42% (AOR = 1.42, 95% CI [1.16, 1.73]) more likely to be assisted by NSBA compared to those who resided in Katsina State.

DISCUSSION

In the three northern Nigeria states surveyed, close to 90% of all women were assisted by

NSBAs during delivery. In multivariate analysis we found that women aged 20-34 and those aged 20 years and below were more likely to report assistance by NSBA during their delivery compared with older women aged 35 years and above. We also found that state of residence was positively associated with delivery by NSBA.

The finding that residence in Yobe State is positively associated with assistance by NSBAs during delivery compared to residence in Katsina State may be associated with differences in access to health care facilities. For example, Yobe and Zamfara States are ranked fifth and seventh respectively (compared with Katsina State which is ranked thirteenth) in terms of poverty incidence out of the 36 States and the Federal Capital Territory (Abuja) in Nigeria. The high levels of poverty partly explain the observed state differences in delivery by NSBAs. Births delivered outside a health facility (and mostly by NSBAs) are associated with high neonatal adverse outcomes²⁷. Nevertheless, poor maternal outcomes have been reported elsewhere²⁸ within health facilities largely due to low quality care. In such instances, some women may choose to be assisted by NSBAs due to anticipated low quality care at the health facility. For example, 43.8% of women in the MNCH-BS 2009 preferred having their most recent birth delivered at home because it was more comfortable at home whereas 2.1% were concerned with the attitude of the health workers.

One of the key advantages of the data is that they come from a very strong sample based on all women from all the three states. The sample was structured to enable comparison, per state, of areas with interventions and those without. However, there are a number of limitations worth considering. When the results are compared with similar studies which assessed the effect of rural versus urban residence, readers should remember that the definitions of urban versus rural may differ from one country to the other^{29,30}. In the MNCH-BS 2009, an urban / semi-urban area was defined as an area

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Table 2. Deliveries assisted by non-skilled birth attendants among women with births within the last 5 years prior to the MNCH-BS 2009 by selected characteristics.

Characteristics	n	Percent delivered by NSBA within each sub-group
Age (years)	p<0.001	
<20	246	91.8
20-34	2,655	86.3
35+	2,155	83.9
Has formal schooling	p=0.106	
Yes	919	83.8
No	4,101	86.2
Residence	p=0.012	
Urban/Semi-urban	1,578	83.7
Rural	3,478	86.5
Occupation	p=0.166	
Food processing	1,864	85.3
Agricultural processing	228	84.7
Farming	181	92.0
Trading	880	85.6
Housewife	1,465	85.6
Other	411	86.5
Has mobile phone	p=0.387	
Yes	396	84.2
No	4,641	86.0
Number of deliveries	p=0.817	
1	633	85.6
2-4	2,106	86.2
5+	2,295	85.4
Ethnicity	p=0.113	
Hausa	3,637	85.1
Kanuri	319	88.7
Fulani	798	86.1
Other	283	86.7
State	p=0.001	
Katsina	2,372	83.5
Yobe	1,111	87.9
Zamfara	1,574	86.1
Level of accessibility	p=0.046	
Easy to reach	2,762	84.8
Hard to reach	2,294	86.8

Notes: P-value for chi-square test between those who were assisted by non-skilled birth attendants (NSBAs) versus those who were assisted by skilled birth attendant. The 'percent' column reports the percent of women who were assisted by NSBAs out of all the women in the specific group (row). For e.g., out of 246 women aged <20 years, 91.8% were assisted by NSBAs.

Table 3. Unadjusted odds ratios (OR), adjusted odds ratios (AOR) and 95% confidence interval (CI) of the association of socio-demographic variables and delivery assisted by non-skilled birth attendant, MNCH-BS 2009.

Characteristics	OR (95% CI)	AOR (95% CI)
Age (years)		
35+ (r)	1	1
20-34	1.21 (1.03, 1.43)	1.21 (1.03, 1.43)
<20	2.14 (1.33, 3.45)	2.14 (1.33, 3.45)
Residence		
Urban/Semi-urban (r)	1	1
Rural	1.25 (1.05, 1.48)	1.23 (1.00, 1.51)
State		
Katsina (r)	1	1
Yobe	1.43 (1.17, 1.74)	1.42 (1.16, 1.73)
Zamfara	1.22 (1.02, 1.47)	1.19 (0.98, 1.43)
Level of accessibility		
Easy to reach (r)	1	1
Hard to reach	1.18 (1.00, 1.38)	1.01 (0.83, 1.23)
N	5,091	5,076
Log-likelihood		-2065.09
Prob > chi2		0.00

Notes: This table includes variables found significant in Table 2; “r” – reference category; All bivariate models (with significant estimates) for deliveries by NSBAs are significant at $p < 0.05$.

outside the LGA headquarters. All areas other than these were considered rural. The fact that the data were collected via self-reports implies that the results should be interpreted with caution. Our findings may also be biased as a result of potential misreporting by respondents and our inability to establish causation between any of the variables and the outcome, i.e., having been delivered by a NSBA. The latter is a result of the cross-sectional nature of the study.

Although these results are generally consistent with previous studies²⁵, the scale and magnitude of utilisation of NSBAs in northern Nigeria is alarming particularly as we approach the MDG deadline of 2015. Efforts aimed at increasing awareness of the dangers of deliveries assisted by NSBAs, reduction in poverty, and elimination of barriers in accessing health facilities should be promoted. As

noted elsewhere¹², awareness campaigns specifically targeted at elimination of cultural barriers to accessing health care should be promoted. These factors should be critical in designing interventions to reduce the rate of NSBA assisted deliveries thereby reducing neonatal and maternal mortality rates.

CONCLUSION

Findings from this study indicate that having delivery supervised by NSBAs was associated with young adult age and state of residence. In order to reduce maternal and neonatal mortality rates as we get close to the MDG deadline of 2015, we recommend the following: To strengthen delivery of quality, reliable and affordable reproductive and maternal health services, including basic and emergency basic obstetric care at the time of

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delivery; To make institutional delivery service free at the point of delivery and also treat complications free of charge; To strengthen referral systems through an emergency transport system aimed at evacuating women in labour to a health facility; To use radio messages and educational sessions targeting the whole community on the dangers of utilizing NSBAs; and To intensify provision of formal education as emphasized in the second MDG to enable women better understand information given.

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REFERENCES

1. Bryce J, Daelmans B, Dwivedi A, Fauveau V, Lawn JE, Mason E, Newby H, Shankar A, Starrs A, Wardlaw T. Countdown to 2015 for maternal, newborn, and child survival: the 2008 report on tracking coverage of interventions. *Lancet* 2008; 371:1247-58.
2. Mpembeni RN, Killewo JZ, Leshabari MT, Mas-sawe SN, Jahn A, Mushi D, Mwakipa H. Use pattern of maternal health services and determinants of skilled care during delivery in Southern Tanzania: implications for achievement of MDG-5 targets. *BMC Pregnancy Childbirth* 2007; 7:29.
3. Magoma, M., Requejo, J., Campbell, O.M.R., Cousens, S., and Filippi, V. High ANC coverage and low skilled attendance in a rural Tanzanian district: a case for implementing a birth plan intervention. *BMC Pregnancy Child Birth* 2010; 10:13.
4. Waiswa P, Peterson S, Tomson G, Pariyo GW. Poor newborn practices – a population based survey in eastern Uganda. *BMC Pregnancy Childbirth* 2010; 10:9.
5. Osubor KM, Fatusi AO, Chiwuzie JC. Maternal health-seeking behavior and associated factors in a rural Nigerian community. *Mat. Child Health J.* 2006; 10:159-69.
6. Adekunle C, Filippi V, Graham W, Onyemunwa P, Udjo E. Patterns of maternity care among women in Ondo States, Nigeria. In *Determinants of health and mortality in Africa* Issue 10 Edited by: Allan G Hill. Demographic and Health Survey Further Analysis Series. New York: The Population Council; 1990:1-45.
7. Mekonnen Y, Mekonnen A. Factors influencing the use of maternal healthcare services in Ethiopia. *J. Health Population Nutr.* 2003; 21:374-382.
8. Stewart MK, Stanton CK, Ahmed O. Maternal health care. In *DHS Comparative Studies* Issue 25 Calverton, Maryland, Macro International Inc; 1997.
9. Myer L, Harrison A. Why do women seek antenatal care late? Perspectives from rural South Africa. *J. Midwifery Women's Health* 2003; 43(4): 268-272.
10. UNFPA: *Maternal Mortality Updates 2002: A Focus on Emergency Obstetric Care.* New York: UNFPA 2003.
11. Siziya S, Muula AS, Rudatsikira E. Socio-economic factors associated with delivery assisted by traditional birth attendants in Iraq, 2000. *BMC Intl. Health Human Rights* 2009; 9:7.
12. Wall LL. Dead mothers and injured wives: the social context of maternal morbidity and mortality among the Hausa of Northern Nigeria. *Stud. in Family Planning* 1998; 29: 341-359.
13. Gabrysch S, Campbell OMR. Still too far to walk: Literature review of the determinants of delivery service use. *BMC Pregnancy and Childbirth* 2009; 9:34.
14. Mubyazi GM, Bloch P, Magnussen P, Olsen OE, Byskov J, Hansen KS, Bygbjerg IC. Women's experiences and views about costs of seeking malaria chemoprevention and other antenatal services: A qualitative study from two districts in rural Tanzania. *Malaria Journal* 2010; 9: 54.
15. Ijadunola KT, Ijadunola MY, Esimai OA, Abiona TC. New paradigm old thinking: the case for emergency obstetric care in the prevention of maternal mortality in Nigeria. *BMC Women's Health* 2010; 10:6.
16. World Health Organization: *Pregnancy, childbirth, postpartum and newborn care: a guide for essential practice.* Geneva: WHO press 2003.
17. Darmstadt GL, Walker N, Lawn JE, Bhutta ZA, Haws RA, Cousens S. Saving newborn lives in Asia and Africa: cost and impact of phased scale-up of interventions within the continuum of care. *Health Policy Plann.* 2008; 23(2):101-17.
18. Perez F, Ba H, Dastagire SG, Altmann M. The role of community health workers in improving child health programmes in Mali. *BMC Intl. Health Hum. Rights* 2009; 9:28.
19. Darmstadt GL, Bhutta ZA, Cousens S, Adam T, Walker N, de Bernis L. Evidence-based, cost-effective interventions: how many newborn babies can we save? *Lancet* 2005; 365(9463):977-988.
20. Tinker A, ten Hoop-Bender P, Azfar S, Bustreo F, Bell R. A continuum of care to save newborn lives. *Lancet* 2005; 365(9462):822-825.

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21. Campbell OM, Graham WJ. Strategies for reducing maternal mortality: Getting on with what works. *Lancet* 2006; 368(9543):1284–1299.
22. Kerber KJ, de Graft-Johnson, JE, Bhutta ZA, Okong P, Starrs A, Lawn JE. Continuum of care for maternal, newborn, and child health: From slogan to service delivery. *Lancet* 2007; 370(9595):1358–1369.
23. National Population Commission (NPC) [Nigeria] and ICF Macro: *Nigeria Demographic and Health Survey 2008*. Abuja, Nigeria: National Population Commission and ICF Macro 2009.
24. Aka EO: *Regional Disparities in Nigeria's Development: Lessons and Challenges for the 21st Century*. Lanham, Maryland: University Press of America.
25. UNICEF: *The State of the World's Children 2009*. New York: United Nations Children's Fund 2003.
26. Maternal and Newborn Road Map, 2003 Nigeria Demographic and Health Survey.
27. Tiebere P, Jackson D, Loveday M, Matizirofa L, Mbombo N, Doherty T, Wigton A, Treger L, Chopra M. Community-based situation analysis of maternal and neonatal care in South Africa to explore factors that impact utilization of maternal health services. *J. Midwifery Women's Health* 2007; 52:342-50.
28. Leigh B, Mwale TG, Lazaro D, Lunguzi J. Emergency obstetric care: how do we stand in Malawi? *Intl. J. Gynaecol. Obstet.* 2008; 101:107-11.
29. Muula A: How do we define 'rurality' in the teaching on medical demography? *Rural Remote Health* 2007; 7:653.
30. Rourke J: In search of a definition of 'rural'. *Canadian J. Rural Med.* 1997; 2:113-115.