



Emergency Preparedness of Health Professionals in Combating Maternal Mortality in Ghana: A Health Facility-Based Descriptive Study

Hubert Amu,^{1,*} and Kenneth Setorwu Adde²

¹Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Sciences, Hohoe, Ghana

²Department of Population and Health, University of Cape Coast, Cape Coast, Ghana

*Corresponding author: Hubert Amu, Department of Population and Behavioural Sciences, School of Public Health, University of Health and Allied Sciences, Hohoe, Ghana. E-mail: hamu@uhas.edu.gh

Received 2017 July 15; Revised 2018 January 21; Accepted 2018 January 25.

Abstract

Background: Ghana was unable to meet the millennium development goal five target of 190 maternal deaths per 100,000 live births in 2015, as the country's maternal mortality ratio is still high (358 deaths per 100,000 live births). A target of the newly-set sustainable development goal three also requires the country to reduce the maternal mortality ratio to less than 70 deaths per 100,000 live births by 2030. We examined the country's emergency preparedness in pursuit of this target.

Methods: The study was a descriptive cross-sectional survey, which collected data from 537 physicians and nurses/midwives at three regional level health facilities in Ghana using a 26-item questionnaire. Frequency, percentage, and chi-square statistics were used in presenting the results and describing associations. All analyses were done using SPSS (version 22).

Results: We realized that about 6-10 maternal emergency cases were recorded at the selected facilities every week. Essential logistics such as oxygen, blood, and ambulance services required for managing such cases were either never available, or sometimes not available. Even though training courses/workshops were regularly organized to improve the emergency preparedness of health professionals, most of them did not attend.

Conclusions: Health professionals are not prepared to handle all maternal emergency cases due to non-availability of some essential logistics and a lack of regular training to update their skills to enable them to handle such cases. Ghana is, therefore, unlikely to meet the sustainable development goal three target by 2030. To forestall this, management of hospitals and the Ghana health service must ensure that all essential logistics are always available at hospitals to avert unwarranted maternal deaths. A whipping system should also be put in place to ensure professionals attend training workshops organized for them.

Keywords: Preparedness, Logistics, Training, Professionals, Emergency, Health, Ghana

1. Background

About 830 women in their reproductive years die every day from complications related to pregnancy and childbirth around the world (1). This result is about 303000 maternal deaths in a year. Maternal mortality is therefore considered the leading cause of death among women aged 15 - 49 years worldwide (2). The primary causes of maternal mortality are; direct obstetric causes such as infections, haemorrhage, and hypertension; and indirect causes, which mainly result from interactions between pregnancy and pre-existing medical conditions (3). Most maternal deaths occur during labor, delivery, or within the first 24 hours after birth, and most of these deaths could have been prevented if timely interventions were put in place (4, 5). The preparedness of health professionals in handling maternal emergencies is therefore crucial.

A major factor, which influences the preparedness of health professionals to effectively handle maternal emergency cases is availability of essential logistics such as; oxygen, magnesium sulphate, oxytocin, cannula, giving sets, intravenous infusion, ergometrine, blood, operation set, ambulance, and stretchers (6). In many developing countries; however, health professionals are usually unable to handle emergencies due to the non-availability of these logistics to handle such cases (6). Maternal complications; therefore, result in the death of the women (7-9).

The ability of health professionals to handle maternal emergency cases effectively is also effectively dependent on their acquisition of regular and adequate training (10). The health resources and services administration (11); therefore, admonishes health facilities to provide adequate and regular training to their staff on emergency management and the implementation of emergency man-

agement protocols (EMP) in order to prevent deaths and save lives.

Ghana was unable to meet her millennium development goal (MDGs) five target of 190 maternal deaths per 100,000 live births in 2015 as the country's maternal mortality ratio was still very high (358 deaths per 100,000 live births) in 2015 (12). In 2015, 17 new sustainable development goals (SDGs) were thus introduced to replace the MDGs (2, 13). A target of the new SDG 3 requires the country to reduce her maternal mortality ratio to less than 70 deaths per 100,000 live births by 2030 (2, 12, 13). We, therefore; examined the country's emergency preparedness in pursuit of this target.

Our study was conducted against the backdrop that even though much research has been conducted on the country's high maternal mortality ratio and the obstetric causes of such unwarranted deaths over the years (14-16), attention has not been paid to the emergency preparedness of health professionals in preventing them, especially with regards to availability of essential logistics and acquisition of regular training by the professionals to effectively handle maternal emergency cases.

2. Methods

The study was a descriptive cross-sectional survey, which collected data from doctors (physicians) and nurses/midwives at three regional level health facilities in Ghana. Doctors and nurses/midwives were chosen for the study because they are the ones who attend in maternal emergency cases. The regional level facilities were also chosen because they receive direct as well as referred cases from all over their catchment regions. There are 10 regions in Ghana and each of them has one regional level health facility. To arrive at the three facilities, a cluster sampling approach was adopted. The country was grouped into three clusters; Northern Zone (Upper East, Upper West, and Northern Regions), Middle Zone (Ashanti, Brong Ahafo, and Eastern Regions), and Southern Zone (Greater Accra, Central, Volta, and Western Regions) (2, 17). One region was then randomly selected from each of the groupings and the regional hospital in that region was selected by default.

The study targeted all doctors/physicians and nurses/midwives in the three facilities considering the fact that it was quantitative in nature and thus, required a large sample size to make meaningful deductions (18). During the data collection; however, some of the professionals were either on leave or declined to participate. Thus, the sample size for the study was determined based on a census of all professionals present and willing to participate at the various facilities. A total of 563 questionnaires

were administered to the respondents. At the end of the data collection, 537 of the instruments were retrieved and included in the analysis. Data collection for the study took place at various hospitals for 20 days. Ethical clearance for the study was waived by the University of Cape Coast ethical review board. Approval was also obtained from management of the various facilities before the study was conducted in those facilities. Informed consent was also sought from the respondents to participate in the study.

A self-developed structured questionnaire was used in collecting data from the respondents. The scale exhibited a high reliability ($\alpha = 0.72$). To ensure face, construct, and content validity, the questionnaire was presented to two experts; one in maternal health and the other in hospital emergency management. The experts made their inputs to ensure that the content was valid and measures what the instrument was intended to measure. In doing so, they expunged some of the initial questions in the instrument and introduced others. The instrument had 26 items divided into three sections; socio-demographic characteristics, availability of essential logistics, and acquisition of regular training to handle maternal emergencies. Socio-demographic characteristics of the respondents included in the study were; age, sex, marital status, level of education, religion, ethnicity, occupation, and duration of working at the hospitals.

To assess the availability of essential logistics, respondents were asked to indicate the average number of maternal emergency cases reported to the hospital weekly. They were then asked to indicate the availability of essential logistics. Their responses to each of these logistics were coded on a Likert scale of; 1= never available, 2 = sometimes not available, and 3 = always available. Respondents were also asked to indicate if maternal mortality cases occurring at the hospitals were attributable to the non-availability of essential logistics in handling those cases effectively and their responses were coded as: 1 = no, and 2 = yes.

Acquisition of regular training courses/workshops in managing maternal emergencies was measured by asking the respondents to indicate if such courses are usually organized for them. Those who said the courses were organized for them were then asked to indicate the last time they received the training. Those who said the training courses/workshops were organized were also asked to indicate if they were personally able to attend the last organized training. Respondents were also asked to indicate how important they considered regular training programmes/workshops in preparing health professionals to handle emergencies.

The overall maternal emergency preparedness of the professionals (outcome variable) was; however, measured by asking the respondents; "What is your level of prepared-

ness in preventing maternal mortality at this hospital taking into consideration the availability of essential logistics and skills acquisition through regular training programmes?" This was coded as: 1 = not prepared, and 2 = prepared. Chi-square statistics were used to examine the influence of the availability of essential logistics and acquisition of regular training on the maternal emergency preparedness. The acceptable level of significance was $P < 0.05$. All analyses were done using SPSS version 22.

3. Results

3.1. Socio-Demographic Characteristics of Respondents

Socio-demographic characteristics included in the study were age, sex, marital status, level of education, religion, ethnicity, occupation, and number of years working at the hospitals (Table 1). We realized that 47.9% of the respondents were in their 20s while 8% were 50 - 59 years old. Majority were females (78.8%), married (58.7%) and Christians (85.5%). Regarding education, diploma holders constituted 65.5% whereas post graduate degree holders formed 10.6%. Akans also constituted the comparative majority (41.5%) in terms of ethnicity. While doctors formed 19.7%, 80.3% were nurses and midwives. Half of the respondents had also been working at their respective hospitals for 1 - 5 years (49.5%) (Table 1).

3.2. Availability of Essential Logistics in Handling Maternal Emergencies

Figure 1 presents the average number of maternal emergency cases recorded at the hospitals in a week as reported by the respondents. Majority of respondents indicated that the 6 - 10 cases maternal emergencies were recorded at their respective hospitals in a week (69.3%).

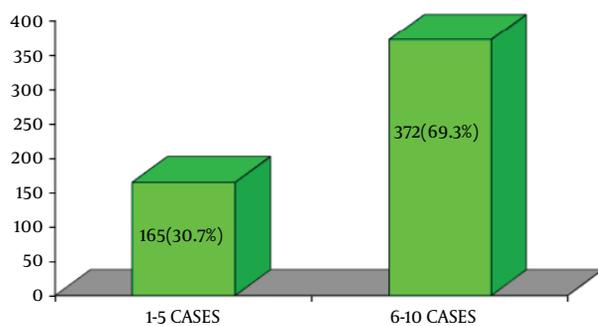


Figure 1. Average number of emergency cases reported to the hospitals in a week

Table 2 also presents results on the availability of essential logistics. Oxygen was reported by 50.7% of the respondents as sometimes not available. Most of respondents

Table 1. Socio-Demographic Characteristics of Respondents^a

Socio-Demographic Variables	Frequency	Percentage
Age, y		
20 - 29	257	47.9
30 - 39	196	36.5
40 - 49	41	7.6
50 - 59	43	8.0
Sex		
Male	114	21.2
Female	423	78.8
Marital status		
Never married	200	37.2
Married	315	58.7
Divorced	7	1.3
Separated	10	1.9
Widowed	5	0.9
Level of education		
Diploma	352	65.5
First degree	128	23.9
Post graduate degree	57	10.6
Religion		
Christian	459	85.5
Islam	78	14.5
Ethnicity		
Akan	223	41.5
Ewe	112	20.9
Guan	33	6.1
Mole Dagbani	51	9.5
Ga/Dangme	83	15.5
Other	35	6.5
Occupation		
Doctor	106	19.7
Nurse/midwife	431	80.3
Duration of working at the hospital, y		
Less than a year	101	18.8
1 - 5	266	49.5
6 - 10	111	20.7
11 - 15	53	9.9
16 - 20	6	1.1
Total	537	100.0

^aSource: Field work, 2017.

constituting 54% also said blood was not always available. Half of the respondents (50.1%) also indicated that ambulances to convey women during maternal emergencies were sometimes not available when needed. Magnesium sulphate (54.7%), oxytocin (83.4%), cannula (85.3%), giving set (86.4%), intravenous infusion (90.9%), ergometrine (55.5%), operation set (64.8%), and stretchers (64.2%) were; however, always available.

The Chi-square tests conducted showed that oxygen ($P < 0.001$), oxytocin ($P < 0.01$), cannula ($P < 0.001$), giving set ($P < 0.001$), intravenous infusion ($P < 0.001$), blood ($P < 0.001$), operation set ($P < 0.001$), ambulance ($P < 0.001$),

Table 2. Availability of Essential Logistics and Their Influence on Emergency Preparedness, N = 537^{a,b}

Essential Logistic	Availability			Emergency Preparedness	
	Never Available	Sometimes Not Available	Always Available	X ²	P Value
Oxygen	41 (7.6)	272 (50.7)	224 (41.7)	30.354	< 0.001
Magnesium sulphate	64 (12.0)	179 (33.3)	294 (54.7)	1.237	0.539
Oxytocin	25 (4.7)	64 (11.9)	448 (83.4)	11.563	< 0.001
Cannula	24 (4.5)	55 (10.2)	458 (85.3)	13.716	< 0.001
Giving set	7 (1.3)	66 (12.3)	464 (86.4)	6.299	< 0.001
Intravenous infusion	4 (0.7)	45 (8.4)	488 (90.9)	8.997	< 0.001
Ergometrine	54 (10.0)	185 (34.5)	298 (55.5)	1.493	0.474
Blood	290 (54)	208 (38.7)	39 (7.3)	24.824	< 0.001
Operation set	63 (11.7)	126 (23.5)	348 (64.8)	17.619	< 0.001
Ambulance	75 (14)	269 (50.1)	193 (35.9)	19.041	< 0.001
Stretchers	26 (4.8)	166 (31.0)	345 (64.2)	7.130	< 0.001

^aValues are expressed as No. (%).

^bSource: Field work, 2017.

and stretchers ($P < 0.001$) were statistically significant (Table 2). The implication is that the availability of oxygen, oxytocin, cannula, giving set, intravenous infusion, blood, operation set, ambulance, and stretchers did influence the preparedness of health professionals in handling maternal emergencies.

When asked to indicate whether maternal deaths recorded at the hospitals could be attributed to the non-availability of some essential logistics, 37.2% said “No” and the majority (62.9%) said “Yes”. Thus, to most of the doctors and nurses/midwives surveyed, deaths particularly resulting from maternal emergencies at the hospitals could be largely blamed on the non-availability of some essential logistics, which were indicated to comprise blood, ambulance, and oxygen.

3.3. Acquisition of Regular Training to Handle Maternal Emergencies

Table 3 presents the level of preparedness of doctors and nurses/midwives in terms of regular and adequate training geared towards equipping them to effectively handle emergencies which occurred or brought to the hospitals. Regarding whether training courses were regularly organized for them by their facilities and the Ghana health service, the majority of the respondents indicated that the training courses/workshops were regularly organized for them (59%) while 41% disagreed. Half of those who said the programmes were organized, also indicated that the last time any of such training was organized was between 1-6 months prior to the data collection. Most of them however, indicated that they were unable to attend the train-

ing programme when it was last organized (59.7%) (Table 3). This was despite the fact that nine out of every 10 of the respondents recognized the importance of the training programmes in equipping them effectively to manage maternal emergencies.

Chi-square tests conducted to determine the influence of training programmes on the emergency preparedness of the health professionals also showed that organisation of the training courses/workshops ($P < 0.001$), last time training was received by the respondents ($P < 0.001$), and being able to personally attend such training programmes ($P < 0.001$) significantly influenced their preparedness to handle the maternal emergencies for which such training workshops were organized (Table 3).

From Figure 2, when asked “What is your level of preparedness in preventing maternal mortality at this hospital taking into consideration the availability of essential logistics and skills acquisition through regular training programmes?”. the majority of the respondents (55%) said they were not prepared while 45% said they were prepared.

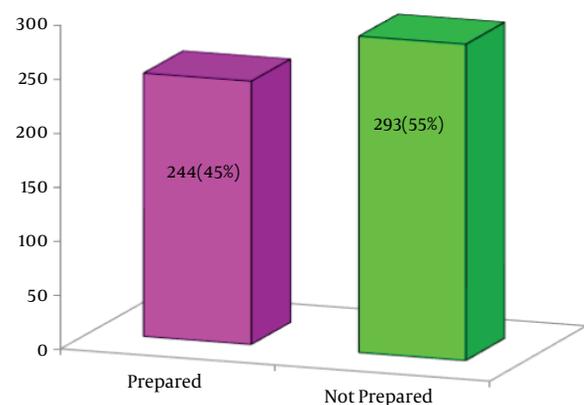
4. Discussion

About 6-10 maternal emergency cases were reportedly recorded at the various hospitals in a week. This is reflective of the fact that the hospitals are regional level facilities receiving cases from all over their catchment regions. As such, several cases are either sent there primarily or are referred there as emergencies. We realized that oxygen, blood, and ambulance services were either never available or sometimes not available. The findings confirm the

Table 3. Acquisition of Regular Training on Maternal Emergency Management^a

Variable	Frequency	Percentage	Emergency Preparedness	
			Chi-Square	P Value
Organisation of training courses/workshops by hospitals and GHS (N = 537)			31.973	< 0.001
No	222	41.3		
Yes	315	58.7		
Last time of training was organized (N = 315)			13.043	< 0.001
This week	5	1.6		
2 - 3 weeks ago	109	34.6		
1 - 6 months ago	158	50.2		
7 - 12 months ago	10	3.2		
More than one year ago	33	10.5		
Personally able to attend last training (N = 315)			8.672	< 0.001
No	127	40.3		
Yes	188	59.7		
Importance of regular training for emergency preparedness (N = 537)			1.280	0.258
Not important	51	9.5		
Important	486	90.5		

Abbreviation: GHS, Ghana Health Service.

^aSource: Field work, 2017.**Figure 2.** Overall emergency preparedness of health professionals in preventing maternal mortality

argument by Jensen and Rappaport (7) that the issue of non-availability of essential logistics including blood and oxygen, serve as major impediments that hamper the preparedness of health professionals to handle emergencies.

Chi-square tests conducted for the influence of the availability of essential logistics on maternal emergency

preparedness also showed that the availability of these logistics (oxygen, blood, and ambulance services) statistically influenced the preparedness of professionals in preventing maternal mortality. Their non-availability; therefore, poses serious threats to the survival of women needing maternal emergency services in the country (19). The fact that most of the professionals also indicated that maternal deaths, which occurred at the facilities, were attributable to the non-availability of these essential logistics also points to the fact that the healthcare system does not pay attention to the little but essential logistics, which determine the survival of women during pregnancy and childbirth. Even the ministry of health of Ghana (20) concurs that “in spite of investments in the last 10 years, there are huge gaps in access to services and a shortage of equipment, consumables, essential drugs, and supplies” (p. 2).

Our findings where regular training courses/workshops were organized for the professionals are consistent with findings of previous studies conducted by Gatesman and Smith (10) and the health resources and services administration (11) in which most of their participants indicated that training programs were regularly organized for them in order to improve their competency in addressing various tenets of their job description including; cardiopulmonary resuscitation (CPR), critical care, pediatric care, and emergency maternal care.

Even though participants in our study acknowledged that training courses were important in equipping them to effectively handle maternal emergencies, most of them were unable to attend such training workshops. The fact that the health professionals did not partake in the courses/workshops affects their competencies in managing maternal emergencies occurring at the facilities and could thus, result in increased maternal mortality cases in a country, which is already experiencing high maternal mortality ratios (21).

Despite the important findings we made, it is essential to point out the possible limitations of the study. The fact that the study was conducted with cross-sectional data made it impossible for us to examine the situation over time. Meanwhile, situations regarding maternal emergency preparedness in Ghana could vary over time. This limitation does; however, not limit the validity and representativeness of the findings.

4.1. Conclusion

We found that health professionals were generally not prepared to handle maternal emergency cases due to constraints emanating from the non-availability of some essential logistics and lack of regular training to update their skills to enable them effectively handle maternal emergencies. The implication of these findings is that the country is likely to miss out on her ability to meet the SDG 3 target of reducing her maternal mortality ratio to below 70 maternal deaths per 100,000 live births by the year 2030. To forestall this, there is a need for the management of various hospitals across the country, the ministry of health, and the Ghana health service to ensure that essential logistics such as ambulances, blood, and oxygen are procured and always available at hospitals to avert unwarranted maternal deaths. There should also be a whipping system established by the management of the hospitals to ensure that all health professionals fully participate in training courses.

Acknowledgments

The authors would like to thank the authorities of hospitals included in the study for their support by allowing the study to be conducted in the facilities.

References

- World Health Organisation (WHO) . *Media centre: maternal mortality*. 2016, [cited 19 June]. Available from: <http://www.who.int/mediacentre/factsheets/fs348/en/>.
- Amu H, Nyarko SH. Preparedness of health care professionals in preventing maternal mortality at a public health facility in Ghana: a qualitative study. *BMC Health Serv Res*. 2016;**16**:252. doi: [10.1186/s12913-016-1527-y](https://doi.org/10.1186/s12913-016-1527-y). [PubMed: [27405375](https://pubmed.ncbi.nlm.nih.gov/27405375/)]. [PubMed Central: [PMC4942930](https://pubmed.ncbi.nlm.nih.gov/PMC4942930/)].
- World Health Organisation (WHO) . *Health statistics and information systems: Maternal mortality ratio (per 100 000 live births)*. 2017, [cited 20 June]. Available from: <http://www.who.int/healthinfo/statistics/indmaternalmortality/en/>.
- Dickson KS, Adde KS, Amu H. What Influences Where They Give Birth? Determinants of Place of Delivery among Women in Rural Ghana. *Int J Reprod Med*. 2016;**2016**:7203980. doi: [10.1155/2016/7203980](https://doi.org/10.1155/2016/7203980). [PubMed: [28101522](https://pubmed.ncbi.nlm.nih.gov/28101522/)]. [PubMed Central: [PMC5215620](https://pubmed.ncbi.nlm.nih.gov/PMC5215620/)].
- World Health Organisation (WHO) . *Maternal death surveillance and response technical guide: Information for action to prevent maternal death*. Geneva: WHO; 2013.
- Hill K, El Arifeen S, Koenig M, Al-Sabir A, Jamil K, Raggars H. How should we measure maternal mortality in the developing world? A comparison of household deaths and sibling history approaches. *Bull World Health Organ*. 2006;**84**(3):173-80. [PubMed: [16583075](https://pubmed.ncbi.nlm.nih.gov/16583075/)]. [PubMed Central: [PMC2627303](https://pubmed.ncbi.nlm.nih.gov/PMC2627303/)].
- Jensen V, Rappaport BA. The reality of drug shortages—the case of the injectable agent propofol. *N Engl J Med*. 2010;**363**(9):806-7. doi: [10.1056/NEJMp1005849](https://doi.org/10.1056/NEJMp1005849). [PubMed: [20554977](https://pubmed.ncbi.nlm.nih.gov/20554977/)].
- Annan J. Assessment of logistics management in Ghana health service. *Int J Bus Soc Res*. 2013;**3**(8):75-87.
- Souza JP, Gulmezoglu AM, Vogel J, Carroli G, Lumbiganon P, Qureshi Z, et al. Moving beyond essential interventions for reduction of maternal mortality (the WHO Multicountry Survey on Maternal and Newborn Health): a cross-sectional study. *Lancet*. 2013;**381**(9879):1747-55. doi: [10.1016/S0140-6736\(13\)60686-8](https://doi.org/10.1016/S0140-6736(13)60686-8). [PubMed: [23683641](https://pubmed.ncbi.nlm.nih.gov/23683641/)].
- Gatesman ML, Smith TJ. The shortage of essential chemotherapy drugs in the United States. *N Engl J Med*. 2011;**365**(18):1653-5. doi: [10.1056/NEJMp109772](https://doi.org/10.1056/NEJMp109772). [PubMed: [22040130](https://pubmed.ncbi.nlm.nih.gov/22040130/)].
- Health Resources and Services Administration . *Health centre emergency management program expectations: Policy information notice 2007-15*. 2007, [cited 18 June]. Available from: <https://bphc.hrsa.gov/about/pdf/pin200715.pdf>.
- Government of Ghana , United Nations Development Programme (UNDP) . *Ghana Millenium development goals 2015 report*. Accra: Government of Ghana and UNDP; 2015.
- Council for International Development (CID) . *Sustainable Development Goals: Changing the world in 17 steps – interactive*. 2015, [cited 19 June]. Available from: <http://www.cid.org.nz/news-old/sustainable-development-goals-changing-the-world-in-17-steps-interactive/>.
- Hogan MC, Foreman KJ, Naghavi M, Ahn SY, Wang M, Makela SM, et al. Maternal mortality for 181 countries, 1980-2008: a systematic analysis of progress towards Millennium Development Goal 5. *Lancet*. 2010;**375**(9726):1609-23. doi: [10.1016/S0140-6736\(10\)60518-1](https://doi.org/10.1016/S0140-6736(10)60518-1). [PubMed: [20382417](https://pubmed.ncbi.nlm.nih.gov/20382417/)].
- Asamoah BO, Moussa KM, Stafstrom M, Musinguzi G. Distribution of causes of maternal mortality among different socio-demographic groups in Ghana; a descriptive study. *BMC Public Health*. 2011;**11**:159. doi: [10.1186/1471-2458-11-159](https://doi.org/10.1186/1471-2458-11-159). [PubMed: [21392387](https://pubmed.ncbi.nlm.nih.gov/21392387/)]. [PubMed Central: [PMC3063206](https://pubmed.ncbi.nlm.nih.gov/PMC3063206/)].
- Alkema L, Chou D, Hogan D, Zhang S, Moller AB, Gemmill A, et al. Global, regional, and national levels and trends in maternal mortality between 1990 and 2015, with scenario-based projections to 2030: a systematic analysis by the UN Maternal Mortality Estimation Inter-Agency Group. *Lancet*. 2016;**387**(10017):462-74. doi: [10.1016/S0140-6736\(15\)00838-7](https://doi.org/10.1016/S0140-6736(15)00838-7). [PubMed: [26584737](https://pubmed.ncbi.nlm.nih.gov/26584737/)]. [PubMed Central: [PMC515236](https://pubmed.ncbi.nlm.nih.gov/PMC515236/)].
- Amu H, Dickson KS. Health insurance subscription among women in reproductive age in Ghana: do socio-demographics matter? *Health Econ Rev*. 2016;**6**(1):24. doi: [10.1186/s13561-016-0102-x](https://doi.org/10.1186/s13561-016-0102-x). [PubMed: [27325249](https://pubmed.ncbi.nlm.nih.gov/27325249/)]. [PubMed Central: [PMC4916106](https://pubmed.ncbi.nlm.nih.gov/PMC4916106/)].
- Burmeister E, Aitken LM. Sample size: how many is enough? *Aust Crit Care*. 2012;**25**(4):271-4. doi: [10.1016/j.aucc.2012.07.002](https://doi.org/10.1016/j.aucc.2012.07.002). [PubMed: [22835279](https://pubmed.ncbi.nlm.nih.gov/22835279/)].

19. Sobhy S, Zamora J, Dharmarajah K, Arroyo-Manzano D, Wilson M, Navaratnarajah R, et al. Anaesthesia-related maternal mortality in low-income and middle-income countries: a systematic review and meta-analysis. *Lancet Glob Health*. 2016;**4**(5):e320-7. doi: [10.1016/S2214-109X\(16\)30003-1](https://doi.org/10.1016/S2214-109X(16)30003-1). [PubMed: [27102195](https://pubmed.ncbi.nlm.nih.gov/27102195/)].
20. Ministry of Health G. *The Ghana health sector annual programme of work 2007*. Accra: Ministry of Health, Ghana; 2007.
21. Prata N, Passano P, Sreenivas A, Gerdtz CE. Maternal mortality in developing countries: challenges in scaling-up priority interventions. *Womens Health (Lond)*. 2010;**6**(2):311-27. doi: [10.2217/whe.10.8](https://doi.org/10.2217/whe.10.8). [PubMed: [20187734](https://pubmed.ncbi.nlm.nih.gov/20187734/)].