Middlesex University Research Repository

An open access repository of

Middlesex University research

Final accepted version (with author's formatting)

This version is available at: https://eprints.mdx.ac.uk/20272/

Title: Evaluating lay perceptions of maternal mortality to improve risk communication: A case study in Rivers State, Nigeria

Natasha Oyibo[1], Gordon Weller[2], John Watt[1]

Centre for Decision Analysis and Risk Management, School of Science and Technology, London UK[1]

School of Health and Education, Middlesex University, London, United Kingdom[2]

Middlesex University, The Burroughs, Hendon, NW4 8BT, London, UK.

Authors E-mail addresses: NO251@live.mdx.ac.uk (Natasha Oyibo, corresponding author)

G.weller@mdx.ac.uk   (Gordon Weller)

J.watt@mdx.ac.uk   (John Watt)

Abstract

Maternal mortality is one of the major challenges in reproductive health in Nigeria. Approximately two-thirds of the women (three-quarters in rural Nigeria) deliver their babies outside of health facilities and without medically skilled birth attendants. Communication and education are vital since so many births take place outside formal healthcare environments, and the high mortality rate suggests there is potential for progress, which can supplement Nigerian government efforts. The purpose of the study was to elicit lay knowledge and interpretations about the major components of the problem as part of a wider mental models study aimed at improving risk communication. These knowledge and perceptions were elicited through semi-structured interviews with women of childbearing age (15-49 years). Interviews were analysed to evaluate common themes that will be used to model lay perceptions for comparison to the expert mental model as part of the wider method. The emergent themes will be presented and discussed in the context of the identification of important gaps in knowledge and misperceptions that have the potential for development of improved risk communication.
Keywords: Communication; mental models; maternal mortality; perception

Introduction

Nigeria is the most populous country in Africa with approximately 171 million people and land mass covering an area of 923 768 km^2. It has one of the highest maternal mortality rates (MMRs) in Sub-Saharan Africa (Achem & Agboghoroma, 2014).

The MMR in Nigeria is estimated to be between 560 and 704 per 100,000 live births with 40,000 maternal deaths recorded in 2013, indicating that Nigeria is yet to meet the United Nations Millennium Development Goals (MDG5) (Achem & Agboghoroma, 2014; Dinyain et al., 2014; Fapohunda & Orobaton, 2013). Maternal mortality is more than double in rural areas compared to the cities (828 vs. 351 deaths per 100,000 live births, respectively), perhaps because more women deliver their babies outside health facilities and without skilled birth

attendants[1] (two- thirds and three quarters respectively) (Okereke et al., 2013; Shiffman, Okonofua & Ved, 2006).

Understanding of the determinants of maternal mortality is a difficult task, as it is influenced by different categories of conditions, such as cultural, economic, biological, demographic, clinical conditions, availability and accessibility of health services (Hussein & Fortney, 2004; McCarthy, 1997). However, the development of interventions and consequent reduction of the burden of the issue is dependent on understanding the contributory causes and factors (Ameh, Adegoke, Pattison & Broek, 2014). Many of these risks can be addressed by actions from the women and key stakeholders, highlighting the usefulness of risk communication, education and awareness for saving lives. Agan et al. (2010) suggested the urgent need to inform the public on maternal health issues through the media, community associations, churches and community leaders. Galadanci, Idris, Sadauki & Yakasai (2010) reinforced the need for communication strategies and also opportunities for dialogue between low-level health care workers and senior health managers. Communication and advocacy should transcend all levels of governance including local government levels where officials may be unaware of the extent of reproductive health problems (Adinma &Adinma, 2011). This dialogue should lead to improvements in policy implementation, and acceptance of new systems and maintaining morale. However, the success or failure in reducing the MMR in Nigeria ultimately lies with intervention from the government and willingness to implement policies (Cooke & Tahir, 2013). Interventions tend to work based on the acceptance of the public to them and the willingness of the audience to implement individual changes (Campbell, 2003).

---

[1] The terms 'skilled birth attendants' and 'nurses' as utilised in this paper refer to health care workers who have been medically trained and government approved to assist in the process of pregnancy and childbirth.

Individuals use a mental model to make sense of their environment, which assists their interpretive process by enabling them to screen information in order to prevent overload and intolerable levels of uncertainty towards behavioural choices (Klimoski & Mohammed, 1994). These mental models are fragmentary beliefs and perceptions, formed over time through phenomena, interactions and society (Morgan, Fischoff, Bostrom & Atman, 2002). Perception and belief of citizens should play an important role in the fight to reduce maternal mortality. Evans (2013) and Chiwuzie & Okolocha (2001) showed that traditional beliefs and practices contributed to the deterioration in health of pregnant women and concluded that socio-cultural and other extra medical/hospital factors are important in determining maternal mortality. The realisation of the importance of women as change agents led to the selection of a risk communication methodology called the Mental Models Approach (MMA), which develops communication tools based on the differences between the mental models of the expert community and those elicited from the target audience (Vari, 2004). MMA provides a structured process for eliciting expert understanding of risk phenomena and then tests the knowledge in the target audience with the aim of passing on relevant messages and dispelling misconceptions (Morgan et al., 2002).

The current study was carried out in response to the need for additional empirical studies within the maternal health field that assess how different stakeholders think, make decisions and engage each other. This paper thus presents results from the evaluation of lay perception of Nigerian women of childbearing age in Rivers State, which will provide a basis for mapping against the expert mental model reported elsewhere (Oyibo, Weller & Watt, 2016) and future development of a communication protocol.

Methods

This is the second step in a larger project, which uses the MMA to explore the subject of maternal mortality and develop risk communication tools (Morgan et al., 2002). MMA has

4

four phases (Figure 1), of which the second is reported here. Implementation started with the production of an expert mental model, which involved the identification of, and relationship between, key variables related to maternal mortality (Oyibo et al., 2016), followed by the elicitation of lay participant knowledge.

Data were collected via semi-structured interviews with 37 public participants (women of childbearing age, 15-49 years), selected from rural and urban regions of Rivers State (MMR: 889 per 100,000 live births) to represent the target population (RSMOH, 2010). This sample size was chosen because after about 20 interviews few new concepts or ideas emerge (known as data saturation (Morgan et al., 2002)). The interviews lasted for 30-40 min and were conducted in religious houses, community centres, hospitals and participant's homes. This process aimed to identify important beliefs, attitudes and perceptions, leading to the development of concepts as a baseline for a questionnaire for phase 3 (see figure 1), which tests the frequency and prevalence of these concepts in a larger sample of the target group. The women were asked open-ended questions designed to cover specific interest areas derived from the expert mental model creation (phase 1), and including prompts that covered general knowledge of the topic, risk assessment and management, risk communication, maternity service utilisation and impact of maternal mortality. A typical interview began with a basic general question such as: 'Tell me what you know about women dying during pregnancy and childbirth', and was conducted in English and Pidgin English and the participants' native dialect as appropriate. They were manually transcribed verbatim, coded and analysed thematically, which led to the construction of subthemes and themes.

Results and discussion

Following data analysis, the main concepts that emerged from the data were grouped into seven key themes.

(Insert Figure 1 about here)

Compassion and skill of workers

Maternal health care and attendance of antenatal classes have been recognised as major influences on improving a wide range of health outcomes for pregnant women and infants (Omer et al., 2014; Dibaba, Fantahun, & Hindin, 2013; Moore, Alex-Hart & George, 2011; Dairo & Owoyokun, 2010). However, the women frequently spoke about the lack of adequately skilled workers in the hospitals, and of misappropriate patient management:

> 'You find the nurses[1] shouting for someone and hallaring (screaming) when you are complaining that this is the way am feeling, the nurses would not care, they have this nonchalant attitude and don't know what they are doing, so it angers me' (Justina, 41 years old, urban, graduate, self-employed)

The attitude of health care workers has previously been shown to be a limiting factor on the utilisation of health facilities (Olayinka, Achi, Amos & Chiedu, 2014; Diala, Pennas, Choi & Rogers, 2012), for example pregnant women's usage of malaria prevention and treatment services provided by the government was highly constrained by perception of a rude and unfriendly healthcare worker attitude, although the women understood the advantages of such services (Diala et al., 2012). In a study carried out by Moore et al. (2011) in Rivers State, out of 112 women interviewed, 70.8% attributed their underutilisation of health care facilities to the unfriendly attitude of the staff. Further analysis in the current study showed that many of the women established a link between the attitude of the health care workers and the socio-economic/ financial status of the patient.

> 'With money you will be taken good care of because even the government hospitals, they are very nonchalant. They see government work as normal work but if you can afford a good private hospital they will not allow their workers to mess up nurses will sit up, they give you attention, so you pay for it' (Ethel, 30 years old, urban, Masters, employed)

It was presumed that the richer the patient the better the treatment and vice-versa. This finding is corroborated by Omer et al. 2014, who reported that women were treated badly by workers especially if they were poor during antenatal care in Nigeria. Discrimination between the poor and rich at health care facilities was also noted by Moyer, Adongo, Aborigo, Hodgson & Engman (2014), with nurses more likely to treat the families with money more attentively and ignore the family without money. Despite the link between low financial status and poor treatment by nurses being shown, the nonchalant and uncompassionate attitudes were not only identified by the poor or rural women, this was also a concern for the rich interviewees. This may be attributed to the inadequacies in the skill set of the workers, many of whom seem to lack empathy, which is a desired skill the pregnant women would want to see in their nurses. Empathy is a major component in comprehensive nursing care and has a palliative and possibly healing effect on the patients (Baillie, 2014; Kelley & Kelley, 2013). The limited numbers of skilled health workers especially in the rural areas of Nigerian have a negative impact on utilisation of health care services (Abimbola, Okoli, Olubajo, Abdullahi, & Pate, 2012).

Native midwives/community influence

The interviewees showed a level of trust for native midwives[2] based on their previous success rate and referrals. Native midwives give the pregnant women herbal medicines for their well-being, although these herbs have not been researched scientifically for their potency, properties, toxicity and usage levels:

---

[2] The terms 'native midwives' and 'spiritualists' as utilised in this paper, refer to individuals who are not medically trained and government approved to assist in the process of pregnancy and childbirth.

'I like them (native midwives), somebody was booked for operation and she ran to those local women, and they prepared herbs, when she took the herb the woman was massaged by an Ijaw woman and the person never undergone any operation she delivered safely' (Jane, 41 years old, rural, secondary school, homemaker)

Some of these practices are seen by western medical practitioners as risky to the mother and baby, for example when deliveries occur under unhygienic conditions and native midwives apply a mixture of substances (ash oil, spices, herbs and mud) to the baby's umbilical cord stump (Obuekwe & Obuekwe, 2013).

One of the practices that stood out in this study was native massaging of the pregnant women's belly, in some cases to change the baby's positioning to a more favourable one:

'In native homes are spiritualist and native midwives, they give herbs, they use their hands in pressing stomachs like how doctors use thermometer to check people, the women use their hands to know the direction and sex and maintain the shape of the baby, so through all those things sometimes it works' (Justina, 41 years old, urban, graduate, employed)

Further enquiry around the native massage process shows that the process bears a resemblance to a medical process called 'external cephalic version' (ECV), a well-established procedure in Western medicine involving application of gentle pressure to the pregnant woman's abdomen in order to turn the foetus (Rosman et al., 2014). However, De Hundt, Veldel, de Groot, Mol, & Kok (2014) and McCarthy et al. (2014) identified that women who underwent the ECV procedure during a breeched pregnancy were at an increased risk for caesarean delivery and instrumental vaginal delivery. It therefore could be inferred that when these procedures are carried out by native midwives, whether or not they have the appropriate skills, they do not have the facilities in their native locations to carry out an urgent procedure, such as if the woman needs urgent caesarean section.

Previous research (Olusanya, Inem, & Abosede, 2011) has revealed a clear negative correlation between skilled attendants at birth and MMR (Stanton et al., 2001). The implication of the current study is that the usage of native midwives is not to be totally condemned as it is intricately intertwined in the fundamental practices of the community across generations, but instead they should be trained and incorporated into the country's health system. Native midwives can be useful in health outreach and communication and can serve as a point to encourage women to go to health centres for preventative care (Sumankuuro, 2014).

Folklore

Culture has been identified as having a direct influence on mother's health care behaviour (Evans, 2013). For example, there are different types of food taboos, and recommendations passed down generations amongst the different cultural groups. Findings from this study indicate that there are several folklores prevalent in Rivers State about pregnancy and childbirth, which corroborates Chukuezi (2010), and Okafor (2000), who reported that Nigeria still has many folklore beliefs, which may lead to delay in the referral of complications to hospitals. One such folklore concerns foods, which are to be avoided by the pregnant women because it is believed that they could be harmful:

> 'My mother advice me not to eat snail or the child will be bringing out saliva, and
> if you are eating don't bend your head because if you bend your head the thing
> will disturb the baby in you' (Bridget, 45 years old, rural, secondary, employed)

Food taboos may lead to deprivation of certain vitamins and minerals and could be associated with anaemia. Rogo Oucho, & Mwalali (2006) and McCarthy & Maine, (1992), also showed that poor nutrition causes anaemia, which decreases the chances of the mother surviving obstetric haemorrhage. However, there is evidence in some developing countries,

including those without adequate technical support, that certain foods are restricted to avoid large babies and consequent difficult labour process for the mother (Nichter & Nichter, 2009; Lefeber & Voorhoever, 1997).

Folklore is not just only about food taboos, it refers to cultural expressions, like legends, myths, festivals and beliefs (Magdalenic, 2010). This study identified several other cultural beliefs that have been passed on to generations. For example

'Okay, you shouldn't cross anything tied like let me say yam if they tied yam together you shouldn't cross over it that the placenta will tie the child in the womb' (Stella, 38 years old, urban, graduate, self-employed)

Traditional beliefs and practices have been known to contribute to the maternal health outcome of pregnant women (Chiwuzie & Okolocha, 2001). However, the traditional beliefs that were identified in this research were not generally deemed to be harmful to the women or to present an urgent risk to the pregnant women, so therefore more emphasis was placed on the traditional practices.

Poor awareness/lack of information

It is the central premise of the current study that it is likely that the provision of vital information on the prevention of maternal mortality will lead to a significant drop in the rates seen in Nigeria (Igberase, Isah & Igbekoyi, 2009), supported by other studies advocating a community participation and mobilisation approach (Findley et al., 2014; Uneke, Ndukwe, Ezeoha, Urochukwu, & Ezeonu, 2014; Igberase et al., 2009). It was therefore interesting to see this position endorsed by some participants:

'The government need to create awareness not just in the township (urban), they should move to the rural areas and come and tell us the bad things that happens during pregnancy and what we can do' (Blessing, 40 years old, rural, secondary school, self-employed)

Two major components that play a vital role in assuring informed choice of family planning and reproductive health behaviours are communication and decision-making (Oladeji, 2008). For example, there are prodromal signs and symptoms associated with pre-eclampsia (Adamu, Tunau, Hassan, & Ekele, 2014), knowledge of which may hasten the identification of danger thereby increasing the chances of survival. This was one area where misperceptions and gaps in knowledge were identified, such as the assumption that illness is malaria:

> 'Sometimes if am feeling sick somehow, I just think its malaria because these days mosquitoes are always biting me. So I just go to the chemist and buy malaria medicine and treat myself' (Briana, 35 years old, urban, secondary school, unemployed)

Self-medication may be pervasive and even recommended for treatment of minor diseases, but due to the potential negative outcome of this practice (Befekadu, Dhekama, & Mohammed, 2014), it was suggested (Anyanechi & Saheeb, 2014) that the process be eradicated or reduced to the minimum through health education and enlightenment campaigns. Adeusi, Adekeye, & Ebere (2014) stressed the urgency in the appropriate health education of the women, to enable them make informed health decisions regarding their health and that of their children.

Religion and belief

Pregnancy and religion are fundamentally intertwined in the lives of the women in this study, with the pregnancy process frequently being seen to be controlled by supernatural powers. In Nigeria, religion is an important component of the citizen's lives, with a mainly Christian south and an Islamic north (Holter, 2014). Many of the women interviewed attributed

complications and death to the influence of evil forces, witches and wizards[3] (Ogujuyigbe &

Liasu, 2007):

> 'The evil forces and enemies they will want to kill you, because they feel that a
> pregnant woman is weak in prayers, and that's the right time to hit. That is why
> we go to church to give birth and pray instead of hospital' (Kelly, 45 years old,
> urban, masters, employed)

Due to the fear of attack by the evil forces, the women have advised themselves and

future mothers to be vigilant in prayers and identify their 'Pharaohs[4]' before it is too late:

> 'I want to hit the nail on the head they are pharaohs in every family, monitoring
> children of God not to stand, they know successful babies because Devil has eyes.
> They use microscope to find out what is in the womb but if you are strong in the
> Lord the devil will not work'(Zoe, 42 years old, urban, secondary, self-employed)

This may imply that some of the women consider the church to be a haven for spiritual

protection against the "Pharaohs", and the handiwork of witches and wizards, to the extent

that many of the women prefer church deliveries:

> 'It is only God that can help someone, just like the doctors say we treat, and God
> heals. The only person that knows the right way to prevent something is God so to
> give birth in church is good sometimes' (Justina, 41 years old, urban, graduate,
> self-employed)

---

[3] Witches and wizards: Interviewees referred to these as evil forces capable of inflicting pain and
causing death, a relatively common usage in Nigerian Christianity.

[4] Pharaohs: a bad character likened to the Pharaoh in the Old Testament that held the Israelites captive
(Book of Exodus).

Decline in government health provisions/responsibility

A key component of successful health systems has been identified as effective governance (Ciccone, Vian, Maurer, & Bradley, 2014). Over the past two decades, Nigeria has made some progress in the reduction of MMR (Cooke & Tahir, 2013), but the majority of the interviewees attributed maternal death to the irresponsibility of the government. The women frequently reported negative emotions to the subject and towards the government, who they feel has abandoned its citizenry for corruption:

> 'That the government should help us in bringing nearby health centres, clinics where at least all these trained doctors who can take care of all these women will work, so they can assist them fine' (Rachael, 26 years old, rural, secondary school, homemaker)

Availability of such health infrastructure is just one component of the issue with the women also citing transportation as a barrier and the ambulance system ineffective:

> 'When I dey deliver for house, not for hospital because na night time labour dey worry me too much and that time we no get motor, and no ambulance, so I no go fit carry leg, me and my husband ' (Sarah, 39 years old, semi-urban, secondary school, unemployed)

It has become clear from this research and other studies (Olayinka et al., 2014; Thomas & Taiwo, 2014) that the provision of adequate knowledge and easily accessible health care services at a reasonable cost will increase the utilisation of health services by the women. A relationship between transport cost and usage of family planning services has been studied (Etukudo & Ben, 2014) and transport cost was discovered to be an important barrier in limiting access and usage of family planning services which is important because prevention of pregnancy is an effective form of primary prevention of maternal mortality (Olayinka et al., 2014; Campbell et al., 2006).

Conservatism: Tradition and wilful blindness

The customary practices and knowledge from previous generations play a major role in the health-seeking behaviour of these women:

> 'So many of our native midwives have inherited the gift from their mothers, so we trust them to treat us, just like our mothers have been surviving in the past the same way' (Nancy, 29 years old, rural, primary, homemaker)

Interventionists advocate for societies to change some of these traditional practices in order to improve the maternal survival rate during pregnancy (WHO, 2003). Furthermore, a decision not to address information because it may either challenge their thinking or require action breaking with tradition could be considered wilful blindness (Faith, 2013), when an individual 'wilfully shut his/her eyes to the fact', thereby shirking their opportunity for knowledge and responsibility to be informed (Hefernen, 2011):

> 'Anytime I deliver I always take my child to my village for circumcision, even though I hear it is not good for the child, my mama do am to us so I go do am to my child, is that not how it happens' (Brenda, 35 years old, semi-urban, secondary, homemaker)

Brenda acknowledged the negativity surrounding female circumcision, but the intent on delving more into the potential negative outcomes and changing behaviour is absent.

Implications

This is the first known study to apply the mental model approach to the issue of maternal mortality. The complexities and interrelatedness of barriers, challenges and issues regarding maternal death pose a major issue for any future interventions. A number of cross-cutting themes have emerged, which are discussed below.

Power/influence of religious leaders

Many of the religious and cultural beliefs presented above are rooted in acceptance of teachings and guidance of religious leaders of different types. One implication of this for maternal health care in Rivers State, and consequently Nigeria, is that support could, and perhaps should, be sought from various networks such as the religious houses and leaders, in order to lead to an effective partnership between government institutions, private institutions and local/church health providers. Thus the issue of perception of problems caused by spirits and the importance of imaginary phenomena should not be seen simply as matter for an individual, or women only, but as a whole community or state matter. In addition, it should be noted that the issue of religion and leadership from prophets in some cases does not have only spiritual implications, but further extends to the physical where many of the women have developed a 'fear of caesarean':

> 'Due to plenty vision that comes around, operation this and that you go to the hospital you will be operated and do the operation and die, a lot of all these fearful threatening visions' (Ann, 40 years old, semi-urban, primary school, self-employed)

Religion in this study may not only stand to constrain the women's reproductive health behaviour, but can be potentially seen as an oppressing instrument on the health care seeking behaviours and practices of the women (Gyimah, Takyi, & Addai, 2006). It is therefore necessary for policy makers to ask questions about the importance of religion in maternal health care utilisation and behaviours, and how to incorporate churches and religious sects into the formal health care system.

Economic barriers

Irrespective of the negative outcomes that could happen when pregnant women use native midwives, some of the interviewees mentioned that they just have no choice but to use

15

them based on their financial status. Discrimination between the rich and poor was noted in this study, and can be attributed to the need for patients to pay bribes for services, possibly stemming from the low salary of the health care workers and corruption, which unfortunately is ubiquitous in Nigeria (Timothy et al., 2014):

> 'We go to native midwives because we cannot pay bill in private hospital, we go there to register, some deliver safely, some the placenta wont come out, so that is one of the things that makes us loose child there' (Tricia, 46 years old, rural, primary, unemployed)

Fatalism

The issues identified further led to several of the women having a fatalistic attitude with several of them leaving their fate to a higher power:

> 'Some workers are good some are bad, it is just God because when giving birth there is a lot of complication there so what they will do is just be running up and down. So I just leave am for God' (Judy, 32 years old, urban, primary school, unemployed)

Acknowledgement of the issue surrounding the fatalistic attitude of the women is important, as this has highlighted the need for further education and maternity support interventions; as such an attitude only increases the chances of a negative outcome (Yar'Zever & Said, 2013).

Conclusions

Reduction in maternal death has remained a major challenge to the public health profession. Effective interventions require high quality information. The key themes identified in this study should support the need for interventions to incorporate the needs of the women and to develop effective risk communication.

This study has shown some dimensions of the perception of the women, which will inform future identification of key gaps and misconceptions between the women's knowledge and experts' knowledge, to serve as the major component in a targeted risk communication instrument.

Acknowledgement

We thank all the participants in this study, as this paper would not have been possible without their input. Many thanks also to the reviewers for helping us produce a quality paper.

Disclosure statement

No potential conflict of interest reported by the authors.

References

Abimbola, S., Okoli, U., Olubajo, O., Abdullahi, M. J., & Pate, M. A. (2012). The midwives service scheme in Nigeria. *PLoS Medicine*, *9(5)*, e1001211. doi:10.1371/journal.pmed.1001211

Achem, F. F., & Agboghoroma, C. O. (2014). Setting up facility-based maternal death reviews in Nigeria. *BJOG: An International Journal of Obstetrics & Gynaecology*, *121(s4)*, 75-80. doi:10.1111/1471-0528.12817

Adamu, A. N., Tunau, K. A., Hassan, M., & Ekele, B. A. (2014). The Perception of Patients' Relations on the Cause of Eclampsia. *Gynecol Obstet (Sunnyvale)*, *4(205),* 2161-0932. doi:10.4172/2161-0932.1000205

Adeusi, S. O., Adekeye, O. A., & Ebere, L. O. (2014). Predictors of Maternal Health As Perceived By Pregnant Women In Eti-Osa, Lagos State, Nigeria. *Journal of Education and Practice*, *5(18),* 125-131. Retrieved from http://eprints.covenantuniversity.edu.ng/id/eprint/3953

Adinma, J. I. B., & Adinma, E. D. (2011). Impact of reproductive health on socio-economic development: A case study of Nigeria. *African Journal of Reproductive Health*, *15(1)*, 7-12. Retrieved from http://www.ajol.info/index.php/ajrh/article/view/67851

Agan, T. U., Archibong, E. I., Ekabua, J. E., Ekanem, E. I., Abeshi, S. E., Edentekhe, T. A., & Bassey, E. E. (2010). Trends in maternal mortality at the University of Calabar Teaching Hospital, Nigeria, 1999–2009. *International Journal of Women's Health*, *2*, 249. Retrieved from http://citeseerx.ist.psu.edu/viewdoc/download?doi=10.1.1.293.1905&rep=rep1&type=pdf

Ameh, C. A., Adegoke, A., Pattinson, R. C., & Broek, N. (2014). Using the new ICD-MM classification system for attribution of cause of maternal death—a pilot study. *BJOG: An International Journal of Obstetrics & Gynaecology*, *121(s4),* 32-40. doi:10.1111/1471-0528.12987

Anyanechi, C. E., & Saheeb, B. D. (2014). Toothache and self-medication practices: A study of patients attending a Niger Delta tertiary hospital in Nigeria. *Annals of Medical and Health Sciences Research*, *4*(6), 884-888. Retrieved from http://dx.doi.org/10.4103/2141-9248.144896

Baillie, L. (Ed.). (2014). *Developing practical nursing skills*. CRC Press.

Befekadu, A., Dhekama, N. H., & Mohammed, M. A. (2014). Self-medication and contributing factors among pregnant women attending antenatal care in Ethiopia: The case of Jimma University specialized hospital. *Medicine Science*, *3(1),* 969-81. doi:10.5455/medscience.2010.02.8098

Campbell, C. (2003). *Letting them die: why HIV/AIDS intervention programmes fail*. Bloomington, Indiana: Indiana University Press.

Campbell, O. M., Graham, W. J., & Lancet Maternal Survival Series steering group. (2006). Strategies for reducing maternal mortality: getting on with what works. *The lancet*, *368(9543),* 1284-1299. Retrieved from http://dx.doi.org/10.1016/S0140-6736(06)69381-1

Chiwuzie, J., & Okolocha, C. (2001). Traditional belief systems and maternal mortality in a semi-urban community in southern Nigeria. *African Journal of Reproductive Health*, *5(1),* 75-82. doi:10.2307/3583200

Chukuezi, C. (2010). Socio cultural factors associated with maternal mortality in Nigeria. *Research Journal of Social Science*, *1(5),* 22 - 26. Retrieved from http://www.aensiweb.net/AENSIWEB/rjss/rjss/2010/22-26.pdf

Ciccone, D. K., Vian, T., Maurer, L., & Bradley, E. H. (2014). Linking governance mechanisms to health outcomes: A review of the literature in low-and middle-income countries. *Social Science & Medicine*, *117*, 86-95. doi:10.1016/j.socscimed.2014.07.010

Cooke, J. G., & Tahir, F. (2013). *Maternal health in Nigeria: With leadership, progress is possible*. Washington, DC: Center for Strategic and International Studies.

Diala, C., Pennas, T., Choi, P., & Rogers, S. (2012). Barriers to uptake of malaria prevention and treatment during pregnancy in Cross River and Nasawara States, Nigeria. Washington (District of Columbia): C-Change/FHI,360. Retrieved from https://www.c-changeprogram.org/sites/default/files/Barriers-to-Uptake-of-Malaria-Prevention-and-Treatment.pdf

Dairo, M. D., & Owoyokun, K. E. (2010). Factors affecting the utilisation of antenatal care services in Ibadan, Nigeria. *Benin Journal of Postgraduate Medicine*, *12(1), 3-13*. Retrieved from http://dx.doi.org/10.4314/bjpm.v12i1.63387

De Hundt, M., Velzel, J., de Groot, C. J., Mol, B. W., & Kok, M. (2014). Mode of delivery after successful external cephalic version: a systematic review and meta-analysis. *Obstetrics & Gynecology*, *123(6)*, 1327-1334. doi; 10.1097/AOG.0000000000000295

Dibaba, Y., Fantahun, M., & Hindin, M. J. (2013). The effects of pregnancy intention on the use of antenatal care services: systematic review and meta-analysis. *Reproductive Health*, *10*(1), 50. Retrieved from http://reproductive-health-journal.biomedcentral.com/articles/10.1186/1742-4755-10-50

Dinyain, A., Omoniyi-Esan, G. O., Olaofe, O. O., Sabageh, D., Komolafe, A. O., & Ojo, O. S. (2014). Autopsy-certified maternal mortality at Ile-Ife, Nigeria. *International Journal of Women's Health*, *6*, 41. doi:10.2147/IJWH.S39863

Etukudo, I. W., & Ben, V. E. (2014). Transport cost and the use of family planning as a preventative and promotion health care strategies in rural Akwa Ibom State of Nigeria. *British Journal of Education*, *2(4)*, 63-72. Retrieved from http://www.eajournals.org/wp-content/uploads/Transport-Cost-and-the-Use-of-Family-Planning1.pdf

Evans, E. C. (2013). A review of cultural influence on maternal mortality in the developing world. *Midwifery*, *29(5),* 490-496. doi:10.1016/j.midw.2012.04.002

Faith, K. E. (2013). The role of values-based leadership in sustaining a culture of caring. *Healthcare Management Forum, 26(1)*, 6-10. doi: 10.1016/j.hcmf.2012.07.001

Fapohunda, B. M., & Orobaton, N. G. (2013). When women deliver with no one present in Nigeria: who, what, where and so what?. *PloS one*, *8*(7), e69569. Retrieved from http://dx.doi.org/10.1371/journal.pone.0069569

Findley, S. E., Doctor, H. V., Ashir, G. M., Kana, M. A., Mani, A. S., Green, C., & Afenyadu, G. Y. (2014). Reinvigorating health systems and community-based services to improve maternal health outcomes: Case study from northern Nigeria. *Journal of Primary Care & Community Health*, *6(2),* 88-99. doi:10.1177/2150131914549383

Galadanci, H. S., Idris, S. A., Sadauki, H. M., & Yakasai, I. A. (2010). Programs and policies for reducing maternal mortality in Kano State, Nigeria: A review. *African Journal of Reproductive Health 3(14)*, 31-36. Retrieved from http://www.ajol.info/index.php/ajrh/article/view/109278

Gyimah, S. O., Takyi, B. K., & Addai, I. (2006). Challenges to the reproductive-health needs of African women: On religion and maternal health utilisation in Ghana. *Social Science & Medicine*, *62(12)*, 2930-2944. doi:10.1016/j.socscimed.2005.11.034

Heffernan, M. (2011). *Wilful blindness: Why we ignore the obvious*. New York: Simon and Schuster.

Holter, K. (2014). Pregnancy and Psalms: Aspects of the healing ministry of a Nigerian prophet. *Old Testament Essays*, *27(2)*, 428-443. Retrieved from http://www.scielo.org.za/scielo.php?pid=S1010-99192014000200007&script=sci_arttext#back

Hussein, J., & Fortney, J. A. (2004). Puerperal sepsis and maternal mortality: what role can new technologies play? *International Journal of Gynecology & Obstetrics*, *85*, S52-S61. doi:10.1016/j.ijgo.2004.01.010

Igberase, G. O., Isah, E. C., & Igbekoyi, O. F. (2009). Awareness and perception of maternal mortality among women in a semi-urban community in the Niger Delta of Nigeria. *Annals of African Medicine*, *8(4)*, 261-265. Retrieved from http://dx.doi.org/10.4103/1596-3519.59582

Kelley, K. J., & Kelley, M. F. (2013). Teaching empathy and other compassion-based communication skills. *Journal for nurses in professional development*, *29(6)*, 321-324. doi:10.1097/01.NND.0000436794.24434.90

Klimoski, R., & Mohammed, S. (1994). Team mental model: Construct or metaphor? *Journal of Management*, *20(2)*, 403-437. doi:10.1177/014920639402000206

Lefeber, Y., & Voorhoever, H. (1997). Practices and beliefs of traditional birth attendants: lessons for obstetrics in the north? *Tropical Medicine & International Health*, *2(12)*, 1175-1179. doi: 10.1046/j.1365-3156.1997.d01-219.x

Magdalenic, S. (2010). What is folklore? In George Fink (ed.), *Stress of war, conflict and disaster*, pp. 177ff. London, UK: Academic Press.

McCarthy, E. A., Shub, A., Robinson, M., McDowell, R., Permezel, M., & Walker, S. P. (2014). Successful external cephalic version does not confer a measurable increased risk of intrapartum cesarean section in modern obstetric practice. *Acta Obstetricia et Gynecologica Scandinavica*, *93(5),* 522-523.

McCarthy, J. (1997). The conceptual framework of the PMM Network. *International Journal of Gynecology & Obstetrics*, *59*, S15-S21. doi:10.1016/S0020-7292(97)00143-4

McCarthy, J., & Maine, D. (1992). A framework for analyzing the determinants of maternal mortality. *Studies in Family Planning*, *23(1),* 23-33. doi:10.2307/1966825

Moore, B. M., Alex-Hart, B. A., & George, I. O. (2011). Utilisation of health care services by pregnant mothers during delivery: A community based study in Nigeria. *East African Journal of Public Health*, (8), 49-51. Retrieved from http://europepmc.org/abstract/med/22066284

Morgan, M. G,. Fischhoff, B., Bostrom, A., & Atman, J. (2002). *Risk communication: A mental models approach*. Cambridge, UK: Cambridge University Press.

Moyer, C. A., Adongo, P. B., Aborigo, R. A., Hodgson, A., & Engmann, C. M. (2014). 'They treat you like you are not a human being': Maltreatment during labour and delivery in rural northern Ghana. *Midwifery, 30(2),* 262-268. doi:10.1016/j.midw.2013.05.006

Nichter, M., & Nichter, M. (2009). *Fat talk: What girls and their parents say about dieting*. Boston, MA: Harvard University Press.

Ogujuyigbe,P.O., & Liasu, A. (2007). Perception and health - seeking behavior of Nigerian women about pregnancy - related risks: Strategies for improvement. *Journal of Chinese Clinical Medicine, 2(11),* 643 - 654.

Okereke, E., Aradeon, S., Akerele, A., Tanko, M., Yisa, I., & Obonyo, B. (2013). Correction: Knowledge of safe motherhood among women in rural communities in northern Nigeria: Implications for maternal mortality reduction. *Reproductive Health*, *10*, 62. doi:10.1186/1742-4755-10-62

Olusanya, B. O., Inem, V. A., & Abosede, O. A. (2011). Infants delivered in maternity homes run by traditional birth attendants in urban Nigeria: a community-based study. *Health Care for Women International*, *32(6)*, 474-491. Retrieved from http://dx.doi.org/10.1016/j.midw.2013.05.006

Obuekwe, I. F., & Obuekwe, I. C. (2013). Identifying Indigenous Health Technologies Used by Women in a Rural Community in Nigeria on the Cord Stumps of Newborns: A Decrease in Cord Infections and Neonatal Tetanus? *Journal of International Women's Studies*, *4(3),* 148-153. Retrieved from https://69.32.208.13/library/journal/1G1-113055165/identifying-indigenous-health-technologies-used-by

Okafor, C. B. (2000). Folklore linked to pregnancy and birth in Nigeria. *Western Journal of Nursing Research*, *22(2),* 189-202. doi: 10.1177/019394590002200206

Oladeji, D. (2008). Communication and decision-making factors influencing couples interest in family planning and reproductive health behaviours in Nigeria. *Studies of Tribes and Tribals*, *6*(2), 99-103.

Olayinka, O. A., Achi, O. T., Amos, A. O., & Chiedu, E. M. (2014). Awareness and barriers to utilisation of maternal health care services among reproductive women in Amassoma community, Bayelsa State. *International Journal of Nursing and Midwifery*, *6(1),* 10-15. doi:10.5897/IJNM2013.0108

Omer, K., Afi, N. J., Moh'd C, B., Adamu, M., Malami, S. A., Oyo-Ita, A., Cockcroft, A., & Andersson, N. (2014). Seeking evidence to support efforts to increase use of antenatal care: a cross-sectional study in two states of Nigeria. *BMC Pregnancy and Childbirth*, *14(1),* 380. doi:10.1186/s12884-014-0380-4

Oyibo, N., Weller, G., & Watt, J. (2016). *Maternal mortality in Nigeria: An expert model*. Unpublished manuscript

Rivers State Ministry of Health (RSMOH). (2010). *Rivers state government strategic health development plan 2010-2015*. Nigeria: RSMOH.

Rogo, K. O., Oucho, J., & Mwalali, P. (2006). Maternal mortality.

Rosman, A. N., Vlemmix, F., Beuckens, A., Rijnders, M. E., Opmeer, B. C., Mol, B. W. J., Kok, M., & Fleuren, M. A. (2014). Facilitators and barriers to external cephalic version for breech presentation at term among health care providers in the Netherlands: a quantitative analysis. *Midwifery*, *30(3)*, e145-e150. doi:10.1016/j.midw.2014.01.002

Stanton, C., Hobcraft, J., Hill, K., Kodjogbé, N., Mapeta, W. T., Munene, F., Naghavi, M., Rabeza, V., Sisouphanthong, B., & Campbell, O. (2001). Every death counts: Measurement of maternal mortality via a census. *Bulletin of the World Health Organization, 79(7)*, 657-664. Retrieved from http://dx.doi.org/10.1590/S0042-96862001000700011

Shiffman, J., Okonofua, F. E., & Ved, R. (2006). The state of political priority for maternal mortality reduction in Nigeria and India. [Unpublished] 2006. Paper presented at the annual meeting of the Population Association of America held in Los Angeles California, March 30-April 1, 2006. Retrieved from http://www.popline.org/node/189538

Sumankuuro, J. (2014). Achieving MDGs: Breaking the silence on training of traditional midwifes in developing countries. Retrieved from http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2426849.

Thomas, K. A., & Taiwo, A. O. (2014). Determinants of maternal health care services utilisation in rural communities of Osun State, Nigeria. In *South Africa International Conference on Education,* (p. 157).

Timothy, G., Irinoye, O., Yunusa, U., Dalhatu, A., Ahmed, S., & Suberu, A. (2014). Balancing Demand, Quality and Efficiency in Nigerian Health Care Delivery System. *European Journal of Business and Management*, *6(23),* 50-56.

Uneke, C. J., Ndukwe, C. D., Ezeoha, A. A., Urochukwu, H. C., & Ezeonu, C. T. (2014). Improving maternal and child healthcare programme using community-participatory interventions in Ebonyi State Nigeria. *International Journal of Health Policy and Management*, *3(5),* 283-287. doi; 10.15171/ijhpm.2014.91

Vari, A. (2004). The mental model approach to risk research -AN RWM perspective, *Nuclear Energy Agency*. Retrieved from https://www.oecd-nea.org/rwm/docs/2004/rwm-fsc2004-7-rev1.pdf.

WHO. (2003). Traditional medicine: Our culture, our future. *African Health Monitor, 4(1)*: 1-39.

Yar'Zever, I. S., & Said, I. Y. (2013). Knowledge and barriers in utilisation of maternal health care services in Kano State, Northern Nigeria. *European Journal of Biology and Medical Science Research, 191*, 1-14. Retrieved from http://www.eajournals.org/wp-content/uploads/Knowledge-and-Barriers-in-Utilisation-of-Maternal-health-care-services-in-Kano.pdf

Phase 1

Phase 2

Create expert mental model

Semi structured interviews with lay participants

Identify gaps between public and expert Knowledge

Phase 3

Structured survey to elicit public knowledge on larger scale

Assess frequency of public misconceptions and knowledge gaps

Identify key information gaps between lay participants and experts

Phase 4

Develop risk communication instrument

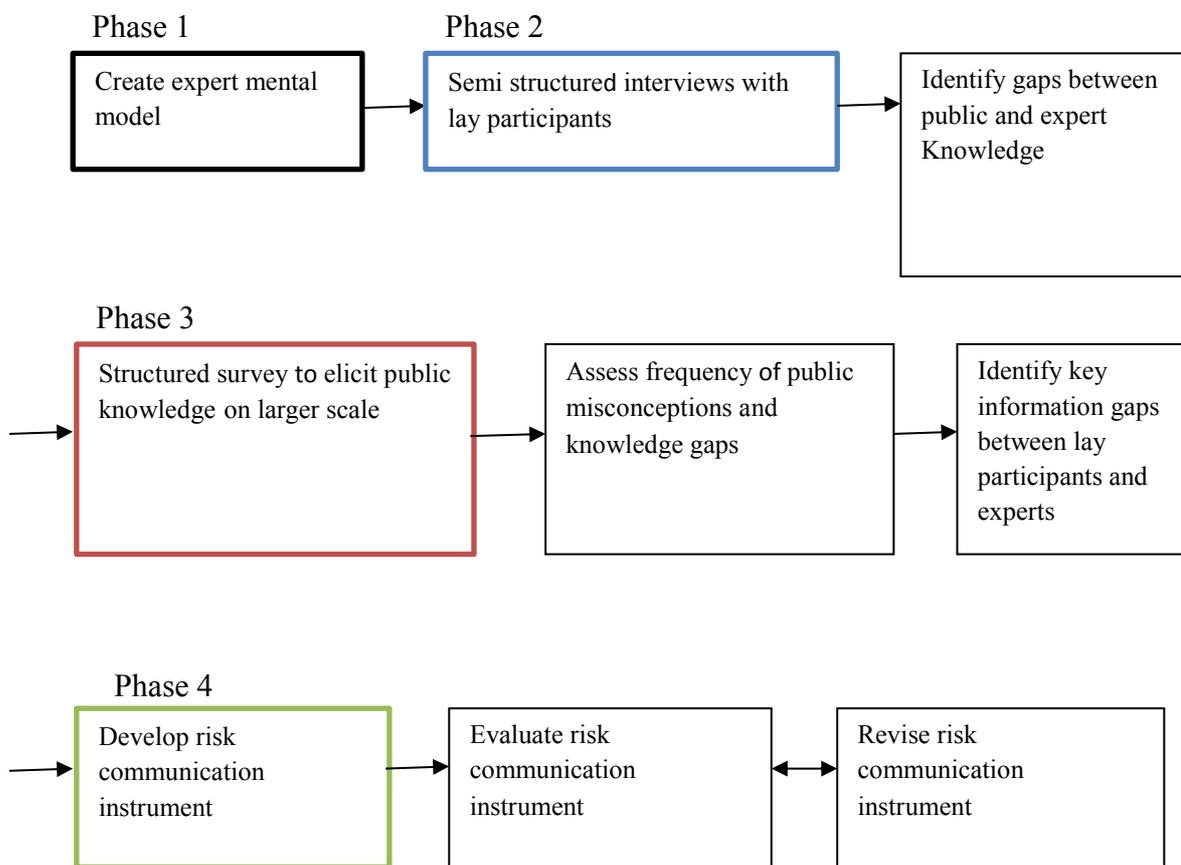| Evaluate risk communication instrument |
| --- |

Revise risk communication instrument

Figure 1. Mental model risk communication framework (Morgan et al., 2002)