



USAID
FROM THE AMERICAN PEOPLE



The Facility Perinatal Mortality Indicator Study: Tanzania

A study to validate an indicator on facility-based perinatal mortality

June 2018

www.mcspprogram.org

MCSP Implementation Research Brief
Series

Measurements to assess potentially preventable stillbirths and newborn deaths which occur in health facilities are challenging. The Maternal and Child Survival Program (MCSP)—with the Tanzania Ministry of Health, Community Development, Gender, Elderly and Children (MOHCDGEC)—conducted a study to validate an indicator on facility-based perinatal mortality (FPM), which uses data found in the national health information systems (HMIS) in Tanzania. The indicator can be integrated into routine HMIS, and can be used in quality improvement initiatives to prevent stillbirths and newborn deaths. The measure can also potentially serve as a “sentinel” measure of the quality of intrapartum care.

Background and Rationale

Globally, an estimated 2.7 million neonates die each year, and approximately 0.7 million of these deaths are due to intrapartum-related events.¹ Ninety-eight percent of these deaths occur in low- or middle-income countries.² Very early newborn deaths make up nearly one-half (46%) of the overall burden of newborn and child deaths.³ Improvements in intrapartum care could prevent as many as 1.3 million intrapartum deaths and a large proportion of newborn deaths.⁴ To measure if quality of care improvement programs are effecting positive change, an indicator is needed to track facility-based perinatal deaths—i.e., deaths that occur after the woman has been admitted to labor services. In 2009, the World Health Organization recommended the collection of such an indicator.⁵



Photo by Karen Kasmauski/MCSP

Every year in Tanzania, there are 51,000 neonatal deaths and 43,000 stillbirths.^{5,6} An estimated 40% of deaths in children under 5 years of age occur among neonates,⁷ yet up to two-thirds of these deaths could be prevented with improved intrapartum and neonatal care. In addition, there is currently a lack of valid and reliable indicators to measure the quality of labor and delivery care, including newborn care, that use routine health facility service statistics. A critical measurement gap is a tested indicator that can use HMIS data to measure perinatal mortality that occurs in the facility, in order to be linked to quality improvement measures.

Concerns about the quality of HMIS data can sometimes deter ministries of health staff, partners, and donors from using it to guide decision-making about clinical care and service management. Misunderstandings among health workers about how to classify perinatal deaths is also a common problem in low-income countries.

- In a study conducted in Ghana, 30% of admissions with fetal heart rate (FHRs) assessed were classified as macerated stillbirths (MSBs).⁸
- There was a significant reduction in fresh stillbirths (FSBs) as a result of the Helping Babies Breathe intervention in Tanzania, indicating a high level of provider misclassification of newborn death as FSB.⁹

Methodology

Design—The study used a prospective design to test the validity of the FPM indicator and had two guiding research questions (see Box 1): 1) test the validity of the FPM indicator by comparing perinatal death outcomes recorded in the HMIS maternity register to outcomes determined by gold-standard perinatal death audits conducted by health facility staff and 2) examine the feasibility of using HMIS data to calculate the FPM indicator.

Sample—The study took place at 10 government health facilities in the Kagera Region of Tanzania from November 2016 to April 2017. Facilities were purposively selected based on caseload of deliveries. The Kagera Region was selected due to high maternal mortality and MCSP's presence. The sample required a comparison of 106 “pairs” of perinatal deaths—one-half of the pair were cases with health outcomes recorded in the HMIS maternity register, and the other half of the pair were cases for which perinatal death audits had been conducted. The goal of this analysis was to accurately detect very early newborn deaths, MSBs, or FSBs in the audit to detect a sensitivity of 85% accuracy and a 0.05% power for the study design.

Procedure—Health care providers at the 10 participating facilities received a refresher training on perinatal death classification. Each facility was **equipped** with two handheld Doppler devices. Two **columns were added to the maternity register at each facility to record** the following: whether an FHR was detected at the time the woman in labor was admitted, and the device used to measure the FHR (Moyo, other Doppler, or Pinard). Enhanced perinatal death audit forms were completed by study staff who attended facility perinatal death audits. Secondary data from HMIS maternity registers were abstracted using tally sheets (data elements added to HMIS maternity register). The audits built on a facility's own Maternal and Perinatal Death Surveillance and Review (MPDSR) process. Facility staff and trained researchers jointly conducted the gold-standard audits. The primary audit tool was the MOHCDGEC MPDSR tool, with slight modifications for study purposes.

Study measures—The outcome measure for validity was the sensitivity and specificity of the perinatal death type (MSB, FSB, or very early newborn death) recorded in the HMIS register to predict the type of perinatal death identified through the gold-standard audit.

For the study's second objective (calculating the FPM Indicator, see Box 2), the study team used routine HMIS data extracted from the facilities' maternity registers.

The Johns Hopkins Bloomberg School of Public Health Institutional Review Board reviewed the study and determined it to be exempt—i.e., not a humans subjects research. The Tanzania National Institute of Medical Research approved the study.

Box 1. Study questions

- What is the sensitivity and specificity of perinatal death outcomes as recorded in the facility's Health Management Information System (HMIS) as compared to a gold standard audit?
- Can HMIS registry data be used to calculate the facility-based perinatal mortality indicator?

Box 2. Facility-based perinatal mortality (FPM) indicator

The FPM indicator is a valuable metric to use to assess efforts to improve the quality of intrapartum care.

The indicator is calculated this way:

$$\frac{\text{Fresh stillbirth + very early newborn death}}{\text{All maternal admissions with fetal heart rate detected}}$$

The FPM indicator represents a new metric to assist facilities track perinatal deaths that occur within the facility setting; many of these deaths may be preventable.

Key Findings

Validity of the FPM Indicator

The study team observed or reviewed 128 perinatal death audits (MSBs, FSBs, and very early newborn deaths) and compared them to perinatal death outcomes recorded in the study facility's HMIS maternity register (see Table 1). All classifications were in agreement except one—a death was classified as FSB in the HMIS register but as a very early newborn death in the audit (see circled in Table 1). Accordingly, the HMIS register had high sensitivity and specificity to predict the type of perinatal death. The sensitivity—i.e., probability of stillbirth or very early newborn death being classified as such in the HMIS register and also in the gold-standard audit—was 95.7%, 100%, and 97.8% for FSB, MSB, and very early newborn death, respectively. The specificity—i.e., probability of a perinatal death classified as not being a stillbirth or very early newborn death in the HMIS register but classified as a stillbirth or very early newborn death in the audit—was 98.8%, 100%, and 97.7%, for FSB, MSB, and very early newborn death, respectively.

Table 1. Health information system (HMIS) versus audit classification of perinatal deaths

		Audit perinatal death classification			
		Very early newborn deaths	Fresh stillbirths	Macerated stillbirths	Total
Perinatal death classification in HMIS register	Very early newborn deaths	44	0	0	44
	Fresh stillbirths	1	45	0	46
	Macerated stillbirths	0	0	43	43
	Total	45	45	43	133

Calculation of the FPM Indicator

The study team calculated the FPM indicator using the study facilities' HMIS data. The data spanned the study's 6-month implementation period (from November 2016 to April 2017) and included 9,687 women admitted to maternity services (see Table 2). Of these, 9,411 women (97%) had their FHRs assessed upon admission to the facility in labor; 326 perinatal deaths were recorded, including 76 FSBs, 99 MSBs, and 151 very early newborn deaths. The crude rate of perinatal deaths (including MSBs, with all admissions as a denominator; deaths were not adjusted for multiple births) was 3% (326 deaths out of 9,687 admissions).

Table 2. Facility-based perinatal morality (FPM) indicator, November 2016–April 2017

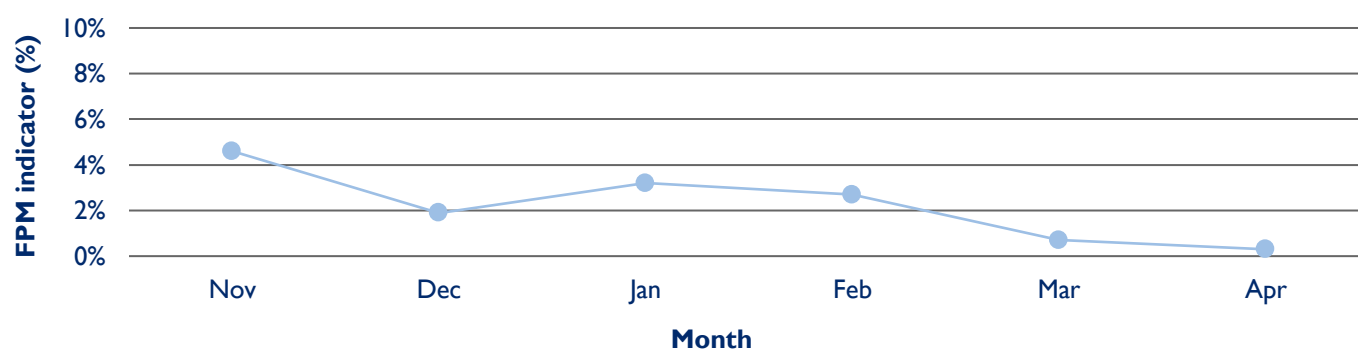
Facility	Fresh stillbirths	Newborn deaths	Women admitted with FHRs assessed	FPM indicator calculation	FPM %
Regional hospital					
Regional hospital A	29	71	2,379	$\frac{29 + 71}{2379} = 0.042$	4.2%
District hospitals					
District hospital A	4	15	740	$\frac{4 + 15}{740} = 0.026$	2.6%
District hospital B	2	16	662	$\frac{2 + 16}{662} = 0.027$	2.7%
District hospital C	6	4	661	$\frac{6 + 4}{661} = 0.015$	1.5%
District hospital D	4	6	339	$\frac{4 + 6}{339} = 0.029$	2.9%
District hospital E	22	8	1,189	$\frac{22 + 8}{1189} = 0.025$	2.5%
District hospital F	7	27	1,594	$\frac{7 + 27}{1594} = 0.021$	2.1%

Facility	Fresh stillbirths	Newborn deaths	Women admitted with FHRs assessed	FPM indicator calculation	FPM %
Health centers					
Health center A	1	2	932	$\frac{1+2}{932} = 0.003$	0.3%
Health center B	0	1	198	$\frac{0+1}{198} = 0.005$	0.5%
Health center C	1	1	717	$\frac{1+1}{717} = 0.005$	0.3%

Note: fetal heart rates (FHRs)

Shown below is an example of one of the study facility's FPM rate over the 6 months of the study (see Figure 1). Calculating the FPM rate can be used to monitor perinatal mortality and relate the data to the quality of care provided.

Figure 1. Sample facility-based perinatal mortality (FPM) indicator calculation for one facility in the study



Program/Policy Implications

Many perinatal deaths can be prevented,^{4,10} especially in a health facility setting.^{2,11} A multicountry study found that 45% of the deaths that occur in the facility setting were potentially preventable.¹¹ An assessment in Muhimbili National Hospital showed that suboptimal care was found in 80% of the audited perinatal deaths.¹²

Accurately measuring intrapartum and predischarge perinatal deaths can be challenging.⁶ The new FPM indicator described in this study provides a validated metric that can be incorporated into a national HMIS. The indicator, which uses admissions in which a FHR was detected, allows facilities to have a more specific assessment of deaths that occur after admission—deaths that could potentially be averted with improvements in quality of care. This is currently a gap in Tanzanian policy documents. For example, while the 2015 Tanzania guidelines for MPDSR give examples of ways to analyze surveillance results, they do not include an equation to calculate the perinatal mortality rate at a facility.¹³

Due to instability in rates which occur with rare events, it is recommended that in facilities where deaths are under 20 per month, the FPM indicator be calculated on a quarterly, biannual, or an annual basis. In addition, it should be noted that comparison of FPM rates across different types of facilities may not be as useful as comparing similar types of facilities, e.g., district hospitals with district hospitals and health centers with health centers.

Conclusion

This study found a high level of sensitivity and specificity of perinatal deaths recorded in the HMIS registers, compared to gold-standard audits, thereby concluding that the use of HMIS data to calculate the FPM indicator can produce a valid and meaningful measurement. Further, this measurement can be linked to quality improvement initiatives (see Box 3). This indicator is an important new tool for facilities to use to monitor improvements in quality of intrapartum care and the resulting reduction in preventable facility-based perinatal deaths.

Facilities and health administrators should track facility-based perinatal deaths using the FPM indicator, and they should document their experiences. HMIS should be revised to include the data elements necessary to calculate the FPM indicator and track perinatal deaths that occur in facilities.

Box 3. Validity of facility-based perinatal mortality (FPM) indicator

The introduction of the proposed FPM indicator should be accompanied by some validation of health care providers' abilities to classify perinatal mortality outcomes and by an assessment of the quality of data in the Health Management Information System (HMIS).

Our study found a high level of agreement between perinatal deaths recorded in the HMIS register and the outcomes determined in the audit. However, a similar high accuracy of classification of perinatal deaths has not been reported consistently across the literature. In Ghana, a study assessed the effectiveness of using visual classification of perinatal deaths and found that one-third of fresh stillbirths were reported as macerated stillbirths, and one-half of macerated stillbirths were instead described as fresh stillbirths; the authors concluded that appearance may not be an accurate proxy to determine a prepartum death from an intrapartum death.⁸ In Tanzania, a similarly high level of misclassification of perinatal death was evident when an intervention to improve newborn resuscitation showed that health care providers had been mistakenly classifying newborn deaths as fresh stillbirths.⁹

Acknowledgements

The authors acknowledge the health authorities of Kagera Region and all health care providers in the 10 study facilities, whose work made this study possible. The MCSP-MOHCDGEC study investigators are listed below:

- Hussein Kidanto—MOHCDGEC, Tanzania
- Marya Plotkin—MCSP Washington
- Dunstan Bishanga—Jhpiego Tanzania
- John George—Jhpiego Tanzania
- Ruth Lemwayi—Jhpiego Tanzania
- Gaudiosa Tibaijuka—Jhpiego Tanzania
- Benny Ngereza—Jhpiego Tanzania
- Filbert Mpogoro—Jhpiego Tanzania
- Jeremie Zougrana—Jhpiego Tanzania
- Mary Drake—Jhpiego Tanzania
- Amasha Mwanamsangu—Jhpiego Tanzania
- Neena Kadhka—MCSP Washington
- Barbara Rawlins—MCSP Washington
- Jim Ricca—MCSP Washington
- Mary Carol Jennings—Johns Hopkins Bloomberg School of Public Health, Department of International Health
- Jim Litch—Saving Newborn Lives

References

1. Liu L, Oza S, Hogan D, et al. 2016. Global, regional, and national causes of under-5 mortality in 2000–15: an updated systematic analysis with implications for the Sustainable Development Goals. *Lancet*. 388(10063):3027–35. doi: 10.1016/S0140-6736(16)31593-8.
2. Blencowe H, Cousens S, Jassir FB, et al. 2016. National, regional, and worldwide estimates of stillbirth rates in 2015, with trends from 2000: A systematic analysis. *Lancet Glob Health*. 4(2):e98–108. doi: 10.1016/S2214-109X(15)00275-2.
3. Baqui AH, Mitra DK, Begum N, et al. 2016. Neonatal mortality within 24 hours of birth in six low- and lower-middle-income countries. *Bull World Health Organ*. 94(10):752–758B.
4. Lawn JE, Blencowe H, Waiswa P, et al. 2016. Stillbirths: rates, risk factors, and acceleration towards 2030. *Lancet*. 387(10018):587–603. doi: 10.1016/S0140-6736(15)00837-5.
5. World Health Organization (WHO). 2009. Monitoring emergency obstetric care. WHO website. <http://www.who.int/reproductivehealth/publications/monitoring/9789241547734/en/>. Accessed May 16, 2018.
6. World Health Organization (WHO). 2006. Neonatal and perinatal mortality: country, regional and global estimates. WHO website. <http://apps.who.int/iris/handle/10665/43444>. Accessed May 16, 2018.
7. Afnan-Holmes H, Magoma M, John T, et al. 2015. Tanzania's Countdown to 2015: an analysis of two decades of progress and gaps for reproductive, maternal, newborn, and child health, to inform priorities for post-2015. *Lancet Glob Health*. 3(7):e396–409. doi: 10.1016/S2214-109X(15)00059-5.

8. Gold KJ, Abdul-Mumin AR, Boggs ME, et al. 2014. Assessment of “fresh” versus “macerated” as accurate markers of time since intrauterine fetal demise in low-income countries. *Int J Gynaecol Obstet.* 125(3):223–7. doi: 10.1016/j.ijgo.2013.12.006.
9. Msemu G, Massawe A, Mmbando D, et al. 2013. Newborn mortality and fresh stillbirth rates in Tanzania after helping babies breathe training. *Pediatrics.* 131(2):e353–60.
10. Bhutta ZA, Yakoob MY, Lawn JE, et al. 2011. Stillbirths: what difference can we make and at what cost? *Lancet.* 377(9776):1523–38.
11. Goldenberg RL, McClure EM, Kodkany B, et al. 2013. A multi-country study of the “intrapartum stillbirth and early neonatal death indicator” in hospitals in low-resource settings. *Int J Gynaecol Obstets.* 122(3):230–3.
12. Kidanto HL, Mogren I, van Roosmalen J, et al. 2009. Introduction of a qualitative perinatal audit at Muhimbili National Hospital, Dar es Salaam, Tanzania. *BMC Pregnancy Childbirth.* 9:45. doi: 10.1186/1471-2393-9-45.
13. Reproductive and Child Health Section, Ministry of Health and Social Welfare Tanzania. 2015. *Maternal and Perinatal Death Surveillance and Response.*

This brief is made possible by the generous support of the American people through the United States Agency for International Development (USAID) under the terms of the Cooperative Agreement AID-OAA-A-14-00028. The contents are the responsibility of the Maternal and Child Survival Program and do not necessarily reflect the views of USAID or the United States Government.

The Maternal and Child Survival Program (MCSP) is a global, USAID Cooperative Agreement to introduce and support high-impact health interventions. MCSP focuses on 25 high-priority countries with the ultimate goal of ending preventable child and maternal deaths within a generation.

www.mcsprogram.org

Maternal and Child Survival Program (MCSP)

1776 Massachusetts Ave., NW, Suite 100

Washington, DC 20036

Tel: 202.835.3100

Fax: 202.835.3150

Facebook.com/MCSPglobal

Twitter.com/MCSPglobal