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CLINICAL ARTICLE

Comparability of sociodemographic and pregnancy characteristics of pregnancy-related deaths identified via the sisterhood method versus the household/verbal autopsy method

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ABSTRACT

Objective: To compare sociodemographic and pregnancy characteristics of pregnancy-related deaths identified by the direct sisterhood and the verbal autopsy with household mortality (HHVA) methods. *Methods:* Nationally representative data for 1997–2001 were obtained from the household, verbal autopsy, and women's questionnaires of the Bangladesh Maternal Health Services and Maternal Mortality Services Survey, 2001. Sociodemographic and pregnancy characteristics were compared for maternal deaths identified by the two methods. Characteristics of deceased women were reported directly with HHVA, but extrapolated in the direct sisterhood method using the reporting sister as proxy. *Results:* Overall, 201 pregnancy-related deaths were identified via HHVA and 388 through DS reporting. There were no significant differences between reporting sister characteristics and deceased women's characteristics in educational attainment, working status, husband's educational attainment, and spouse educational parity. However, timing of death relative to pregnancy phase, number of previous live births, and years since death did differ ($P < 0.05$). *Conclusion:* The sociodemographic characteristics of women with pregnancy-related deaths identified via the two methods were similar. However, some pregnancy characteristics differed significantly, suggesting that different policy interventions are required. Before considering using sister proxy characteristics to target services, issues responsible for these differences should be resolved, and generalizability of evaluated indicators must be considered.

1. Introduction

Millennium Development Goal 5A aims to reduce the maternal mortality ratio by three-quarters between 1990 and 2015. However, accurate accounting of maternal deaths has been a primary challenge in the estimation of pregnancy-related mortality in low-resource countries and the collection of data to advocate for policy change around maternal heath [1–3]. The quality and consistency of available data vary substantially owing to inadequate vital registration systems and death misclassification [4–6].

Pregnancy-related mortality includes all deaths that occur during pregnancy or delivery, or within 6 weeks after delivery, irrespective of cause [6]. There are several direct and indirect methods for estimating pregnancy-related mortality ratios (PRMRs) in the absence of functioning vital registration systems, each with advantages and disadvantages [3]. The two methods that are most frequently used are the direct sisterhood (DS) method and the household mortality (HH) survey.

Via the DS method, women provide mortality information for all their sisters. It is widely used to establish PRMRs via large household surveys because it provides population-representative data, generates a recent estimate, and is easily included in multipurpose surveys [7–9]. With the HH method, household heads report on deaths occurring within their household. Both methods assess timing of death relative to pregnancy phase for women of reproductive age. The DS and HH methods were previously found to yield similar PRMR estimates in a nationally representative survey from Bangladesh: 400 maternal deaths per 100 000 live births (95% confidence interval [CI] 337–462) and 382 per 100 000 live births (95% CI 305–460), respectively [10].

Although the PRMRs estimated from these two methods were equivalent, characteristics of the deceased reported via these two approaches might not be comparable. HH respondents report on deaths within their households, whereas DS respondents report on deaths in multiple other households. Inclusion of verbal autopsy with the HH method (HHVA) enables an investigation of non-medical issues surrounding the death, allowing a characterization of populations most at risk for maternal death to inform intervention targeting [11]. However,

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HHVA is intensive and expensive, whereas DS is easily incorporated into population-based surveys. Characterizing high-risk populations by attributing characteristics of the reporting sister as a proxy for the deceased is possible through the DS method. Graham et al. [12] proposed that social and demographic characteristics are likely to be similar among adult family members, but this assertion has not been validated.

The aim of the present analysis was therefore to compare sociodemographic and pregnancy characteristics between pregnancy-related deaths reported by the DS method and deaths reported through HHVA within a nationally representative sample from Bangladesh to provide preliminary evidence regarding the validity of using sister-reported characteristics from the DS method for targeting services to reduce pregnancy-related mortality.

2. Materials and methods

In a nationally representative study, data for pregnancy-related deaths were obtained from HH questionnaires, verbal autopsy questionnaires, and women's questionnaires completed as part of the Bangladesh Maternal Health Services and Maternal Mortality Survey (BMMS) 2001. The present analysis was determined to be exempt from ethical approval by the Harvard School of Public Health Institutional Review Board because it was a secondary analysis of data in the public domain.

The BMMS was conducted from January 9 to June 15, 2001, to provide a nationally representative, stratified, random sample comprising a cross-sectional collection of HH questionnaires, verbal autopsy questionnaires, and women's questionnaires. Responses included 99 202 households, 106 789 ever-married women of reproductive age (13–49 years), and 928 verbal autopsies. The BMMS is the only known dataset to concurrently estimate pregnancy-related mortality via DS and HHVA. Full details on the BMMS are published elsewhere [13].

Briefly, the HH questionnaire was completed by the individual identifying as head of household, and recorded characteristics and demographics of all household residents, and reports of household deaths since April 1997. Further questions were asked about the deaths of women aged 13–49 years to identify pregnancy-related deaths by establishing timing of death relative to pregnancy phase (i.e. pregnant, giving birth, given birth in the previous 6 weeks).

Additionally, verbal autopsy was conducted for all deaths reported for women aged 13–49 years, and addressed symptoms and circumstances around the death. Respondents for the verbal autopsy were the individuals within the household who self-reported that they knew the most about the circumstances of the death at the time of interview.

Within each household, women who had ever been married and were aged 13–49 years were asked to complete the women's questionnaire, which collected data for sociodemographic characteristics, birth history, and sibling history. To estimate PRMR via the DS method, data for siblings

Table 1
Characteristics of pregnancy-related deaths identified via the DS and HHVA methods.

Measure	Categories used	DS method	HHVA method
Pregnancy-related characteristics			
Timing of death	Pregnancy, delivery, post partum	Reporting sister is asked in sequence: "Was [name] pregnant when she died?"; "Did [name] die during childbirth?"; and "Did [name] die within 1.5 mo (6 wk) after the end of a pregnancy or childbirth?"	Respondent to VA is asked in sequence: "Was the woman pregnant at the time of her death?; "Did the woman die before labor pain began?"; "Did she die after labor pain began?"; and "How many days or months before her death did she deliver?" (post partum if within 42 d)
Parity	Continuous data coded as: 0, 1–2, 3–4, ≥5	Reporting sister is asked: "How many live born children did [name] give birth to during her lifetime (before this pregnancy)?"	Respondent to VA is asked: "How many live births did she have?" and "How many still births did she have?"
Years since death	Continuous data coded as: <1, 1, 2, 3	Reporting sister is asked: "How many years ago did [name] die?"	Respondent to HH survey is first asked whether any deaths had occurred in the household since April 1997 (3 y prior); for each death listed, the month and year of death were recorded.
Sociodemographic characteristics			
Household asset quintile	Poor, poorer, middle, richer, richest	Calculated at the household level (as reported within HHVA); the household asset quintile for DS is reported for the household to which the reporting sister belongs as proxy.	Respondent to HH is asked various questions about dwelling characteristics and household ownership of goods [15]; principal components analysis is used to produce a normalized index and is divided into quintiles (poor, poorer, middle, richer, and richest); household asset quintile for HHVA is reported for the household in which the woman died.
Educational attainment [16]	0 y, 1–5 y, 6–8 y, 9–10 y, ≥11 y	Reporting sister is asked whether she has ever attended school, and if so, what were the highest level and class that she completed; educational attainment reported is that of the reporting sister as proxy.	Respondent to HH is asked a sequence of questions about whether the family member had ever attended school, and if so, what were the highest level and class that they completed.
Spouse educational differential	Equal, wife higher, husband higher	Calculated as years difference in educational attainment between reporting sisters and their husbands as proxy.	Calculated as years difference in educational attainment between the woman who died and her husband.
Household head attended school	Yes, no	Calculated from the HH survey; indicates whether the household head of reporting sister's household attended any school.	Calculated from the HH survey; indicates whether the head of the household in which the woman died attended any school.
Employment status	Yes, no	Within the HH survey, questions are asked of all family members: "Is [name] currently working?" and "Does [name] receive wages/income in cask or kind?" Employment status was operationalized as working and receiving any wages/income in cash/kind; status for DS is that of the reporting sister as proxy.	Respondent to VA is asked, "Did [name] do any work, other than her own household chores?" and if so, "Did [name] receive any payment or things for the work, or did she receive nothing?" Employment status operationalized as doing any work and receiving any payment.
Age at death	<18 y, 18–24 y, 25–29 y, 30–34 y, 35–39 y, 40–44 y, 45–49 y	Age of the deceased sister is calculated by combining the question, "How old was [name] when she died?" with the question, "How many years ago did (name) die?" Age at sibling death is also calculated; this is a characteristic of the reporting sister as proxy, calculated by current age and number of years since sibling death of reporting sister.	Respondent to VA is asked: "How old was [name] at the time of her death?"

Abbreviations: DS, direct sisterhood; HHVA, verbal autopsy with household mortality method; VA, verbal autopsy; HH, household mortality.

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