Near-miss abortion-related morbidity: Exploring the utility of maternal near-miss as an indicator to improve the representativeness and comparability of estimates of the burden of unsafe abortion

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Introduction
Unsafe abortion is the most easily preventable cause of maternal mortality[1,2]. Despite issues of data quality, evidence suggests that unsafe abortion causes about 13% of maternal mortality globally[3] and imposes serious economic costs on individuals, families and society[4]. Most unsafe abortions occur in low and middle-income countries where there are legal restrictions and/or societal stigma surrounding terminations of pregnancy[5]. However, considerable uncertainty exists around abortion estimates particularly in high burden regions. There are many methodological challenges to identifying and quantifying unsafe abortion and its sequelae(5, 6), and advances in abortion measurement have been slow[6]. Similarly, monitoring and evaluation of abortion-related programs and policies are challenging because of the stigma associated with the procedure, or the unwillingness of women and providers to report an induced abortion[7]. Such challenges have an impact on the reliability and validity of estimates of regional and global burden of unsafe abortion and abortion-related morbidity. As stigma and reporting biases are likely to vary according to setting, they restrict how representative estimates are of the problem in the general population, and whether estimates from different social and legal contexts are actually comparable.

The aim of this paper is to examine how the concept of near-miss morbidity can improve the measurement of unsafe abortion by providing a population-representative indicator of the burden unsafe abortion, and allowing for greater comparability of estimates across contexts.

Measurement of the burden of unsafe abortion in legally restrictive contexts
The WHO defines an unsafe abortion as “the termination of an unintended pregnancy either by persons lacking the necessary skills or in an environment lacking the minimum medical standards or boths”[8]. Whilst this definition focuses on the process of an unsafe abortion, in practice the burden of unsafe abortion is measured using data on outcomes. The commonest indicators used to describe the burden of unsafe abortions at the national level are the number/rate of hospitalizations for abortion-related complications, and the prevalence rate/ratio of induced abortions. Global estimates typically report on the number and prevalence of unsafe and induced abortions, hospitalizations for abortion-related complications and the proportion of unsafe abortions out of all induced abortions[2,9,10]. Each indicator has its own measurement challenges and limitations.

In measuring the incidence of treatment for complications from unsafe abortions complications due to induced abortions are the cases of interest. However it is challenging to accurately distinguish between complications caused by induced and spontaneous abortions in the data collected from health facilities. Previous methods proposed to perform this task have many limitations[11]. The WHO Figa-Talamanca methodology was developed in 1986 and attempted to classify post abortion cases into induced (certainly induced, possibly induced or probably induced) or spontaneous cases. Subsequent studies attempting to validate the Figa-Talamanca criteria suggested that they underestimate levels of unsafe induced abortion[12].
In 1994, Rees et al. proposed refining the methodology by shifting away from a focus on induced abortions and classifying post abortion cases into low, moderate and high severity complications [13]. In their 1997 study, middle and high-severity categories were used as markers of unsafe abortion[13]. This method is the basis of the prospective morbidity methodology which is currently the most frequently used morbidity classification for abortion-related complications[14–16]. However the PMM cannot differentiate between induced and spontaneous abortions. Thus attempting to generate estimates of the number of hospitalizations due to induced and unsafe abortions can lead to biased estimates depending on if and how adjustments to correct for spontaneous abortions are made[17].

The second indicator commonly measured is the prevalence of induced abortion. Estimates for this indicator are most commonly generated using indirect techniques that utilize hospitalization data from health facilities such as the abortion incidence complications method (AICM)[18]. These methods usually apply adjustment factors to data on abortion-related complications to extrapolate the national incidence of induced abortion[18,19]. Data is typically adjusted for complications of spontaneous abortions[19], weighted for study design and duration of data collection[14,13], and context-specific, locally collected multipliers are applied to account for women who did not develop complications, and/or did not seek care for them[20]. Thereafter in global estimates all induced abortions except in countries with documented legally sanctioned procedures are classified as unsafe[2].

**Limitations of hospital-based data to measure the burden of unsafe abortion**

Hospital-based data does not capture all the morbidity and mortality in the general population as legal and social barriers restrict women’s access and utilization of healthcare for abortion-related complications[21,22]. Specifically they are likely to exclude uncomplicated or low-severity complications from illegal abortions, which are unlikely to require admission to a facility[23,24], and maternal mortality if deaths occur outside facilities[25]. Additionally, cases may go undetected if they occur outside obstetrics/gynecology departments and data collection systems are not put in place to capture them. Whilst abortion-related mortality is a reliable indicator of unsafe abortions it is even more challenging to measure and track over time than morbidity using hospital data. In addition to being poorly captured and underestimated, there is a comparatively low incidence of abortion mortality at sub-national levels and within individual hospitals. This limits its practicality for understanding common deficiencies in clinical care or tracking the impact of interventions over time. Furthermore, since social and legal barriers may limit women’s access to health facilities studying the characteristics of cases of mortality reported in hospitals is non-representative of all abortion-related mortality in the population. Overall, data on all categories of morbidity or mortality within facilities is not representative of the burden of unsafe abortion within the population.

The validity of adjustment factors to account for morbidity and mortality not identified within the facility, and to extrapolate national estimates of all women undergoing induced or unsafe abortion, depends on the accuracy of the research informing their assumptions. However, research into adjustment factors is not advanced and has not
taken place in all contexts. It is also not certain how well they can capture changes in the practice of abortion such as the increasing use of medical abortion. In some cases where multipliers are not available for a particular country, those from a country with similar parameters are applied to the data[18]. This is likely to introduce more bias into the national estimates generated.

The legal context has a great impact on abortion provision and access within the formal healthcare system[26–28]. However, countries differ in the de-facto application of the law. The prevalent practice in each context influences the probability that induced abortion cases will develop severe complications, access post abortion care services and thus appear in a sample of complicated cases. Consequently, global estimates of unsafe abortion where all legal abortions are classified as safe and non-legal abortions as unsafe[2,9] are ambiguous as abortion practice and outcomes are not uniform in similar legal contexts. Present estimates of the prevalence of unsafe abortion are hence not entirely comparable to understand the magnitude of abortions with the greatest health risks, or to track “safety” of induced abortions procedures over time.

The case for near-miss morbidity
In reality unsafe abortions have been measured using outcome data. It may be argued that the process-based definition WHO implicitly accounts for the fact that abortions induced under higher risk circumstances are likely to result in poorer outcomes. However, it is easier to identify and count negative health outcomes than to obtain process data on induced abortions, in particular when these processes are sub-standard as in contexts with a high burden of unsafe abortion. Hence for research measuring unsafe abortion to understand the magnitude of the problem and for monitoring progress, it remains practical to focus on an outcome-based indicator. An ideal outcome-based indicator of unsafe abortion would be measureable using readily available data, represent a level of severity that is unlikely to be attributable to a spontaneous abortion, and be representative of the population within which it is being measured.

Unlike mortality, which is an objective indicator of unsafe abortions but is challenging to measure, morbidity encompasses as spectrum of severity within which we may find an ideal indicator of unsafe abortions. Research studies suggest that there is a substantial but poorly quantified burden of severe morbidity for every death that occurs[29,30]. The population representativeness of an abortion morbidity indicator may be improved by restricting measurement of morbidity to complications so severe that they are more likely to be found within a health facility than within the community. Severe acute health complications are the most objective outcomes of poorly conducted terminations, the means by which “unsafe” abortions have been identified, and the consequences that interventions aim to eliminate. Developments in measuring maternal morbidity demonstrate the importance of describing and quantifying such severe acute maternal morbidity - also known as near-miss - when the woman survives a near-death experience[31–33].
A maternal near-miss has recently been defined by the WHO as “A woman who nearly died but survived a complication that occurred during pregnancy, childbirth or within 42 days of termination of pregnancy”[32]. Severe morbidity and near-misses are most likely but not exclusively the result of induced and illegal rather than spontaneous abortions[34,35]. It occurs more commonly than mortality, but is usually rare enough not to overburden data capturing personnel in facilities[36]. By defining near-miss complications with stringent criteria, such that almost all cases should be seen in facilities or would have died, it is postulated that the burden of abortion near-miss measured with hospital-based data may be more representative of the general population [25] than mortality measured similarly. Compared with near-misses, the proportion of abortion-related mortality occurring in the community is likely to be substantial. The WHO recently proposed standardized criteria to identify a near-miss case. These criteria aim to accommodate the diagnostic capacities of hospitals in different resource contexts by having 3 types of markers for each organ/system- clinical signs and symptoms, laboratory criteria and management-based proxies[32]. They are undergoing vigorous testing in various contexts to highlight and refine their strengths and weaknesses. The use of these criteria allows for the availability of comparable near-miss data and estimates from different contexts.

Table 1 outlines if and how using abortion near-miss as an indictor of unsafe abortion addresses the measurement issues discussed above.

Table 1. How near-miss addresses the limitations of other abortion indicators

<table>
<thead>
<tr>
<th>Critique of current indicators used to describe the burden of unsafe abortion</th>
<th>Addressed by new definition (Yes, unsure, No)</th>
<th>How the definition address the challenge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-representativeness of indicators</td>
<td>Yes</td>
<td>1. By utilizing stringent criteria requiring hospital care to define a near-miss. Abortion near-misses are most likely only identifiable at health facilities. Hence data available from facility records when divided by a population level denominator is more representative of the study population than other indicators currently used.</td>
</tr>
<tr>
<td>Requires appropriate adjustment factors</td>
<td>No</td>
<td>1. Near-misses are more likely to be from induced than spontaneous abortions. 2. Since data will be collected from facility records and there is no intention to divide near-missed into induced versus spontaneous there is less need for elaborate adjustment factors 3. However there is a possibility that facility records are incomplete and near-miss cases are missed during data collection. This may differ by type and level of facility and across contexts. Hence some degree of adjustment may be required to avoid substantial underestimation</td>
</tr>
</tbody>
</table>
| Difficulty with tracking over time | Uncertain | 1. Whilst the data on abortion near-miss is poor,
due to rarity of indicator like mortality

research suggests that it occurs in greater numbers than mortality. This suggests that it may be easier to compare estimates over time to determine trends nationally. However with the increasing use of medical abortion and access to safer abortion care in some contexts, the numbers of near-misses may not be enough to understand trends in sub-regions and at individual facilities

**Limitations of using near-miss to define unsafe abortions**

The near-miss approach has some limitations. There is a small probability that a proportion of near-misses can occur after spontaneous abortions, or induced abortions performed optimally, leading to over-counting the number of near-miss cases from unsafe abortions. In Warakamin et al’s 2004 study in Thailand, although 29% of induced abortions resulted in near-miss, 5% of spontaneous abortions also became near-miss complications [37]. The UK confidential enquiry for 2006-2008 indicated that the mortality rate per 100,000 maternities 1 was 0.31 for spontaneous abortions and 0.09 for induced abortions [38]. Although induced abortions are more likely to result in a near-miss than spontaneous abortions, distinguishing them remains challenging and cannot be attempted using this definition.

Using abortion near-miss as an indicator of unsafe abortions is consistent with the suggestion that severe acute complications are the adverse events of interest for measurement of safety, and that they most frequently occur after induced abortions performed illegally, or under poor clinical standards. The concept of near-miss extends the present abortion-morbidity classification by objectively capturing the most extreme form of morbidity to provide an index of unsafe abortion representative at the population-level. Utilizing the WHO criteria will also allows researchers to generate comparable measurements of abortion-related near-miss from different contexts.

**Integrating near-miss into the measurement of unsafe abortion**

Near-miss maternal morbidity has been used successfully in obstetric care to describe the burden of maternal illness and its long term outcomes [31,39,40], understand the costs of severe morbidity to households [41], assess quality of care through audits and confidential enquiries [42,43], and examine the determinants of maternal death [44]. Most studies applying this concept to quantifying maternal morbidity have not focused on abortions, and only one study has applied the WHO near-miss criteria to abortion complications [30].

The WHO near-miss criteria of severity can be incorporated into the commonly used prospective morbidity criteria used to classify abortion-related morbidity in hospitals within future research studies. As recommended

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1 Maternities are defined as the number of pregnancies that result in a live birth at any gestation, or stillbirths occurring at or after 24 completed weeks of gestation, and are required to be notified by law.

2 These figures were recalculated to reflect all deaths using information provided in the report. They were initially separated into deaths from haemorrhagic complications (chapter 6) and deaths from sepsis (chapter 7)
by the WHO, abortion near-miss indicators such as the near-miss incidence ratio (per 1000 live births per year), and near-miss abortion rate (per 100,000 women of reproductive age (15-49) per year)(29) can be calculated using national or regional level census information to generate comparable indicators between contexts. Since near-misses occur in greater numbers than mortality(23, 38), they may also be more sufficient for regional comparisons of morbidity and quality of care. It can be used as an outcome indicator to track the impact of abortion-related interventions and policies. Furthermore, repeated estimates of the burden of near-miss can be used as an index of the safety of induced abortion services over time and access to post-abortion care at the population level. For example, it is hypothesized that a decline in the number of near-miss abortion complications over time would imply greater and timelier access to good quality services. It is also likely that as medical abortion becomes more accessible within a country, the numbers of near-misses should decline over time due to its relative safety compared with invasive procedures. Additionally, identifying near-miss cases provides an opportunity to understand the socioeconomic circumstances around the most unsafe abortions, possibly related to abortion-related mortality, and to examine the effect of severe morbidity on future reproductive and health outcomes[45].

Conclusion
The issues that make induced abortions controversial and subsequently unsafe in many countries have an impact on how unsafe abortions have been defined, and how the definition is operationalized for measurement. All methods of measuring unsafe abortions are biased and there is considerable uncertainty around estimates generated. As long as induced abortion remains stigmatized, in countries where it is restricted by law or policy, it will remain extremely challenging to capture the process of induced abortions. An outcome based operational definition is hence the most practical means to approach the measurement of unsafe abortions. Despite its limitations, abortion near-miss as defined by the WHO, is an objective and potentially population representative indicator of the prevalence of the most unsafe abortions that can be tracked over time to explore trends in abortion safety. Future research on abortion-related hospitalizations should assess the feasibility of collecting data on abortion near-miss from routine hospital records and the applicability of the WHO criteria within different low and middle-income country contexts. Additional research to determine the abortion near-miss to abortion mortality ratio may also provide data to improve the estimation of abortion-related mortality.
References


[40] Sousa MH, Cecatti JG, Hardy EE, Serruya SJ. Severe maternal morbidity ( near miss ) as a sentinel event of maternal death . An attempt to use routine data for


