

Better understanding of maternal deaths—the new WHO cause classification system

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Accepted 21 July 2011.

Please cite this paper as: Say L, Chou D. Better understanding of maternal deaths—the new WHO cause classification system. BJOG 2011;118 (Suppl. 2):15–17.

The United Nations Millennium Development Goal 5a (MDG 5a) calls for a reduction in the maternal mortality ratio by 75% between 1990 and 2015. Methods for the measurement and identification of maternal deaths continue to evolve. For better informed assessments of progress towards the achievement of MDG 5 and to plan targeted actions, we must first accurately identify the underlying causes of death and, secondly, implement a system that can record the underlying cause of death and any contributing conditions or factors.

Health programmes need to collect accurate information on the causes of maternal morbidity and mortality in order to understand the changes required to make progress towards MDG 5a. The new WHO Classification of Maternal Deaths in Pregnancy, Childbirth, and the Puerperium¹ is a tool that aims to capture data relevant to maternal mortality. The classification was developed in response to the need to standardise the understanding of terminology and to simplify the analysis of causes of maternal death.

Ideally, maternal mortality is captured through vital (civil) registration systems. However, in the majority of countries, this is far from reality, especially in low-resource settings, in which vital registration systems are not well developed and the measurement of maternal mortality may be through household surveys, using direct or sisterhood methods, population censuses, verbal autopsy studies or reproductive-age mortality studies (RAMOS).² Each of these methodologies contains inherent weaknesses in estimating the true levels of maternal mortality. Even the gold standard of a vital registration system, with complete coverage of the population, is subject to under-reporting and the misclassification of deaths. Under-reporting of maternal deaths refers to 'missing' maternal deaths, whereas the misclassification of maternal deaths refers to deaths which are identified and reported to the vital registration system but with incorrect attribution of the cause

of death. Mechanisms such as confidential enquiries and active case findings/surveillance systems reduce under-reporting and the misclassification of maternal deaths. The identification of maternal deaths is also improved with the addition of a pregnancy check box on death certificates, prompting further enquiry into whether or not the death of a woman is a maternal death (see Box 1).

When 'counting' deaths through vital registration systems, maternal deaths are identified by codes listed in the International Classification of Diseases (ICD).³ According to ICD-10, the current revision of the ICD, deaths assigned codes O00 to O99 (Chapter XV Pregnancy, childbirth, and the puerperium) and A34 (maternal tetanus) are considered as maternal deaths. However, the use of an 'O' code does not ensure appropriate cause attribution.

This is, in large part, a result of the fact that healthcare workers who certify deaths are frequently not provided with training on the rationale for death certification, or on the rules of the ICD. Even where 'professional' coders extract information from death certificates, accurate certification may not be possible if key information was not recorded by the healthcare worker.

ICD death certification is complex and rife with confusing terminology. The completion of a death certificate requires a knowledge of the 'underlying cause of death' and any 'contributing causes' to death. The underlying cause of death is defined as the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury. The identified underlying cause should be as specific as possible with an allocated ICD code for accurate cause of death attribution on a death certificate (see Box 2).

Contributory causes are defined as conditions that may exist prior to the development of the underlying cause of death, or that develop during the chain of events leading to

Box 1. Definition of deaths in pregnancy, childbirth and the puerperium: International Classification of Diseases, Tenth Revision (ICD-10)³

Death occurring during pregnancy, childbirth and the puerperium

is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the cause of death (obstetric and nonobstetric)

Maternal death is the death of a woman while pregnant or within 42 days of termination of pregnancy, irrespective of the duration and the site of the pregnancy, from any cause related to or aggravated by the pregnancy or its management, but not from accidental or incidental causes

Box 2. Definition of causality: International Classification of Diseases, Tenth Revision (ICD-10)³

Underlying cause is the disease or injury which initiated the train of morbid events leading directly to death, or the circumstances of the accident or violence which produced the fatal injury. The selection of the underlying cause of death is subject to a set of rules that are laid out in volume 2 of ICD-10

Contributory cause is defined as a condition that may exist prior to development of the underlying cause of death or develop during the chain of events leading to death and which, by its nature, contributed to the death

death. Clinicians readily understand the concept of contributory causes as risk factors or complications. However, an understanding of what is an underlying cause of death, a condition which is appropriate for mortality coding, is more elusive.

A Working Group convened by WHO⁴ highlighted that the attribution of causes to maternal deaths is complicated mainly by: (i) the difficulty in determining when in the cycle one defines the underlying cause of death; and (ii) separating what should be a symptom from a clinical diagnosis.

In response to these problems, WHO conceptualised and developed a framework to improve maternal causes of death attribution. The WHO Classification of Maternal Deaths in Pregnancy, Childbirth, and the Puerperium¹ was developed through a consultative process, with its main guiding principle that the classification should be practical and understood by its users, whilst remaining in line with ICD rules that underlying causes of death be exclusive of other conditions.

The WHO classification for the cause of maternal death has a simple structure to facilitate international comparison by reorganising Chapter XV of the ICD into three basic components to define the cause of maternal death by group, category and underlying causes. Although it builds directly on ICD-10 and vital registration data, it can be used in all

settings, for example, when the cause of death is determined by facility-based death review or verbal autopsy.

The four groups of maternal deaths are indirect, direct, unanticipated complications of management and unknown. Each group has several categories and each category has a number of underlying causes. Depending on the resource setting, data can be collected at the level of specific underlying cause or on a broader level, by category only, making international comparability possible.

The four groups into which the cause of maternal death can fall are:

Direct obstetric deaths: Direct obstetric deaths are those resulting from obstetric complications of the pregnancy state (including pregnancy, childbirth and the puerperium to 42 days), such as deaths as a result of obstetric haemorrhage or eclampsia.

Indirect obstetric deaths: Indirect obstetric deaths are those resulting from previous existing disease or disease that developed during the pregnancy which was not a result of direct obstetric causes, but which was aggravated by the physiologic effects of pregnancy, such as cardiac conditions aggravated by pregnancy.

Unanticipated complications of management: Unanticipated complications of management are deaths resulting from interventions, omissions, incorrect treatment or from a chain of events resulting from any of the above during pregnancy, childbirth or the puerperium (up to 42 days).

Unknown: Cause unknown and thus not attributable to either direct or indirect causes.

The classification was piloted on existing data from a variety of methodologies and from eight different countries. The investigators familiar with the classification found that the new WHO classification was easily applied in field tests. Its use was considered to be feasible with low resources, and it was able to improve the overall understanding of the causes of maternal deaths by improving the certification of deaths and standardising the aggregation of direct and indirect maternal deaths in a transparent manner.

The new classification is expected to render a better assessment of conditions leading to death during pregnancy, childbirth and the puerperium. The use of this classification is recommended as part of the efforts to reduce maternal mortality around the world.

In addition to providing a standard interpretation for cause of death attribution, WHO is engaging countries and partners to elaborate the methodologies used to collect and estimate maternal deaths. For those countries that use the national population census to measure maternal mortality, WHO has collaborated with partners to develop guidance on the evaluation and adjustment of census data on maternal mortality. In other efforts, WHO is working to develop standards, such as in the conduct of verbal autopsy meth-

ods, including data collection instruments, cause of death assignment, resources for verbal autopsy and general guidelines for their use to facilitate accurate attribution of the causes of death aligned with ICD codes with verbal autopsy studies. By aligning methodologies to capture vital events with standardised tools, data will be robust and informative on an international scale.

Progress in data collection is apparent within the countries involved. In Sri Lanka, an active surveillance strategy identifies maternal deaths by cross-linking data from service points that cater for the health needs of the women in the reproductive age group. An annual national review of maternal deaths to confirm cause of death is undertaken by the Family Health Bureau in collaboration with the Sri Lanka College of Obstetricians and Gynaecologists. This national maternal review is intended to improve overall care by identifying necessary policy decisions or guidelines, and provides an opportunity to monitor the implementation of recommendations.⁵ In India, where an estimated 63 000 maternal deaths occurred in 2008,² the special Sample Registration System (SRS) is capturing not only quantitative data on deaths, but also qualitative data, by means of reviewing cause of death by verbal autopsy. India has introduced the SRS in over 4000 sample areas by coordinating data from the continuous monitoring of vital events and reviewing 6-monthly household surveys.⁶

To undertake such surveillance requires a high level of administrative sophistication, as well as the commitment of stakeholders and a government policy. Nevertheless, this is a sound investment, considering that effective planning of healthcare systems and organisation to reduce and eliminate preventable causes of maternal death will only be possible with an accurate understanding of the causes of death and their contributing factors.

With the launch of the United Nations Secretary General Global Strategy for Women's and Children's Health, there has been a call for renewed and enhanced commitments to improve maternal and child health. These commitments to accelerate progress towards the attainment of MDGs 4 and 5 include research and innovation to facilitate the thoughtful and coordinated development of country-led health plans, including comprehensive health services, as well as strengthened vital registration systems in which each death is counted. Counting each death and understanding why it occurred will ensure that concrete steps can be taken to prevent subsequent deaths. The WHO new classification

system for maternal deaths will contribute significantly to the achievement of this clarity.⁷

Disclosure of interests

The authors are staff members of the World Health Organization. The authors alone are responsible for the views expressed in this publication, and they do not necessarily represent the decisions, policy or views of the World Health Organization.

Contribution to authorship

LS and DC conceptualised the article. DC originated the first draft with input from LS. LS made final revisions and gave final approval for publication.

Funding

This work was funded by USAID, UNDP/UNFPA/WHO/World Bank Special Programme of Research, Development and Research Training in Human Reproduction (HRP) and US Fund for UNICEF through a grant from the Bill and Melinda Gates Foundation to the Child Health Epidemiology Reference Group (CHERG).

Acknowledgements

We thank Mike Mbizvo for his detailed review and comments. The World Health Organization has granted the Publisher permission for the reproduction of this article. ■

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