

Measuring maternal health: focus on maternal morbidity

Tabassum Firoz,^a Doris Chou,^b Peter von Dadelszen,^a Priya Agrawal,^c Rachel Vanderkruik,^d Ozge Tunçalp,^b Laura A Magee,^a Nynke van Den Broek^e & Lale Say^b for the Maternal Morbidity Working Group

A reduction in maternal mortality has traditionally been used as a critical measure of progress in improving maternal health. If a 75% reduction in maternal mortality between 1990 and 2015 – the target set under Millennium Development Goal 5 – is to be attained, we must redouble our efforts. In this endeavour, governments, policy-makers, donors, researchers, civil society and other stakeholders have come together in unprecedented fashion. Yet despite the fact that the maternal mortality ratio is considered one of the main indicators of a country's status in the area of maternal health, the burden of maternal mortality is only a small fraction of the burden of maternal morbidity – the health problems borne by women during pregnancy and the postpartum period.

Maternal deaths have been described as the tip of the iceberg and maternal morbidity as the base. For every woman who dies of pregnancy-related causes, 20 or 30 others experience acute or chronic morbidity, often with permanent sequelae that undermine their normal functioning.^{1,2} These sequelae can affect women's physical, mental or sexual health, their ability to function in certain domains (e.g. cognition, mobility, participation in society), their body image and their social and economic status.^{2,3} Not surprisingly, the burden of maternal morbidity – like that of maternal mortality – is estimated to be highest in low- and middle-income countries, especially among the poorest women.⁴

The true burden of maternal morbidity is still not known, however. Existing estimates and calculations are not based on standard, well documented and transparent methods. Such methods are not very useful and have poor validity for informing efforts to address the problem of maternal morbidity. Chief among the reasons for the diffi-

culty in accurately measuring maternal morbidity is the absence of a common definition and of standard identification criteria. This problem is compounded by the inaccuracy of vital records due to inadequate health information systems.

The causes of maternal morbidity are many and complex. They vary in duration and severity and cover a broad range of diagnoses requiring a wide variety of treatments. Maternal morbidity can be conceptualized as a spectrum ranging, at its most severe, from a "maternal near miss" – defined by the World Health Organization (WHO) as the near death of a woman who has survived a complication occurring during pregnancy or childbirth or within 42 days of the termination of pregnancy⁵ – to non-life-threatening morbidity, which is more common by far. In 2011, WHO published guidelines for defining and identifying a maternal near miss on the basis of clinical criteria, laboratory markers and management proxies.⁶ However, varying definitions of non-severe or non-life threatening maternal morbidity continue to exist. During a recent scoping exercise undertaken by WHO, we reviewed the relevant literature and surveyed 55 experts in maternal health across all six WHO geographic regions. The literature and the experts had non-uniform criteria for the identification and classification of maternal morbidity, including its severity and time frame. For example, some sources included conditions existing before pregnancy in their definitions of maternal morbidity, whereas others excluded them.⁷⁻⁹ Other sources classified nausea, a discomfort commonly experienced during pregnancy, as a type of morbidity; others defined maternal morbidity in terms of pregnancy-associated hospitalizations.^{7,10} Given the challenges inherent in defining maternal

morbidity, its epidemiological characteristics and the adequacy and accuracy of its measurement are, not surprisingly, unclear. This is particularly true at the community and primary care levels, where most of the burden of maternal morbidity resides. The majority of older community-level studies used women's self-reported morbidity to identify cases, but subsequent work has shown self-reporting to be more unreliable than medical records, with evidence of both over- and under-diagnosis.¹¹ To adequately monitor maternal morbidity and launch an appropriate programmatic response, it is necessary to arrive at a common definition and establish clear criteria for identifying cases.

In an effort to fulfil this need, WHO's Department of Reproductive Health and Research – including the UNDP/UNFPA/UNICEF/WHO/World Bank Special Programme of Research, Development, and Research Training in Human Reproduction – initiated a project, with support from the Bill & Melinda Gates Foundation, to improve the scientific basis for defining, measuring and monitoring maternal morbidity. This four-year project is led and carried out by a technical working group, the Maternal Morbidity Working Group (MMWG), composed of obstetricians, physicians, midwives, epidemiologists, medical anthropologists, public health professionals and patient advocates from high-, middle- and low-income countries. The specific objectives of the project are to: (i) construct a definition and develop identification criteria for maternal morbidity; (ii) estimate the burden of individual causes of maternal morbidity based on existing evidence; (iii) develop an assessment tool for measuring maternal morbidity at the community and primary-health-care levels in low- and middle-income coun-

^a University of British Columbia, Vancouver, Canada.

^b Department of Reproductive Health and Research, World Health Organization, 20 avenue Appia, 1211 Geneva, Switzerland.

^c Merck for Mothers, Whitehouse Station, United States of America (USA).

^d National Initiative for Children's Healthcare Quality, Boston, USA.

^e Liverpool School of Tropical Medicine, Liverpool, England.

Correspondence to Lale Say (e-mail: sayl@who.int)

(Submitted: 16 January 2013 – Revised version received: 7 June 2013 – Accepted: 12 June 2013 – Published online: 6 August 2013)

tries; (iv) validate the assessment tool in three such countries; and (v) develop indicators of maternal morbidity for population-level tracking.

This work is expected to substantially contribute to improving maternal health by providing benchmarks for collecting high-quality and comprehensive information on maternal morbidity. Elevating the standard of data collected and reported in terms of accuracy and reliability to improve health outcomes has been the subject of increasing attention. It has been recommended, for example, by the Commission on Information and Accountability and by other entities promoting disaggregated analyses and enhanced information sources at the country level.¹² Accurate and reliable data will allow for improved global, regional and local decision-making, optimal resource allocation and better planning of interventions to reduce maternal morbidity and, indirectly, maternal mortality as well.

The MMWG has agreed on the following definition of maternal morbidity: “any health condition attributed to and/or aggravated by pregnancy and childbirth that has a negative impact on the woman’s wellbeing”. This new definition of maternal morbidity will be proposed for inclusion in the 11th revision of the *International statistical classification of diseases and related health problems* (ICD).¹³

The MMWG also defined a framework for developing criteria by which to identify maternal morbidity. The development of the framework followed several guiding principles: (i) identification and measurement of the selected maternal conditions should be feasible and evidence-based; (ii) maternal morbidity should not be viewed as consisting only of the conditions themselves, but also their complications; and (iii) morbid conditions should be prioritized on the basis of their frequency and impact. The aim is to measure maternal morbidity rather than the burden of each condition. In line with these principles and the newly-developed definition, the maternal morbidity framework includes the symptoms, signs, clinical tests and management strategies of relevant maternal conditions – similar to the approach used to identify morbidity in a case of maternal near miss – linked with the direct, indirect and incidental

causes of maternal morbidity. Informed by the published literature and by the classification of maternal deaths used in the tenth revision of the ICD (ICD-10), we have generated a matrix of more than 300 relevant maternal conditions, all indexed according to their ICD-10 codes and categorized into organ systems and domains in line with the WHO application of ICD-10 to maternal mortality, the ICD-MM.¹⁴ We cross-referenced the conditions with respect to a comprehensive list of identification criteria: 109 symptoms, 106 signs, 121 clinical tests and 91 case management strategies. Furthermore, we operationalized functional disability to capture the physical, psychological, cognitive, social and economic effects of morbidity on women. We are currently in the process of weighting each condition according to its frequency and impact. The identification criteria associated with the most highly weighted conditions will be used in the development of a probabilistic model to determine which markers – in terms of symptoms, signs, clinical tests and case management strategies – most closely reflect the cause of the morbidity. These criteria will be piloted within existing databases as well as nested within ongoing field studies. After this initial piloting, the definition of maternal morbidity and the criteria for its identification will also be reviewed by external stakeholders.

Once the final identification criteria are established, a standard assessment tool will be developed to estimate the burden of maternal morbidity in a variety of settings. Although the tool is intended for all levels of health care provision, specific adaptations for use at the community and primary-health-care levels are envisioned. Symptoms, signs and clinical tests that are readily available as point-of-care diagnostics, such as haemoglobin concentration, will be included in the assessment tool at the community and primary-health-care levels as well as the functional disability module. At higher levels of care, the assessment tool will also incorporate other clinical tests and case management strategies based on the generated matrix. The tool will be piloted and validated before it is finalized to ensure face validity and its applicability to women in different settings. In keeping with the guiding principles of the MMWG, the

tool will be pragmatic, evidence-based and action-oriented and will enjoy wide acceptability. The goal is to integrate the tool into routine surveillance and data collection on morbidity in pregnancy, the postpartum period and beyond.

A forceful global response – akin to that generated by maternal mortality – is needed to better explore the causes of maternal morbidity and its epidemiological characteristics and to reduce its frequency. Relying solely on maternal mortality to assess a country’s status in the area of maternal health overlooks the importance of maternal morbidity, which is not only a precursor to maternal mortality but also a potential cause of lifetime disability and poor quality of life. As we move towards 2015 and beyond, it is important that we recalibrate the global goals focused on mortality to address maternal morbidity and its long-term outcomes. Under the sustainable development goals, it is also of utmost importance to consider progress towards equitable coverage with reproductive health services. Defining and measuring maternal morbidity and assessing its impact are merely the first steps. We, the members of the MMWG, invite researchers working in low- and middle-income countries to collaborate with us in evaluating and validating the maternal morbidity assessment tool we have developed, as we jointly work towards improving and investing in the health of women globally. ■

Acknowledgements

Members of the Maternal Morbidity Working Group: Jose Guilherme Cecatti, CEMICAMP, Brazil; France Donnay, Bill and Melinda Gates Foundation, USA; Olubukola Fawole, University of Ibadan, Nigeria; Rebecca Ferguson, Bill & Melinda Gates Foundation, USA; Veronique Filippi, London School of Hygiene & Tropical Medicine, England; Atf Ghérissi, Université de Tunis, Tunisia; A Metin Gülmezoglu, World Health Organization, Switzerland; Gill Gyte, Cochrane Pregnancy and Childbirth Group, Liverpool, and Women’s NHS Foundation Trust, England; Atsumi Hirose, Liverpool School of Tropical Medicine, England; Anoma Jayathilaka, World Health Organization, Sri Lanka; Yacouba Kone, Aga Khan Foundation, Mali; Isabelle Lange, London School of Hygiene & Tropical Medicine, England;

Affette McCaw-Binns, University of the West Indies, Jamaica; Mark Morgan, University of Pennsylvania, USA; Stephen Munjanja, University of Zimbabwe, Zimbabwe; Cihan Öztöpcü, Ankara Numune Research and Education

Hospital, Turkey; Elizabeth Sullivan, University of South Wales, Australia.

Funding: The project is funded by the Bill & Melinda Gates Foundation and WHO's Department of Reproductive Health and

Research through the Special Programme of Research, Development and Research Training in Human Reproduction.

Competing interests: None declared.

References

1. Ashford L. *Hidden suffering: disabilities from pregnancy and childbirth in less developed countries*. Population Reference Bureau; 2002. Available from: <http://www.prb.org/pdf/hiddensufferingeng.pdf> [accessed 24 June 2013].
2. Reichenheim ME, Zylbersztajn F, Moraes CL, Lobato G. Severe acute obstetric morbidity (near-miss): a review of the relative use of its diagnostic indicators. *Arch Gynecol Obstet* 2009;280:337–43. doi: <http://dx.doi.org/10.1007/s00404-008-0891-1> PMID:19112576
3. Pacagnella RC, Cecatti JG, Camargo RP, Silveira C, Zanardi DT, Souza JP et al. Rationale for a long-term evaluation of the consequences of potentially life-threatening maternal conditions and maternal "near-miss" incidents using a multidimensional approach. *J Obstet Gynaecol Can* 2010;32:730–8. PMID:21050503
4. Storeng KT, Murray SF, Akoum MS, Ouattara F, Filippi V. Beyond body counts: a qualitative study of lives and loss in Burkina Faso after 'near-miss' obstetric complications. *Soc Sci Med* 2010;71:1749–56. doi: <http://dx.doi.org/10.1016/j.socscimed.2010.03.056> PMID:20541307
5. Say L, Souza JP, Pattinson RC; WHO Working Group on Maternal Mortality and Morbidity Classifications. Maternal near-miss—towards a standard tool for monitoring quality of maternal health care. *Best Pract Res Clin Obstet Gynaecol* 2009;23:287–96. doi: <http://dx.doi.org/10.1016/j.bpobgyn.2009.01.007> PMID:19303368
6. *Evaluating the quality of care for severe pregnancy complications: the WHO near-miss approach for maternal health*. Geneva: World Health Organization; 2011.
7. Bacak SJ, Callaghan WM, Dietz PM, Crouse C. Pregnancy-associated hospitalizations in the United States, 1999–2000. *Am J Obstet Gynecol* 2005;192:592–7. doi: <http://dx.doi.org/10.1016/j.ajog.2004.10.638> PMID:15696008
8. Liu S, Liston RM, Joseph KS, Heaman M, Sauve R, Kramer MS; Maternal Health Study Group of the Canadian Perinatal Surveillance System. Maternal mortality and severe morbidity associated with low-risk planned cesarean delivery versus planned vaginal delivery at term. *CMAJ* 2007;176:455–60. PMID:17296957
9. Mutihir JT, Utoo BT. Postpartum maternal morbidity in Jos, North-Central Nigeria. *Niger J Clin Pract* 2011;14:38–42. doi: <http://dx.doi.org/10.4103/1119-3077.79238> PMID:21493990
10. Bennett TA, Kotelchuck M, Cox CE, Tucker MJ, Nadeau DA. Pregnancy-associated hospitalizations in the United States in 1991 and 1992: a comprehensive view of maternal morbidity. *Am J Obstet Gynecol* 1998;178:346–54. doi: [http://dx.doi.org/10.1016/S0002-9378\(98\)80024-0](http://dx.doi.org/10.1016/S0002-9378(98)80024-0) PMID:9500498
11. Iyengar K. Early postpartum maternal morbidity among rural women of Rajasthan, India: a community-based study. *J Health Popul Nutr* 2012;30:213–25. doi: <http://dx.doi.org/10.3329/jhpn.v30i2.11316> PMID:22838163
12. Bhutta ZA, Chopra M. The Countdown for 2015: what lies ahead? *Lancet* 2012;380:1125–7. doi: [http://dx.doi.org/10.1016/S0140-6736\(12\)61382-8](http://dx.doi.org/10.1016/S0140-6736(12)61382-8) PMID:22999432
13. World Health Organization [Internet]. The International Classification of Diseases 11th Revision is due by 2015. Geneva: WHO; 2013. Available from: <http://www.who.int/classifications/icd/revision/en/> [accessed 24 June 2013].
14. *The WHO application of ICD-10 to deaths during pregnancy, childbirth and the puerperium: ICD-MM*. Geneva: World Health Organization; 2012. Available from: <http://www.who.int/reproductivehealth/publications/monitoring/9789241548458/en/> [accessed 24 July 2013].

Reproduced with permission of the copyright owner. Further reproduction prohibited without permission.