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Commentary: Verbal autopsies—from small-scale studies to mortality surveillance systems

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Reliable information on cause-specific mortality is crucial for summarizing the total disease burden in different settings. In addition, it is essential for evaluating the impact of public health interventions, and for identifying where resources need to be allocated. Yet in the countries with the highest burden of disease, cause-specific mortality data are usually of poor quality, incomplete, or unavailable. In the absence of vital registration data, the verbal autopsy may be used to estimate cause-specific mortality. Trained fieldworkers interview bereaved relatives using a questionnaire to elicit information on symptoms experienced by the deceased before death. Probable causes of death are assigned either by physician review of the completed questionnaires or using predefined diagnostic criteria given in an algorithm.

The verbal autopsy has been used to estimate cause-specific mortality in a variety of methodological settings, the most common being in the context of an epidemiological study. Estimates of cause-specific mortality from these studies are not necessarily generalizable to a wider population, and may not have arisen from a validated verbal autopsy instrument. Recently, data from 46 epidemiological studies were aggregated in a meta-regression model in order to estimate cause-specific mortality fractions in children aged under five at a global level.[1] The number of deaths in these 46 studies ranged from 8 to 3776, with all but five studies being based on <1000 deaths. Increasingly,

the verbal autopsy is being employed on a much larger scale. For example, in India, a verbal autopsy was conducted on 48 000 adult deaths in Chennai[2] and on 80 000 adult deaths in Tamilnadu.[3] In Tanzania, the verbal autopsy was employed as a part of a national sentinel mortality surveillance system covering a population of over 400 000.[4] In China, a sample-based mortality surveillance system of ~1% of the total population used a combination of medical certification and verbal autopsy.[5]

In this issue of the *International Journal of Epidemiology*, Begg *et al.*[6] describe a method for addressing the important question of sample size estimation in relation to sample-based mortality surveillance. In particular, they present an approach for calculating the optimum sample size required for estimating robust cause-specific mortality fractions. They point out that, to date, mortality surveillance systems have generally been determined by the size of the population within a given administrative area. However, the number of deaths is the crucial parameter required to obtain precise estimates of cause-specific mortality fractions. Moreover, by considering the number of deaths separately according to age group, sex, and broad causes, the optimum sample size will yield enough deaths in the age–sex–cause groups of interest. This will ensure that robust estimates of cause-specific mortality fractions are obtained for the rarest cause of death, and these will not be based on more person-years than are necessary.

Begg *et al.*[6] have estimated the required sample size in three populations, each at a different level of health development. Their estimates vary according to the type of population being

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considered and the level of precision required, but all estimates require a large number of individuals under surveillance (between 646.4 and 1857.4 thousand person-years) and a large number of deaths occurring (between 5227 and 21 136). The resource and logistical implications of conducting such a large number of verbal autopsies should not be underestimated, although there are situations where this has been achieved.[2–5] Moreover, Begg et al.[6] indicate that the required sample size could be reduced considerably by focusing on the age–sex–cause groups 'of interest' and by following up a smaller population over a longer period. Clearly, their approach to sample size considerations is valuable and timely.

The broad groupings of cause of death (communicable, non-communicable, injuries) used by Begg et al.[6] are those commonly used to measure disease burden at the population level. They recommend that broad groupings of causes rather than specific causes are used at the initial stages of sample-based mortality surveillance, unless there are compelling prior data on specific causes. If broad groupings are considered initially for sample size calculations, then the less precise data generated from mortality surveillance on more specific causes could be used to help focus future surveillance.

The classification of disease burden into these broad groupings, however, has recently been challenged in favour of a framework based on broad care needs.[7] This exploits a two-dimensional classification based on the length of time a disease causes ill health and the relative likelihood of the disease causing death. For example, the management of some of the 'communicable' diseases, such as HIV/AIDS and tuberculosis, has more in common with some of the 'non-communicable' diseases, such as diabetes, and this would be reflected in the classification. Different analytical objectives may require alternative classifications; these need further evaluation. Ultimately, however, information on specific causes is required at a local level for setting health priorities and evaluating interventions. At a global level, information on specific causes of death enables estimation of the number of deaths that could be prevented through these interventions.[8]

Although optimum sample size and appropriate disease classification are critical design components of a mortality surveillance system, they are not sufficient without an instrument for obtaining reliable information on cause of death. The verbal autopsy works best for diseases that manifest with a well-defined and unique set of symptoms, such as measles and accidents. The verbal autopsy is less able to discriminate between diseases with overlapping symptoms, such as malaria and pneumonia, or HIV/AIDS and tuberculosis. If there is misclassification between different causes of death using a verbal autopsy instrument then substantial errors will arise in the estimates of cause-specific mortality fractions[9] and it is difficult to adjust for this misclassification.[10] The accuracy of the verbal autopsy may also vary between settings, and, therefore, it should be validated in the settings where it is used. Identifying methods for obtaining reliable information on cause-specific mortality remains an important research priority, as does the validation of such methods when used in different settings.

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