Postscript on measuring mortality rates in cross-sectional surveys: a commentary

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Congratulations to Mark Myatt, Anna Taylor, and W. Courtland Robinson for bringing into the light of rational scientific discourse the subject of estimating mortality rates using cross-sectional surveys. Although frequently done, retrospective estimation of recent mortality has been the subject of relatively little discussion or research. Those techniques most frequently used in non-emergency situations, such as sisterhood methods of estimating maternal mortality, produce estimates of mortality for the relatively distant past which are of less use in emergency situations. Also, thanks to Mark Myatt, there are now easy-to-use computer programs to calculate the sample sizes needed to estimate mortality rates in cross-sectional surveys and to calculate mortality rates and their associated confidence intervals. These are all major steps forward.

Nonetheless, it should be kept in mind that monitoring mortality rates is best done prospectively using mortality surveillance, and that mortality surveillance should be implemented as soon as possible in emergency situations. Ongoing surveillance can produce much more timely estimates of mortality rates than is possible with retrospective methods, thus allowing more timely public health decisions. In addition, surveillance, because it involves ongoing, continual data collection, allows much more expedient monitoring of mortality trends than is possible with repeated surveys. Nonetheless, surveillance is sometimes not yet functioning early in emergencies or public health personnel may wish to estimate mortality in the past before surveillance data were collected. In these cases, retrospective mortality estimates from cross-sectional surveys can be very valuable.

There is as yet no standard method for retrospective estimation of mortality rates. Three basic methods have been commonly used. The previous birth history (PBH) method is well described by Myatt et al. It measures mortality among children less than 5 years of age. At least two additional methods allow estimation of mortality rates in all age groups. One method, sometimes called the past household census method, asks an adult respondent in each selected household to list all persons who lived in that household at some distinct point in the not-too-distant past. The interviewer then asks what has happened to each of these persons. This method, like the PBH method, does not require asking directly about deaths in the household. Another method, sometimes called the current household census method, asks an adult respondent to enumerate the current members of the household, and then asks how many people in the household have died since a point of time in the past. All three of these methods, and others, need to be compared to each other and to some gold standard measure of mortality in order to measure their relative validity. Myatt et al present an excellent plan for the necessary validation studies to achieve this goal.

The discussion by Myatt et al of the desirable attributes of any retrospective method is a valuable start to an ongoing discourse, but there is little empirical evidence supporting the importance of some of these attributes. For example, the importance of a taboo in discussing death may vary greatly depending on the religious and cultural beliefs of survey subjects. Also, the level of simplicity required in data collection and analysis procedures will vary greatly depending on the experience and training of survey personnel. Moreover, the necessity of having a single relationship between the survey respondent and the deceased is not proven. In nuclear families, any adult may be able to provide equally valid data on deaths in that household.

Regardless of the method, the techniques used to choose the sample, conduct the interviews, and analyse the data are crucial to obtaining valid results. The PBH method may result in greater non-response than other methods because it requires that a specific person, the mother of children less than 5 years of age in the
household, be present in the household at the time the survey team visits. Other methods allow interviews to be conducted with any adult member of the household. Of course, well-standardised and validated questions should be uniformly posed during all interviews, and the PBH method uses such questions. Households to be included in the survey sample must be chosen randomly by a method which minimises the influence of survey team members. Myatt et al present various alternative sampling methods; however, various studies have demonstrated that the type of proximity sampling recommended by the Expanded Programme on Immunisation (EPI) can result in substantial bias. Data analysis must be appropriate for the sampling methods. Mark Myatt's spreadsheet is an excellent tool for appropriate analysis of data obtained by cluster sampling.

One clear advantage of the household census methods over the PBH method is the ability to measure crude mortality or age-specific mortality in age groups other than children less than 5 years of age. Although Myatt et al are correct in pointing out that young children are appropriately considered a sentinel group in most emergencies, there may be situations where an estimate of crude mortality or age-specific mortality in other age groups is desired because persons other than children less than 5 years of age are suspected of being at greatest risk of mortality. In such cases, the PBH method cannot be used.

Certain basic sources of bias may play a role regardless of the method used to retrospectively estimate mortality in cross-sectional surveys. The first such bias is survivor bias. Retrospective collection of mortality data will produce underestimates because mortality is generally lower in households with survivors than in households where everyone has died. As described by Myatt et al, the PBH method cannot collect data on children of deceased mothers, and these children are known to have much higher risk of mortality than children of living mothers. Similarly, when estimating crude mortality using all household members as the denominator, data will not be collected from households where all members have died. As Myatt et al have pointed out, the survivor bias in the PBH method will be especially strong in populations with high maternal mortality. Similarly, for methods estimating crude mortality using the entire household as the denominator, survivor bias will be especially important in situations with very high crude mortality or where mortality is strongly clustered in households. Such clustering may occur when mortality is largely due to violent attacks on specific households. Nonetheless, such bias may be less important in situations without these conditions.

A second bias which complicates all mortality measurements is recall bias. Mothers or other adults may not accurately recall the occurrence or dates of deaths of children or other household members. Of course, if deaths are not remembered or not reported to interviewers, mortality rates will be underestimated. On the other hand, if respondents incorrectly recall deaths as occurring more recently than they actually occurred, mortality during a specific, recent recall period will be overestimated. Although mothers might be expected to recall deaths of their children better than adult household members recall the deaths of any household member, the PBH method may still be somewhat more susceptible to recall bias because it requires respondents to place births and deaths in time relative to two different points in the past (to determine if a birth occurred within the prior 5 years and if a death occurred since the beginning of the recall period).

A third potential bias is misclassification bias; it can affect either the numerator or denominator of mortality rates. For example, in order to be included in the numerator or denominator of a mortality rate, a person must have been born alive, which is usually defined as having taken at least one breath after delivery. Therefore, stillbirths should not be counted as a live person nor as a death. Survey subjects reporting stillbirths as deaths will overestimate mortality. Failing to report deaths of live-born infants will underestimate mortality rates. As Myatt et al appropriately stress, interviewers must use standard case definitions when counting both living persons to be included in the denominator and deaths to be included in the numerator.

Unfortunately, all methods used to gather retrospective mortality data may be subject, to some extent, to various complications of sampling, data collection, and potential bias. The relative importance of these difficulties when using the various methods of mortality estimation in cross-sectional surveys needs to be much better studied before one method can be recommended over the others. Myatt et al have begun an important discussion of these issues which should be expanded and reinforced by the empirical findings of well-conducted comparison