Public Health Classics

This section looks back to some ground-breaking contributions to public health, reproducing them in their original form and adding a commentary on their significance from a modern-day perspective. To complement the theme of this month's issue, Vincent Fauveau reviews methods of establishing the cause of death in countries with incomplete vital statistics, with special reference to the 1986 presentation by Michel Garenne & Olivier Fontaine, of which extracts of the English account are reproduced in this issue by permission of Oxford University Press.

Assessing probable causes of death without death registration or certificates: a new science?

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The study of mortality, with its measurement of numbers and death rates, has long been a priority for demographers. The study of causes of death and their role in public health is an area where collaboration between physicians and demographers has been particularly fruitful, as demonstrated in the research presented by Garenne & Fontaine in 1986. It was first published in French,[1] with a subsequent version in English which is extracted here.[2]

The classification of causes of death is always a difficult exercise: difficult in developed countries where the registration of all deaths is relatively complete, necessitating 10 revisions of the *International classification of diseases and causes of death*;[3] more difficult in developing countries where often less than half of all deaths are registered. The deceased patients often received no medical attention, either because they lived too far from the health system or because the establishment of the cause was of no interest to anyone.

In countries with incomplete statistics, Yves Biraud recommended, in 1956, the use of information supplied by the relatives of a deceased person, in an attempt to establish a "community diagnosis" of the cause of death.[4] The first simplified lists of causes of death for use in developing countries were published by WHO in 1978,[5] only six years before the study under review.

A few teams of doctors and demographers had started to research the establishment of causes of death in the well-known "population laboratories" that provided a complete registration of vital events through longitudinal demographic surveillance: in Khanna, northern India, between 1955 and 1960; in Companigonj, Bangladesh, between 1975 and 1978; and in Santa Maria Cauque, Guatemala, and Narangwal, Punjab, between 1978 and 1982. The term "verbal autopsy" was first proposed by Arnold Kielman and coworkers in a publication emanating from Narangwal in 1983.[6] Although the term is not used by Garenne & Fontaine in their article, it can be considered that they are among the "fathers" of this new technique, defined as "a procedure to exploit the information provided by the relatives of a deceased person to reconstruct the events and symptoms that preceded the death so as to deduct a medically acceptable cause, or causes, of the death".[7]

During the following decade, several other research centres started to lay down experiments and theories about the assessment of causes of death by verbal autopsy, such as Matlab in Bangladesh, Niakhar in Senegal, Machakos in Kenya, and MRC Laboratories in the Gambia. The first international workshop to share experiences was organized by the Department of International Health of the Johns Hopkins School of Public Health in March 1989,[8] at which Garenne presented his standardized method developed in Morocco and Senegal. Five years later, a first workshop focusing on maternal deaths was convened by the London School of Tropical Medicine and Hygiene.[9]

The work by Garenne & Fontaine came at the right time to demonstrate a favourable conjunction between demography and public health. It emanated from a study on the relationship between nutritional status and mortality of children under five years of age in Niakhar, a rural region of Senegal under demographic surveillance. This study of causes of deaths was first presented at a seminar on new approaches to the measurement and analysis of mortality organized in Sienna, Italy, in 1986 by the International Union for the Scientific Study of Population (IUSSP) and published in French as part of the proceedings.[1] It has been cited, in either French or English, in almost every subsequent publication on verbal autopsy.

This paper represented an important step forward, because it came at a pioneering time when fellow researchers in the same area needed a bit of guidance and theory, particularly regarding the format of the questionnaire to be applied. Several important methodological points were addressed, among them: the selection of a limited number of causes of death, responsible for the great majority of deaths in the age group considered, leaving aside rare and complex causes that could not have been diagnosed anyway; the selection of delimited age

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groups that share certain causes of death; the formulation of structured questionnaires, in five parts, with standardized questions about main symptoms; the proposition of specific features for the interviews (including cultural sensitivity and the optimal time lag) and criteria for the choice of the enumerators and the respondents; rules of coding and rules to distinguish between immediate, associated and contributing causes, with the wise use of "probable causes"; and the issue of undetermined causes and how to treat them.

One of the main conclusions of the article was that the collection of information to determine cause of death is feasible "where there is no doctor", provided there are well-trained interviewers, while qualified physicians are only necessary "at their desks" to read and interpret the description and infer the probable causes, using several interdependent layers of evidence. Precisely the term "probable cause" suggests that it can be probed, and, while the authors just mention the issue of validation at the end of their paper, this is where the article has opened the way to innumerable studies and publications on validation, particularly from researchers from the London School of Hygiene and Tropical Medicine and from North American Schools of Public Health (e.g. Johns Hopkins and Harvard). Despite many original and innovative validation processes, it seems that no publication has really come up with a definitive positive conclusion.

Another area that was not touched in the base article but triggered several publications in the following years was the use of algorithms to "computerize" verbal autopsy. There are several potential advantages in developing algorithms, including simplification, standardization, replication and comparison. Again, the issue has been debated and several algorithms have been proposed, but they have not been consolidated into a final textbook. The main obstacle was the difficulty of validating diseases presenting with non-specific or misleading symptoms, such as malaria in children, acquired immune deficiency syndrome (AIDS), malnutrition, or neonatal asphyxia.

Nevertheless, the technique of Garenne & Fontaine has been adopted worldwide. A rapid bibliographic search for "verbal autopsy" in Medline revealed 30 relevant publications in 1990–94, 43 in 1995–99, and 80 in 2000–05. A search in the WHO library revealed a similar upward trend in the last five years. What is striking is the diversification of the uses of the technique in a multiplication of public health contexts: to describe the cause structure of mortality in communities, to determine priority diseases and identify areas of programmatic attention, to approach cause-specific mortality rates, to compare different age groups or different regions of a country, different countries or the two sexes, to assess the effect of public health programmes focusing on specific diseases, or to conduct rapid assessments in emergency situations (such as cholera outbreaks, earthquakes and displaced populations). More recently, another use of verbal autopsy has been promoted, as a contribution to sample registration of vital events in communities with incomplete statistics.[10]

In spite of uncertainties revealed by studies of validation and the use of algorithms, there does not seem to be a loss of interest in the assessment of causes of deaths by verbal autopsy. A standardized method has been recommended by WHO in the area of infant and child deaths,[11] while in the area of maternal health, which has received renewed interest since the launch of the Making Pregnancy Safer initiative, the publication of *Beyond the numbers* was a visible landmark that formally places verbal autopsy as one of the options to review maternal deaths in settings where hospital-based audits and confidential enquiries are not possible.[12] This special issue of the *Bulletin* on mortality estimates will undoubtedly refresh the state of knowledge and operational application in the area of counting the dead and determining how they died. ■

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