Letters to the Editor

Mortality estimates for South East Asia, and INDEPTH mortality surveillance: necessary but not sufficient?
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In the June 2012 issue of the *International Journal of Epidemiology*, two diverse aspects of the global status of epidemiology were presented, in the form of a summary of health indicators for the World Health Organization (WHO) South-East Asia Region (SEAR) and an overview of the International Network for the Demographic Evaluation of Populations and Their Health (INDEPTH) mortality surveillance activities in developing countries. The former includes epidemiological estimates derived mainly from statistical models for about a quarter of the world’s population, and the latter describes meticulous demographic surveillance activities to measure mortality and its causes, implemented in relatively small population clusters. Both approaches are of limited value in informing about population health status, the very purpose for which they have been presented. A pragmatic appraisal of the reasoning behind this judgement is essential, so that adequate remedial activities can be undertaken to improve the understanding of mortality patterns in developing countries.

The mortality estimates presented for SEAR countries are not adequately qualified in terms of data sources and/or methods. Table 1 shows the primary data sources and methods used for deriving mortality estimates for South-East Asian countries. The extensive modelling used to develop these estimates was driven by the critical lack of current local vital registration data for SEAR countries. Clearly there is very little credibility in these estimates, but this has been masked by the absence of any mention by Dhillon et al. of the details presented in Table 1. These details are at the least worrisome in view of the limited applicability of the demographic and epidemiological models used in the estimation process. The WHO life-table system uses two types of input parameters to predict a complete schedule of age-specific death rates for specific countries, depending on the availability of input data. Type A inputs consist of country-specific measures of the risks of under-5 mortality and adult mortality. Several countries only have local measures of under-5 mortality, in which case, this is first used in a separate regression to estimate a risk of adult mortality, and the two are then together used in the life-table system. Hence, Type B inputs consist of a country-specific measure of under-5 mortality, and a regression-based estimate of adult mortality. The WHO life table prediction model is based on empirical population and mortality data derived largely from western countries, which do not represent recent phenomena such as rapid declines in fertility (indirectly reducing the risk of child mortality), accelerated aging (influencing changes in adult mortality), and the epidemic of human immunodeficiency virus (HIV) infection and acquired immune deficiency syndrome (AIDS). Hence the all-cause mortality estimates derived from these model life tables may not be appropriate, with regard to place and time, for the target countries. Moreover, differences in health systems, diet, risk behaviours, and other environmental factors across countries undermine any potential for epidemiological coherence in using indirect standardization models to estimate cause-specific mortality, given the varied directions and rates of progression of the chronic disease and injury epidemics unfurling across the developing world.

There is an urgent need for local mortality data from SEAR countries for monitoring, evaluation, and epidemiological research. In 2007, a detailed consultation on mortality statistics organised by the WHO SEAR office identified specific problems in each country in the South-East Asia Region, along with strategies and priorities for the development of mortality statistics. Yet since then there has been no concerted action either by national governments or by international agencies to take comprehensive, practical steps to improve the situation, despite the availability of the knowledge needed to do so. This clearly suggests a gap between knowledge and implementation.

The reluctance on the part of governments to tackle this gap is not entirely without reason. Constraints in funding, human resources, and, more importantly, a lack of strategic vision lead to relegation of the development of mortality statistics to the ‘too difficult’ basket. Also, administrative structures for vital registration in countries covered by the WHO South-East Asia Region office are still under development, and it is not easy to stimulate community participation in passive registration systems. However, recent technological advances could enhance the reporting and
recording of rare events such as births and deaths through the use of key-informant networks at the local level within a basic administrative framework. Ascertaining causes of death is an added complexity, but there are solutions to it in the form of verbal autopsies, at least for collecting information of value to public health. Recent research has demonstrated the utility of these approaches in yielding, for some countries in South-East Asia, population-level epidemiological data that identify important differentials in stroke mortality across countries in the region. 11 It is important that these activities be translated into routine national or nationally representative mortality statistics programs for the provision of reliable and timely mortality data.

Nor are problems with the availability of mortality data limited to South-East Asia. In Africa, the INDEPTH mortality surveillance model has been in operation at several sites since the 1980s to address this limitation, and recently, INDEPTH sites have been established in several other regions of the world, including South-East Asia. 2 However, although the INDEPTH model is a useful starting point for the development of vital statistics, it should not be seen as an alternative source of population level mortality data.

The utility of INDEPTH mortality data has several limitations for the assessment of population health. First, the sample size of most field sites is inadequate for deriving plausible mortality estimates, even with the aggregation of data across periods of several years. Previous research recommends the use of large population samples (~850,000 and above) to yield adequate numbers of deaths for estimating, within reliable bounds of uncertainty, standard international indicators of mortality such as life expectancy at birth, risks of mortality in childhood and adulthood, and leading causes of death in a population. 12 These estimated sample sizes are based on a minimum set of widely available prior variables, and estimation can be readily customised for individual national populations. However, the INDEPTH surveillance population sizes range from within a few tens of thousands to a maximum of a quarter of a million, resulting in mortality measures (both total and cause-specific) with wide confidence intervals, which are of limited use for both descriptive purposes and for monitoring and evaluation. Although there are administrative, sociological, and logistical constraints to operating large-scale programs in many developing countries, efforts should be made to increase population coverage to the recommended sample sizes in order to achieve reliable estimates of mortality at national and major sub-national levels.

In addition to limited sample size, the representativeness of the INDEPTH mortality data are affected by narrow geographical coverage, and selection bias resulting from populations in INDEPTH sites having differential access to health services as compared with the rest of the country. In this regard, Sankoh and

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### Table 1: Data sources for mortality estimates in World Health Organization South-East Asia region countries, 2008

<table>
<thead>
<tr>
<th>Country</th>
<th>Population (millions)</th>
<th>All-cause mortality</th>
<th>Inputs for cause-specific mortality models</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bangladesh</td>
<td>160</td>
<td>Model life tables Type A&lt;sup&gt;b&lt;/sup&gt;</td>
<td>India&lt;sup&gt;a&lt;/sup&gt; and Philippines&lt;sup&gt;e&lt;/sup&gt;</td>
</tr>
<tr>
<td>Bhutan</td>
<td>0.7</td>
<td>Model life tables Type B&lt;sup&gt;c&lt;/sup&gt;</td>
<td>India</td>
</tr>
<tr>
<td>DPRK</td>
<td>24</td>
<td>Model life tables Type B</td>
<td>India and Philippines</td>
</tr>
<tr>
<td>East Timor</td>
<td>1</td>
<td>Model life tables Type B</td>
<td>India and Philippines</td>
</tr>
<tr>
<td>Indonesia</td>
<td>227</td>
<td>Model life tables Type A</td>
<td>India, Philippines, Singapore, Thailand</td>
</tr>
<tr>
<td>Maldives</td>
<td>0.3</td>
<td>Vital registration (2008)</td>
<td>National vital registration</td>
</tr>
<tr>
<td>Myanmar</td>
<td>50</td>
<td>Model life tables Type B</td>
<td>India and Philippines</td>
</tr>
<tr>
<td>Nepal</td>
<td>29</td>
<td>Model life tables Type B</td>
<td>India and Philippines</td>
</tr>
</tbody>
</table>

DPRK, Democratic People’s Republic of Korea.

<sup>a</sup>From references 4–6.

<sup>b</sup>Type A: national measures of under-5 and adult mortality (15–60 yrs) used as inputs in WHO Life Table System (references 4, 6).

<sup>c</sup>Type B: national measures of under-5 mortality, and regression-based predictions of adult mortality, used as inputs in WHO Life Table System (references 4, 6).

<sup>d</sup>The cause-specific mortality estimates presented for India (as included in SEAR data) were derived as described in reference 5; using primary data from the rural survey of causes of death (1995–1998); and the urban medical death certification data for 1995. The limitations of these data are described in detail in reference 7.

<sup>e</sup>Data from Philippines were considered to be of ‘medium-high’ quality (reference 3).

<sup>f</sup>Cause of death estimates for Thailand were derived from an epidemiological study using a sample of 10,000 deaths, approximately 2.5% of national deaths in 2005 (reference 8).
Byass attempt to use findings from a sub-national analysis of Swedish data for 1925 to support their argument that current INDEPTH sites are adequate in terms of population representation. However, sub-national diversity in most developing countries in contemporary times, particularly in terms of the urban–rural divide, is likely to be much greater than the relatively homogenous socio-economic and population health status in Sweden during the early twentieth century. Therefore, mortality surveillance data are required from several sites in each country, irrespective of national population size.

Table 2 illustrates the divergence in mortality measures from three data sources in Vietnam, 1999–2009. The characteristics of each data source as briefly described in the footnotes to Table 2 give an indication of the potential likelihood of each being an adequate measure of true mortality patterns in Vietnam in terms of empiricism as well as geographic and socio-economic representation. The effects of sample size are observed in the life expectancy at birth from the INDEPTH site, for which the 95% confidence interval (CI) is about 2 years, even with cumulation of data across a 5-year period. In terms of cause-specific mortality, the WHO estimates for Vietnam derived from models using patterns observed in China, India, and Thailand are not compatible with empirical data. Also, the differences in mortality rates at the national and local level highlight the importance of breadth in coverage, precision in measurement, and timeliness in reference period for assessing national and sub-national health priorities and trends.

The actual utility of INDEPTH surveillance would lie in the original sites being used as pilot areas to develop and implement legal frameworks, administrative structures, and a critical mass of human resources for vital registration and cause-of-death ascertainment. This should be done in collaboration with government offices charged with registration responsibilities, rather than as a parallel operation. Efforts should be made to establish local networks of key informants to capture the majority of relatively rare vital events such as births and deaths, and to minimise the need for multiple household visits. The experiences and outputs from these pilot sites could then be replicated by local registration authorities in nationally representative population clusters. The INDEPTH sites could continue to act as nodes for capacity building and refinement of methodologies. In small countries (population < 2–3 million), efforts should be made to promote complete coverage. In countries with larger populations, appropriate sampling strategies are required, tailored to country specifications. International agencies must create...
Comment on Mortality estimates for South East Asia, and INDEPTH mortality surveillance: necessary, but not sufficient

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We thank Dr Rao for his explanation of the inadequacy of modelling and the lack of nationally representative mortality data in many low- and middle-income countries. We agree with him entirely.

References

Conflict of interest: None declared.