Subnational Burden of Disease Studies: Mexico Leads the Way

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Why Burden of Disease Studies?
The goal of any health system is to improve the level and distribution of health of its eligible population. This goal implies an ability to measure population health (including differences between subgroups and trends over time) and to assess the contribution of different diseases, injuries, and risk factors to health outcomes.

But to carry out such a needs assessment, diverse health outcomes have to be expressed in a common unit. While various “currencies” have been proposed, only time-based measures of health have literally withstood the test of time. Such measures may indicate time spent in different health states (health expectancy measures) or reflect “functional” time lost as a result of premature mortality and morbidity (health gap measures such as the disability-adjusted life year or DALY—see Box 1).

Burden of disease studies invariably employ DALYs (or HALYs—health-adjusted life years—as they are known in Canada), given their focus on quantifying the relative contribution of different causes to health loss. Such studies were first commissioned by the World Bank [1] and thereafter championed by the World Health Organization [2]. National burden of disease studies have now been completed by many high- and middle-income countries, including the United States, Canada (in progress), Mexico, France, The Netherlands, Mauritius, Australia, and New Zealand [3–8].

The Burden of Disease in Mexico
A study by Gretchen Stevens and colleagues in this month’s PLoS Medicine reports on the burden of disease in Mexico [9]. Estimates of burden are reported for Mexico as a whole and for each of the country’s 32 states (although for presentation in PLoS Medicine the results have largely been aggregated into six regions). Only Australia has previously reported subnational burden of disease estimates [4]. The “value added” by such studies reflects the reality that in many countries, state or provincial rather than national governments hold jurisdiction over health.

Stevens and colleagues show substantial heterogeneity in health, and the relative contributions of different causes to health, across Mexico. These authors interpret their results in terms of epidemiological transition theory, with different regions being at different stages of the transition. The transition is from a high mortality–high fertility demography dominated by childhood infectious diseases and nutritional deficiency disorders to a low mortality–low fertility demography dominated by chronic diseases affecting older adults in particular. They show that the Southern region (and in particular the state of Chiapas), with the least developed economy and the highest proportion of indigenous inhabitants, is at an earlier stage of epidemiological transition than other regions. Tellingly, the Southern region not only has the highest rates of pre-transitional conditions (such as infectious diseases and nutritional deficiency disorders), but also has the highest rates of injury and chronic diseases—although the relative proportion of health loss attributable to these latter cause groups is lower than in other regions.

The Southern region also shows markedly high health losses from alcohol use, mediated in particular through cirrhosis. Indeed, the burden from alcoholic cirrhosis is unusually high throughout Mexico. Neither volume of alcohol consumed nor drinking pattern seems to explain this unusually high burden. Instead, the authors speculate, the high burden may be related to pulque, a traditional fermented alcoholic beverage. The authors also find an unusually high burden from obesity and type 2 diabetes in Mexico as a whole, again highest in the Southern region. Unfortunately, detailed data on diet and physical activity levels are not available to explore this further.

Why Was Mexico Able to Undertake a Subnational Burden of Disease Study?
Mexico is fortunate in having invested for many years in high-quality health statistical systems. Most impressive is the National Health and Nutrition Survey, which collected subnationally representative measured data from some 95,000 participants in 2006. Even so, chronic disease incidence and survival data (needed to calculate the morbidity component of the DALY) are largely lacking—as in most countries,

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Abbreviations: DALY, disability-adjusted life year

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Box 1. The DALY

The DALY is a summary measure of population health that integrates health losses resulting from premature mortality with those resulting from functional limitation (disability). It is, in essence, a measure of unmet need.

The DALYs lost (by a specified population in a specified period) from each disease, injury, or risk factor are calculated as the sum of the years of life lost to premature mortality (YLL) and the equivalent number of “healthy” years lost to functional limitation (YLD) for incident cases of the condition, using the equation:

\[ \text{DALY} = \text{YLL} + \text{YLD} \]

where YLL = number of deaths × standard life expectancy at age of death, and YLD = incidence × duration × severity weight.

Thus one DALY represents the loss of one year of healthy life.

Estimating DALYs requires extensive—and internally consistent—epidemiological data. As well as estimates of incidence and mortality, data are needed on the severity distribution of the functional limitation associated with each condition, taking into account both stage of disease (or the presence of complications) and access to and effectiveness of current health care and disability support services.

Finally, disability (severity) weights must be assigned to each category of functional limitation, based on social preferences for time spent with such limitation relative to full health on the one hand and death on the other.

A number of value choices need to be made when estimating DALYs. These include whether to use the same “ideal” life expectancy standard for all populations; whether to use the same disability weight for everyone living a year in a specified health state (or to weight differently depending, for example, on the age at which the year is lived); and whether to discount the stream of future health losses to net present value (and, if so, what discount rate to use).

Why Should Other Countries Follow Suit?

From a health policy perspective, burden of disease studies are clearly not the whole story. Nevertheless, as every clinician knows, diagnosis must come before treatment. To give one example from Stevens and colleagues’ study: the unacceptable burden of childhood malnutrition and infection (diarrhoea and pneumonia in particular) in Chiapas state calls for urgent and sustained action to improve water supplies, sanitation, housing, and access to high-quality primary health care—especially for few chronic disease registries exist other than for cancer.

The authors have made good use of modelling to close such data gaps, including extrapolating from data obtained in other comparable countries, but better empirical data are sorely needed in all countries. Mexico also lacks local health state valuation studies (to construct DALYs, health states must not only be described, but also valued). For health state valuation, however, it may be adequate to use data from other countries—there is little cultural variation in the relative value people assign to different health states [10]. In fact, burden of disease technology has matured remarkably over the past decade. Better disease models are now available; adjustment for comorbidity can now be made; and structured workbooks have been developed to ease the data management task [11,12].

References

1. World Bank (1993) World Development Report 1993: Investing in health. Available: http://www-wds.worldbank.org/external/default/main?pagePK=6419927kpIPk=64187957kheSitePK=525678kmenuPK=6418751ksec archMenuPK=64187283ksiteName=WDSkent

2. Lopez AD, Mathers CD, Ezzati M, Jamison DT, Murray CJL (2006) Global and regional burden of disease, injuries, and risk factors. PLoS Med 3(6): e125. doi:10.1371/journal.pmed.0030125

3. Stevens G, Dias RH, Thomas KJA, Rivera JA, Carvalho N, et al. (2008) Characterizing the epidemiological transition in Mexico: National and subnational burden of diseases, injuries, and risk factors. PLoS Med 5(6): e135. doi:10.1371/journal.pmed.0050135

4. Begg S, Vos T, Barker B, Mathers CD, Ezzati M, Jamison DT, Murray CJL (2008) Global burden of disease and risk factors, 2001: Systematic analysis of population health data. Lancet 367: 1747-1757.

5. Tobias MI (1999) Our Health, Our Future. Hauora Pakari Koiora Roa. New Zealand Ministry of Health. Available: http://www.moh.govt.nz/moh.nzf/ae8b1fe2c72d4e6ec25669006ed56/691015b6c9e57064c2568800002e403?OpenDocument. Accessed 14 May 2008.

6. Melo J, Esink-Boi ML, Kramers PGN, Hooymans N (2000) A national burden of disease calculation: Dutch disability-adjusted life-years. Am J Public Health 90: 1241-1247.

7. Lapostolle A, Lefranq A, Genn M, Spira A (2007) Sensitivity analysis in summary measure of population health in France. Eur J Public Health 18: 195-200.

8. Public Health Agency of Canada (2008) Population health impact of disease in Canada. Available: http://www.phac-aspc.gc.ca/phi-isp/summary_measures-eng.php. Accessed 14 May 2008.

9. Stevens G, Dias RH, Thomas KJA, Rivera JA, Carvalho N, et al. (2008) Characterizing the epidemiological transition in Mexico: National and subnational burden of diseases, injuries, and risk factors. PLoS Med 5(6): e135. doi:10.1371/journal.pmed.0050125

10. Ustun TB, Rehm J, Chatterji S, Saxena S, Trotter R, et al. (1999) Global and national burden of the disabling effects of different health conditions in 14 countries. Lancet 354: 111-115.

11. van Baal PHM, Hooymans N, Hoogenveen RT, de Wit GA, Wester GP (2006) Disability weights for comorbidity and their influence on health-adjusted life expectancy. Popul Health Metr 4: 1-7.

12. Flanagan W, Boswell-Purdy J, Le Petit C, Berthelot JM (2005) Estimating summary measures of health: A structured workbook approach. Popul Health Metr 3: 5-17.