A POST CARD FROM UK

Summary Measures of Population Health (Postcard from UK/Ireland)

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INTRODUCTION

Information on population health is critical for planning and evaluating health-related interventions and policies. This information is traditionally expressed as the classic epidemiological rates and proportions; incidence, prevalence and mortality, which continue to play a central role as indicators of population health. Based on them, measures that combine mortality and morbidity information - Summary Measures of Population Health - have been developed and are increasingly being used. The aim of this article is to provide a succinct account of these measures, highlighting key components on an introductory basis.

SETTING THE SCENE: EVIDENCE FOR HEALTH POLICY

"Health policy covers courses of action (or inaction) that affect the set of institutions, organizations, services and funding arrangements of the health care system (both public and private)", as indicated by *Buse et al* [1]. Spasoff described the health policy process as a cycle of assessing population health, assessing potential interventions, appraising policy choices, policy implementation and policy evaluation, and back to the first point [2]. Ensuring an evidence based approach to each of these steps is vital for the potential success of the process. Three levels of health policy are recognized, socioeconomic policy, preventative policies and health services policies, with variations in the health measures informing each, e.g. incidence of diseases is more relevant to preventative activities while health service planning requires information on the prevalence of conditions [3].

Evidence is created from comparison of population health indices over time and between populations, conditions or interventions. Comparisons between diseases can be difficult if different diseases are measured with different indicators e.g. incidence for short duration conditions versus prevalence for long duration conditions. Mortality as an indicator of population health has always played a major role in monitoring population health and setting targets for policies and interventions. However information on the burden of a condition should ideally be comprehensive and include the mortality burden as well as that due to ill-health, but then comparisons over time or between groups can become problematic and inconclusive with the numerous comparisons to be made [4].

The need for concise and yet comprehensive information on population health led to the development of Summary Measures of Population Health. These are indicators that express mortality and morbidity in a single number, providing a common currency for comparing diseases that are primarily disabling with those that are primarily fatal and facilitating comparisons over time and between groups or geographical areas. They allow inclusion of disability in decision-making, alongside mortality.

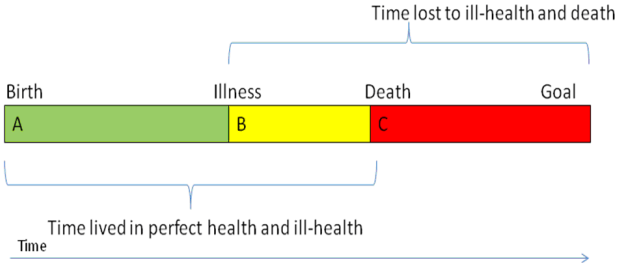
A NOTE ON MEASURING HEALTH

Distinction is increasingly made between negative and positive health, the former being the absence of disease and the latter extending beyond that to individual wellbeing and quality of life. Positive health is a function not only of the absence of disease, but also of the combination of the factors that form the broader context of the individual's life and that fall beyond the remit of health system interventions, such as education and employment. Whether the health system should influence these factors as well as disease levels determines how health should be defined for the purpose of monitoring achievement of health system goals. However what proves to be challenging is not finding an appropriate definition of health, but using that definition to measure health in operational terms [5].

A number of instruments have been developed to measure wellbeing and quality of life, ranging from simple questions about self-rated health, to more complex scales that measure individual performance across predefined domains. Measuring such an aspect of health has introduced the convenience of monitoring population health more frequently and on a wider scale in population surveys without the resort to screening or diagnostic tests for disease measurement. A number of challenges arise however. One is the choice between the two approaches; which one if a single one is to be used to inform health policy, or how to marry the two approaches for better information at the most reasonable costs. Several arguments were presented to that effect [6,7]. Another challenge is the limitation to comparability over time or between populations, arising from the use of different instruments and the variation in performance of the same instrument when applied in different situations or to different populations. The same challenges are bound to transfer to SMPH based on any of these measures of health. Summary measures build on existing health measures and the interpretation and use of a summary measure is determined, by the underlying health measure as well as by the other components.

COMBINING MORTALITY AND MORBIDITY

There are two types of summary measures, health expectancies and health gaps, which are expressed as population rather than individual level measures of health. For simplification however, the figure below is an individual level representation of time lived in various states.



"A" is time lived without ill-health, B is time spent in ill-health and "C" is time lost due to death, compared to an arbitrary goal or norm for survival. Since B is neither equivalent to perfect health nor to death, but rather in between, not all of it can be considered as a total loss. Combining mortality and morbidity information in one index requires adjusting time lived in less than perfect health to calculate the proportion that can be considered as a total loss. A health gap will then be the sum of "C" and adjusted "B" for each individual, with the population level aggregate of the health gap being the numeric sum across all individuals in that populations. Health expectancy is time lived in perfect health, and will be the sum of A and adjusted B. The population level health expectancy is usually expressed in the same way as life expectancy, i.e. an average of the time expected to be lived and not actually lived by the individuals in the population. It is difficult to measure the total time actually lived by the population because this will require following up the population until the death of its last member. A better depiction of the construct of health gaps and health expectancies at population level is based on a survival curve and can be found in

Murray et al [8].A common parameter in SMPH is the life expectancy which is a time-based age standardized measure of mortality indicating time expected to be lived further by an individual at a certain age if subjected to specific risks of death in the future. It is exactly measured by following up a birth cohort until the death of its last member; Cohort life expectancy. Since this is not operationally feasible, Period life expectancy is used instead. It indicates the average duration expected to be lived further by an individual of a certain age if exposed to the currently prevailing age specific risks of death above that age. Life expectancy may be used to express the survival goal in health gaps, while health expectancies are in fact adjusted life expectancies. It follows therefore that health expectancies, unlike health gaps, are age standardized measures [8].

SOCIAL VALUES IN SMPH

The key to combining mortality and morbidity in SMPH is weighting time lived in less than perfect health so it becomes addable to time lost due to mortality. Health state valuation is the assignment of a numerical weight to time spent in less than perfect health (the weights can be seen as the proportion of time spent in ill-health that can be considered as a total loss, and thus equivalent to death). Weights range from 0 to 1 and reflect societal preference for time spent in a health state but not the value to society of the person with that health state or their experience of that health state. A number of techniques exist for eliciting societal preferences; the simplest being a rating scale where individuals or groups are asked to assign a value from 1 to 10 (or their multiples). Health state value sets can vary not only by the type of technique used but also by the group conducting the valuation, the way health states are defined and described to the group, application methods and the dynamics involved e.g. Delphi panels versus general population surveys. While being key to the construction of SMPH, health state weights introduce a level of uncertainty into the measures, because of their potential to vary between populations, groups and techniques [4]. This is usually overcome by developing standard methodologies that combine preference elicitation techniques and methods of applications.

Other social values that are characteristic only of health gaps are the goal for survival chosen, giving less weight to time lost in the future – discounting, and giving less weight to time lost by the very young and the very old in the population – age weighting [4]. The first is indispensible for the construction of a health gap, while the latter (understandably controversial) two may or may not be applied.

WORKED EXAMPLE OF A HEALTH GAP

Disability Adjusted Life Year is a health gap developed in the Global Burden of Disease Project [9] and was used in numerous National Burden of Disease studies. Its mortality gap component, Years of Life Lost (YLL), is based on Standard Life Expectancy from model life tables having a life expectancy at birth of 82.5 years for females and 80 years for males. The morbidity gap component, Years Lived with Disability (YLD), can be based on incident or prevalent cases of disease.

YLL = number of deaths X Standard Life Expectancy at the average age of death.

YLD = Total number of cases X average duration of disease X disability weight.

DALY = YLL + YLD.

Disability weights in health gaps are health state values that range between 0 – 1. Being a gap, 0 is equivalent to perfect health (no loss) and 1 equivalent to death (total loss).

Age	Deaths in reference year	Standard Life Expectancy	YLL
0	1223	79.8074	97604.45
1-4	4413	77.768	343190.2
5-9	3909	72.8915	284932.9
10-14	3027	67.907	205554.5
15-19	2120	62.926	133403.1
20-24	1645	57.9545	95335.15
25-29	1276	53.00142	67629.81
30-34	994	48.0385	47750.27
35-39	812	43.103	34999.64
40-44	692	38.2035	26436.82
45-49	579	33.378	19325.86
50-54	453	28.656	12981.17
55-59	345	24.066	8302.77
60-64	252	19.6545	4952.934
65-69	175	15.538	2719.15
70-74	119	11.8715	1412.709
75-79	14	8.83369	123.6717

80-84	14	6.3425	88.795
85+	73	3.8828	283.4444
Total	22135	20.574	1387027

Table: YLL due to Malaria in males, reference year 2002

In the same year 5,000,000 males experienced malaria episodes (disability weight of 0.183) for 1 week, while 430,000 experienced anaemia (disability weight of 0.012) for 2 weeks.

Morbidity gap = (5,000,000 X 1/52 X 0.183) + (430,000 X 2/52 X 0.012) = 17795 YLD

Total gap in 2002 = 17795 + 1387027 = 1404822 DALY.

Healthy Life Years (HeaLY) is another health gap that was developed from a predecessor used by the Ghana Health Assessment Team to estimate the burden of disease in Ghana [10]. Its morbidity component is similar to that of DALY but it uses a different approach for estimating the mortality component. The number of deaths is the number that will arise in the future from the current number of incident cases in the reference year, and the maximum norm for survival is the life expectancy at the average age of onset of a condition (excluding the average duration of the condition) and not the average age of death. The measure was argued by its creators to be more suitable than DALY for analysing burden of disease in countries where disease trends are notable [11].

HEALTH EXPECTANCIES

The decline in mortality in many parts of the world has drawn attention to the quality of prolonged life. The implications of more people living longer could be [12]:

Expansion of morbidity: longer life with disability.

Compression of morbidity: longer life with delayed onset of disability.

Dynamic equilibrium: longer life but with milder disability

Health expectancy can be based on both negative and positive health. The term is in fact a generic term encompassing a variety of measures that vary by the underlying definition of the health on which each is based. Time lived in less than perfect health is adjusted by values ranging from 0 to 1, 0 being equivalent to death and 1 to perfect health. Examples are Disability-Free-Life-Expectancy, Active-Life-Expectancy, Disability-Adjusted-Life-Expectancy, Years of Healthy Life [8].

WHICH IF ANY AT ALL?

Health expectancies are easier to interpret, being based on a commonly used measure; the life expectancy. Health gaps are additively decomposable into constituent conditions and therefore easier to use by policy makers to identify priority conditions. The disease specific approach is important for policies that target specific diseases. However Health Expectancies express positive health more easily, and therefore are helpful for completing the picture on the health of the population. The two types of measures can be complementary for describing population health [13].

Making a choice or using both assumes that there is enough data to estimate one or both. The key to a valid SMPH is valid data, and SMPH, health gaps in particular, are very data demanding. An exercise to calculate a health gap in data poor settings can be overwhelmed by the generation of the basic epidemiological input through indirect estimation, to the extent that the focus of the exercise is shifted to the process of indirect estimation, calculating SMPH becoming of secondary importance. This risk is particularly high with the calculation of SMPH based on diseases, since there is more space for attempting to generate indirect epidemiological estimates for diseases than for wellbeing. While one could be tempted not to recommend an exercise for the construction of SMPH in data poor settings and to invest the already scarce resources in the development of systems that provide the basic input data first, the stimulus and guidance for such efforts could indeed be such an exercise. Which one should start first depends on which one seems more feasible given the context, capacities available and the level of commitment.

REFERENCES

1. Buse K, Mays N, Walt G. Making health policy. Berkshire: Open University Press; 2005.

2. Spasoff RA. Epidemiologic Methods for Health Policy. New York: Oxford University Press; 1999.

3. Van der Maas. Applications of Summary Measures of Population Health. In: Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Murray CJL, Salomon JA, Mathers CD, Lopez AD, Editors. Geneva: World Health Organization; 2002.p 53-60.

4. Mathers CD, Vos T, Lopez AD, Salomon J, Ezzati M, editors. National Burden of Disease Studies: A Practical Guide. 2nd ed. Geneva: World Health Organization; 2001.

5. Doll R. Health and the environment in the 1990's. Am J Public Health 1992;82:933-41.

6. Broome J. Measuring the burden of disease by aggregating well-being. In: Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Murray CJL, Salomon JA, Mathers CD, Lopez AD, Editors. Geneva: World Health Organization; 2002.p 92-113.

7. Brock DW. The separability of health and well-being. In: Summary Measures of Population Health: Concepts, Ethics, Measurement and Applications. Murray CJL, Salomon JA, Mathers CD, Lopez AD, Editors. Geneva: World Health Organization; 2002.p 115-120.

8. Murray CJL, Salomon JA., Mathers C. A critical examination of summary measures of population health. Bulletin of the World Health Organization 2000;78(8):981–94.

9. Murray CJL, Lopez, AD, editors. The global burden of disease: a comprehensive assessment of mortality and disability from diseases, injuries and risk factors in 1990 and projected to 2020. Cambridge: Harvard University Press; 1996. (Global burden of disease and injury, vol 1)

10. Ghana Health Assessment Team. A quantitative method for assessing the health impact of different diseases in less developed countries. Int J Epid 1981;10:73–80.

11. Hyder A, Morrow RH. Steady state assumptions in DALYs: effect on estimates of HIV impact. J Epid Comm Health 1999;53:43–45.

12. Robine JM. The main trends in the evolution of population health status - Introduction. In: Robine JM, Jagger C, Mathers CD, Crimmins EM, Suzman RM, editors. Determining Health Expectancies. 1st edition. Chichester: Wiley; 2003. p. 9-11.

13. Mathers CD. Cause-deleted Health Expectancies. In: Robine JM, Jagger C, Mathers CD, Crimmins EM, Suzman RM, editors. Determining Health Expectancies. 1st edition. Chichester: Wiley; 2003. p. 149-173.