

## VIII. HEALTH INEQUALITY

### 1. WHR 2000

WHR 2000 defined 'total health inequality' as 'inter-individual variation in healthy life expectancy', thus basing inequality assessment on between-individual and not between-group variation in health expectancy. An important conceptual characteristic of this approach arises from the fact that an individual's health expectancy cannot be observed, but must be estimated.

The Report argues that the ideal approach is to combine individual risks of ill-health and death across ages in a measure of healthy life expectancy, and summarize the distribution of these risks into a measure of inter-individual inequality. However, owing to lack of international data on individual risks across the age groups, WHR 2000 was only able to estimate inequality in the probability (duration) of child survival to age 2.

The index of inequality used in WHR 2000 is as follows:

$$II[\alpha, \beta] = \frac{\sum_{i=1}^n \sum_{j=1}^n |h_i - h_j|^\alpha}{2n^2 \bar{h}^\beta}$$

where  $h_i$  is the expected survival time for child  $i$ ,  $n$  is the number of children in the population, and  $\bar{h}$  is the average expected survival time for all children. The alpha parameter is derived from interviews aimed at assessing aversion to inequality, and the beta parameter is similarly derived from individual preferences for a relative versus absolute measure of inequality. The alpha and beta parameters were estimated from information obtained through internet interviews of approximately 1,600 persons.

The above index of inequality was applied to child survival to age 2, and is called the *Index of Child Survival Inequality*. The individual survival rates and risk profiles for children were estimated from maternal birth histories and other covariates, using the Demographic and Health Surveys (DHS) database for 50 countries. As mentioned earlier, no measures of adult health inequality were developed for WHR 2000.

## 2. Main commentaries and criticisms

### ***Total or partial health variation***

A concern with the concept of total health inequality is that it includes all variation in health in a population, without making any judgements as to which part of the variation is unfair. For example, during the technical consultation on health inequalities it was debated whether voluntary or genetic risks should be excluded from the assessment of total variation, indicating a discomfort with the notion that all inter-individual variation is unfair.

### ***Inter-individual and/or social group approaches to inequality***

The inter-individual approach to inequality in WHR 2000 has generated impassioned debate about the appropriateness and relevance of inter-individual versus social-group inequality measurement. A number of analyses (Braveman et al. 2001; Houweling et al. 2001; Ugá et al. 2001; Szwarcwald 2002) have shown the relative independence of the social-group measures of inequality from the index reported in WHR 2000, and have argued for both social group and inter-individual assessments of inequality.

### ***Inequality in risks of healthy life expectancy***

It is not clear whether the methods employed by WHO to estimate the underlying distributions of risk are applicable to settings where there are no data at the individual level. Wolfson and Rowe (2001) raise concerns about using small geographic area data in these models, as the models are based on the assumption that the population within the areas is homogeneous; in cases where this assumption does not hold, these methods should not be used.

### ***Index of child survival inequality***

Szwarcwald (2002) emphasizes the fact that for a majority of countries the index of child survival inequality was not based on child survival data, but estimated using a regression model. This is viewed as a major weakness of WHR 2000.

The choice of the age group (survival up to age 2) has been justified on the basis that mother's recall of child survival beyond age 2 may be defective, and that the survival risks and their distribution are not significantly different for older children (up to age 5). However, there are significant differences in the causes and risks of child death at different ages (neo-natal, infant, and child) and at different levels of overall mortality (high and low), thus calling into question the appropriateness of this age-grouping to capture inequality in child survival.

As the index of child survival inequality (a generalized Gini coefficient) is homogeneous of degree 2.5, it matters whether survival time is measured in months or years (Szwarcwald 2002). Moreover, defining the index of child survival equality as the complement of the index of child survival inequality (1 minus the index of inequality) would be strictly correct only if the latter is a relative measure (Szwarcwald 2002). Both these considerations affect the scale used to measure inequality.

As the index is a generalized Gini coefficient, it will not be decomposable into additively separable components (with the between- and within-components adding up to total inequality). This makes the measured contributions of the different 'components' of inequality dependent on the order in which they are introduced into the decomposition exercise (e.g., holding income constant first and then education, or vice-versa). Hence the magnitude of the components will be difficult to assess unambiguously.

The empirical values of the inequality measure demonstrate a very tight range across countries with low child mortality. However, it has been remarked in the literature that significant residual social-group inequalities in child survival do exist in these low mortality countries but are not captured by the WHO inequality index (Houweling et al. 2001; Leon et al. 2001; Szwarcwald 2002).

The specification of the risks of child survival that are related to maternal characteristics may not include important residential and environmental covariates. As noted by Wolfson and Rowe (2002), the cross-sectional DHS data may not be of sufficiently high quality to estimate inequality in risks.

DHS data are used to derive the measure of child survival inequality in the year 2000. However, DHS data are collected infrequently in most countries, and the year 2000 estimates of inequality cover a wide range of years (e.g., 1975-1985, 1985-1995). Szwarcwald (2002) raises questions about what these estimates actually represent in terms of the data under consideration, and about what the realistic time interval should be for the calculation of inter-temporal change.

As pointed out by Braveman et al. (2001), Houweling et al. (2001), Leon et al. (2001), Ugá et al. (2001) and Szwarcwald (2002), the policy value of the WHO measure of 'total health inequality' relies on an analysis of its determinants, which was not included in WHR 2000.

### ***Key technical issues***

#### **Equality standard**

The current WHO approach to health inequality measurement is based on the total inter-individual variation in health for a population. The unresolved

question is whether there is an appropriate common fairness standard for all countries against which to assess this variation.

### **Alpha parameter – aversion to inequality**

The values of this parameter are likely to be dependent on the age group and type of health outcome under consideration. For example, populations may have more aversion to a certain level of inequality in children's health compared with a similar level of inequality in adults' health. Similarly, the alpha parameter may be more sensitive to inequality in survival than in states of (ill-) health.

### **Beta parameter – absolute versus relative measures**

It is important to note that the WHO measure of total health inequality falls between a purely absolute and a purely relative measure. As such it is different from most measures used in the literature and WHO should be clear as to its interpretation.

### **Estimation of alpha and beta**

On the empirical side, a more transparent estimation procedure for the alpha and beta parameters is desirable. At present, it is not clear that the information obtained through the internet surveys uniquely identifies a person's alpha and beta parameters in the inequality formula.

## **3. WHO responses and proposals**

### ***Total or partial health variation***

WHO suggests that social-group inequalities in health outcomes ignore the within-group inequalities that exist in social groups, and argues that the poor health expectancy of individuals should be of concern independently of their membership of a social group. Therefore, WHO proposes to continue to measure overall or total health inequality in a population, ideally in terms of inequality in health-adjusted life expectancy (HALE). In addition, it proposes to introduce a special focus on the health of the poor, using data on assets ('permanent income') from the World Health Survey to identify the poor.

WHO has intensified efforts to increase the availability of data through multiple sources including DHS, the Pan-Arab Project on Children, the UNICEF Multiple Indicator Cluster Surveys (MICS), and an abridged birth history module in WHS (for countries that do not have a recent DHS). Relevant birth history data from up to 120 countries should be available for the next round of estimation of inequality in child survival.

The covariates of risk of child mortality have been used in a 'decomposition' analysis to identify the effect of changing one covariate on the inequality

index, e.g. removing inequality in income or improving education levels. This work represents an explicit response by WHO to the critique concerning the policy relevance of measuring pure inter-individual inequality. The analysis attempts to identify the main sources of inequality in a population with a view to suggesting policies and interventions to reduce these inequalities. For example, improving access to health care appears to lower the inequality index of child survival.

### ***Inequality in adult health***

In response to the criticisms about the lack of relevance of the indicator for high-income countries, WHO is proceeding with the development of methods to estimate inequality in healthy life expectancy. A survival analysis model has been developed to estimate the distribution of adult mortality risk. This model is similar to the one used for children, and can be used on individual level data from health surveys and censuses that have been linked to vital registration information in some Member States. The survival analysis model includes a shared frailty component that is able to capture unmeasured community effects on adult mortality.

This approach, while appropriate for high-income countries with sophisticated vital registration systems and computerized census and health survey databases, is difficult to apply in the majority of Member States. For Member States where individual-level data are not available, statistical techniques are being developed by WHO to estimate the distribution of mortality risk from small-area data. Wolfson and Rowe (2002) and Szwarcwald (2002) note that the approach of using small-area data depends on the construction of the geographical areas and the homogeneity of the population in them. Inevitably, small-area data will underestimate the true level of inequality. In order to quantify the extent of under-estimation, WHO proposes to compare results from small-area data analysis with results from individual-level data analysis for about 10 Member States where both types of data are available.

Statistical models and micro-simulation techniques developed and already in use at Statistics Canada will help in the implementation of this strategy. If a systematic relationship is found between the estimates from the two types of data, small-area data can be used with more confidence to estimate the distribution of mortality risk for adults where individual-level data are not available. In this case, WHO would proceed with small-area analysis of health inequality in a number of Member States (approximately 50 to 60) where vital registration and health data exist for relatively homogeneous small areas, such as municipalities or counties.

### ***Inequality in health states***

In WHR 2000 there were no measures of health inequality related to non-fatal health outcomes. This not only reflects the absence of data for such an

assessment but also the challenge of identifying an appropriate indicator of non-fatal health that is amenable to inequality measurement.

In its Multi-Country Survey Study 2000-2001, WHO has collected data on health states for nationally representative samples of males and females of all ages in a manner that allows for cross-country comparisons. WHO proposes to incorporate the distribution of health states by age and sex into the estimation of HALE for Member States. Preliminary results from the analysis of these data suggest that the observed trends in survival, where there is more variation for males than for females, are different from trends in non-fatal health outcomes, where there is more variation for (adult) females than for (adult) males. This highlights the importance for WHO to complete this analysis and continue with the implementation of WHS for reporting on health inequality in the future.

#### **4. SPRG comments and recommendations**

##### ***Total or partial health variation***

The concept of total health inequality defined as 'inter-individual variation' raises the question of the purpose of measuring inequality in health. Are health systems interested in assessing distributional performance by describing total variation (which is perhaps an over-inclusive notion of inequality)? Or are health systems interested in assessing distributional performance by describing inequalities that are thought to be unfair (which are a sub-set of the total variation)? SPRG recommends that WHO should continue to foster open debate on these two approaches.

##### ***Single or multiple measures of inequality***

We acknowledge that WHO needs to use a single measure of inequality in its final estimation of health-system attainment. But as the average level of population health is reported separately by WHO, this measure can be a purely relative one. In addition to the single measure used in HSPA, WHO should also report on health inequality using alternative summary measures such as the inter-quartile range, the Gini coefficient, and the coefficient of variation. A combination of measures may need to be calculated to encompass concerns about distinct aspects of inequality.

##### ***Social group measures of inequality***

SPRG endorses WHO plans to estimate separately the health of the poor and the non-poor in Member States. SPRG also recommends that a broader range of social inequalities in health be assessed, including gender and racial (or ethnic) inequalities. These social groupings raise fundamental issues

related to the norms against which the inequalities are assessed, e.g. genetic differentials in survival between the sexes. WHO should take account of the current policy environment to assess which of these group stratifiers is most useful in identifying inequalities. For example, the pervasive move towards decentralized health systems raises the importance of being able to identify both within- and between-district inequalities in health. SPRG noted that there was no conceptual or empirical attempt to assess gender inequalities in health in WHR 2000.

***Inequality in individual risks***

Further validation of the approach proposed by WHO to measure inequality in the distribution of health expectancy is recommended. It should be sensitive to the extreme ranges in levels of mortality across countries, and not overly dependent on the level of healthy life expectancy.

***Index of child survival inequality***

A number of technical recommendations on the index of child survival inequality follow:

- More explicit deliberation is needed about the equality standard against which inequality in health performance is assessed.
- Further estimates of the alpha parameter used to incorporate aversion to inequality are required for different age groups and for different health outcomes.
- Instead of relying exclusively on a hybrid absolute-relative measure, separate indices of relative and absolute inequality would help to clarify the different impact they have on assessing both the level of, and trends in, inequality.
- The robustness of the current index should be evaluated further by comparing it to more tightly defined age-group measures of inequality, e.g. neo-natal, infant, and child.
- The sensitivity of the index to inequality in high-, medium- or low-mortality settings should be explored, and if necessary an index developed that is appropriately sensitive.
- The current risk model (based on cross-sectional DHS data) should be validated by using longitudinal data on child survival from demographic surveillance sites such as Matlab, Bangladesh or Navrongo, Ghana.
- Approaches to reporting the inequality index for estimates based on data collected in different years and in different countries, but reported for a single year (e.g., 2000), should be standardized.
- Given the rate at which new child survival data are generated, guidelines for the frequency of reporting on the 'Index of Inequality in Child Survival' should be developed.

### ***Decomposition of the inequality index***

Further work should specify whether the models of the determinants of inequality in child survival perform differently from the models of the determinants of average child survival. WHO should take advantage of longitudinal data to develop more robust models of the determinants of inequality to understand better the extent to which modifying risk factors alter inequality.

### ***Adult health inequality***

SPRG recommends that WHO proceeds with the evaluation of small area variation as a basis for deriving reliable estimates of adult inequality.

### ***Data requirements***

Given the number of countries in WHR 2000 for which data were missing for the estimates of child survival inequality, it is likely that an absence of data will limit more ambitious inequality measurement efforts, e.g. for a broader range of age-sex groups and health states. The data intensity of these methods raises significant concerns about whether countries, especially those with limited health-information systems, will be able to invest in such data. WHO should propose strategies for the sustainability of the assessment of health inequality at regular time intervals.

### ***General recommendations for future development***

Although fairness in the distribution of health is a key performance criterion of health systems, it is not clear that the current 'Index of Inequality in Child Survival' actually informs the fairness in health outcomes component of HSPA. The literature, experts and members of SPRG have raised a considerable number of conceptual and technical challenges, some of which have been addressed, while others are only beginning to be explored. For these reasons SPRG believes that the health inequality aspect of HSPA would benefit from further conceptual, technical and practical discussion and development in collaboration with international experts.

Given the extent to which other inequality measures – e.g., effective access and coverage inequality – draw on the conceptual framework of the approach to health inequality (inter-individual inequality in the probability of an event), these measures too should be included in a robust indicator development process that engages appropriate technical and country-based constituencies.

## **5. References**

- Braveman, P., B. Starfield, and H. J. Geiger (2001): World Health Report 2000: How it removes equity from the agenda for public health monitoring and policy. *British Medical Journal*, 323(7314): 678-681.
- Houweling, T. A., A. E. Kunst, and J. P. Mackenbach (2001): World Health Report 2000: inequality index and socioeconomic inequalities in mortality. *Lancet*, 357(9269): 1671-1672.
- Leon, D. A., G. Walt, and L. Gilson (2001): International perspectives on health inequalities and policy. *British Medical Journal*, 322: 591-594.
- Szwarcwald, C. L. (2002): On the World Health Organisation's measurement of health inequalities. *Journal of Epidemiology and Community Health*, 56: 177-182.
- Ugá A. D., C. M. Almeida, C. L. Szwarcwald, C. Travassos, F. Viacava, J. M. Ribeiro, N. R. Costa, P. M. Buss, and S. Porto (2001): Considerations on methodology used in the World Health Organization 2000 Report. *Cadernos de Saude Publica*, 17(3): 705-712.
- Wolfson, M. and G. Rowe (2001): On measuring inequalities in health. *Bulletin of the World Health Organization*, 79(6): 553-560.