# Technical Guidelines

The main objective of the analysis is to identify whether there is systematic variation in the use of health care services in relation to some measure of living standards. To achieve consistency in the results across countries, we offer the following guidelines for definition and measurement of the variables required for the analysis (See van Doorslaer et al 2004).

- Unit of analysis: Individual;

- Sample: All individuals or all adults (18+). Sample weights to be applied in instance that samples are not directly representative of the population;

- Year of analysis: Latest available data that contain all variables identified below and, if available, five years or more prior to the latest available data for assessment of the direction of inequity over time.

Living Standard Measure (Ranking Variable):

Distributions of health care utilization and outcomes require some measure of household living standards. Preferred measures of living standards for these analyses have been described in chapter 6 of O'Donnell et al (2008), as follows:

- 1st best - Household consumption: the value of goods and services consumed.

- 2nd best - Household expenditure: the value of goods and services purchased.

- 3rd best - Household income (net of taxes preferred): the value of goods and services produced.

- 4th best - Household wealth index: the value of possessions and living conditions.

Due to underreporting of income, the use of household consumption or expenditure is preferred over income or wealth, when available.

<u>Adjusting for the size and age structure of households</u>:

The assumption of adult equivalent scales is important as it can alter the distribution of households along the income distribution. Income measures tend to overstate the income of families with small children as they weight the needs of children to the same degree as those of adults. Using adult equivalence scales is generally justified by the need to weight children to a lesser degree than adults.

Therefore, total household consumption/expenditure/income can be divided by an equivalence scale defined as:

$$e_h = (A_h + \Phi K_h)^\theta,$$

Where $e_h$ is the equivalence factor for household h, $A_h$ is the number of adults in household h, and $K_h$ is the number of children. As recommended by Deaton (1997, pp. 241-270), the two parameters $\Phi$ and $\theta$ should be equal to 0.75 and children defined as those under 14 years.

<u>Health Care Utilization Variables</u>:

The amount of health care received can be measured with 10 measures of health care utilization, as follows:

1. Any doctor visit (probability, Y/N)
2. Total number of doctor visits
3. Any generalist visit (probability, Y/N)
4. Total number of generalist visits
5. Any specialist visit (probability, Y/N)
6. Total number of specialist visits
7. Any hospitalization (probability, Y/N)
8. Total number of inpatient days
9. Any dentist visit (probability, Y/N)
10. Total number of dentist visits

The probability of a visit and the total number of visits are analyzed separately to assess if there is variation between the likelihood of use and intensity of health care use.

**NOTE**: If the recall period differs across type of service, scale the quantity data accordingly such that the effective recall periods are equalized. Standardize on the recall period that applies for most of the services. Longer recall periods, such as 12 months, are better to capture utilization data but more susceptible to recall bias.

Standardization:

Standardization is important when two conditions are satisfied: (a) the standardizing variables are distributed unequally by the living standard variable and (b) they are correlated with health. Indirect standardization is recommended for individual level data.

Standardization for health status/morbidity is usually made for demographic variables such as age and sex. To standardize health status, the health variable is regressed on its determinants, which include both standardizing and non-standardizing variables, plus the measure of living standards. From the estimated parameters, the standardized concentration index is calculated by subtracting the contribution of the standardizing variables from the non-standardized concentration index for the dependent variable. (See O'Donnell et al 2008, Chapter 5).

Standardization for health care utilization is usually made for age, sex, and health status/morbidity, except for dentist utilization when only age is used. Health care utilization is standardized using the same procedure as the standardization of health status by regressing the health care utilization variable on its determinants, which include standardizing (need) and non-standardizing variables (non-need), plus the measure of living standards. The standardized concentration index for health care utilization is calculated the same way as health status. (See O'Donnell et al 2008, Chapter 15).

Standardizing (need) Variables:

Variables used in need standardization includes demographic and health status variables. Health status/morbidity measurement is based on questions related to self-assessed health status, diagnosed chronic condition, physical/activity limitations, and other indicators for disability. Evidence from the literature indicates that these are the

most appropriate measures of health status for health equity studies. Suggested categories are as follows (See van Doorslaer et al 2004):

- Age-gender categories: male and female dummy variables for age categories 18-34, 35-44, 45-64, 65-74, 75+. Reference category = male 18-34 years.

- Self-assessed health (SAH): dummy variables for very good, good, fair, poor, very poor. Reference category = very good

- Activity/physical limitation: dummy variables for moderate, severe, none. Reference category = no limitation

- Chronic disease: dummy variable for the presence of a chronic problem (preferred if diagnosed by a health professional)

**NOTE**: The definition of such measures as standardizing or non-standardizing variables requires special consideration. There is growing concern that differential reporting of morbidity by income may be a significant problem and seriously bias the assessment of inequity if the results are standardized on morbidity. The severity of this problem will vary across countries and also with the type of morbidity measures available. Country teams should begin by examining the correlation between reported morbidity and the living standards measure. If this shows the expected negative correlation, then there are good grounds for including morbidity among the standardizing variables. If, however, there is a positive correlation between morbidity and expenditure/income, then morbidity should not be included in the standardizing variables. But, in this case, the morbidity measures should still be included in the regression since this helps avoid bias in estimation of the demographic effects required for standardization. Reporting bias in morbidity is inevitable and should be considered by country teams. In the first instance, it is important to make some assessment of the likely degree of the problem in the survey being used. (EQUITAP Empirical Notes)

Non-Standardizing (non-need, explanatory) Variables:

- Education: Dummies for years of study. Reference category = highest level of education;
- Activity status: Dummy variables for employed, self-employed, unemployed, retired/pensioner, student, housework, and others. Reference category = employed;

- Rural/urban;
- Geographic region;
- Race/ethnicity;
- Marital status;
- Private insurance coverage;
- Household size;
- Family type;
- Any other socio-economic characteristics relevant to the country.

Methodological Issues:

While health insurance coverage and activity status are key determinants of health care utilization and therefore should be included as non-need determinants in the regression model, potential problems of endogeneity can arise with their inclusion. Endogeneity usually occurs when an independent variable is correlated with the error term in a regression model. There are three ways in which this can occur: when omitted variables that should be controlled for are not included in the model, usually due to unavailability of data, as for example, lack of objective measures of health status; when one or more of the variables in the model contains measurement error; or when at least one of the explanatory variables is determined simultaneously along with the variable of interest, for example, when health care utilization is partly determined by health insurance coverage or vice-versa. Noteworthy is the fact that the distinction of these three possible forms of endogeneity is not always clear.

Potential problems of endogeneity are particularly relevant in the context of causal interpretation of the results. If causality is to be investigated, these problems should be explored with the use of a structural model that captures a causal relationship, instead of explanatory models that captures associations. Alternatively, variables can be included in the initial model and endogeneity explored afterward. (van Doorslaer et al., 2002; Wooldridge, 2002).

Assessment of Inequality:

For each of the health care utilization distributions, present the standardized and non-standardized concentration curve and concentration index (with standard error) (see O'Donnell et al 2008, Chapters 7 and 8). Concentration curves are generated to

identify whether income-related inequalities in health care utilization is present. Concentration indices are computed to measure the magnitude of differential utilization of health care by income.

The estimation methods and variables proposed in this study are almost identical to the OECD study developed by Van Doorslaer et al (2004). The horizontal inequity methodology calls for the comparison between the actual and the need-expected distribution of health care utilization to assess inequalities in health care use. Income-related distribution of actual health care utilization reveals inequality in use, while the need-standardized health care utilization reveals inequity in use (see van Doorslaer et al., 2004).

The Horizontal Inequity index (HI) is calculated as the difference between the concentration index of the actual health care utilization ($C_U$) and the concentration index of the need-expected health care utilization ($C_N$) or $HI_{WV} = C_U - C_N$.

Assessment of Contributions to Inequality:

Decomposition analysis is used to show the contribution of each variable in the analysis of the total inequality in health care. According to O'Donnelll et al (2008), if the health care utilization variable is specified as a linear function, then its concentration index can be decomposed into each determinant's contribution, allowing for explanation of horizontal inequity in health care utilization. Concentration indices and distributions are calculated using linear and non-linear methods to ascertain that the results would not be biased due to the method used and to test the sensitivity of the concentration index with both methods. Previous studies have shown that standardized concentration indices for health care utilization are usually not sensitive to the use of linear or nonlinear methods (see chapter 13, O'Donnelll et al., 2008).

When a linear model is used, the need-standardized concentration index for health care utilization generated by the decomposition method is exactly the same obtained by subtracting the contributions of all need variables from the unstandardized concentration index, the two-step approach. The decomposition of the concentration index is calculated as the product of the health care variable elasticity with respect to each determinant and its concentration index, as follows:

Equation 6:

$$C = \sum_k (\beta_k \overline{x}_k / \mu)C_k + GC_\varepsilon / \mu$$

Where:

$\mu$ = mean of y

$\beta_k$ = regression coefficient of determinant $k$

$\overline{x}_k$ = mean of $X_k$,

$C_k$ = concentration index for $X_k$,

$GC\varepsilon$ = generalized concentration index for the error term ($\varepsilon$).

If sensitivity analysis of the concentration indices and distributions with linear and nonlinear models produce substantial differences, linear approximation is used to estimate the partial effects with non-linear methods for the decomposition process. As suggested in the literature, the decomposition is still possible with the linear approximation to the nonlinear model. The previous formula still applies for the decomposition with linear approximation, if replacing βk by $\beta_k^m$, the partial effects of each determinant.

Noteworthy is the fact that linear models generate the same horizontal inequity index when calculated with the two-step approach or through decomposition. But when a nonlinear model is used, the horizontal inequity indices produced by these two approaches are not the same due to the introduction of the linear approximation error. (van Doorslaer et al., 2004)

References and Further Reading:


Deaton, A. The Analysis of Household Surveys, John Hopkins University Press, Baltimore, Maryland, 1997. Available at http://go.worldbank.org/3QU7VFEEK0

EquiTAP Empirical Guidelines. Available at www.equitap.org

Hentschel, J., Lanjouw, P. Constructing an indicator of consumption for the analysis of poverty, LSMS Working Paper 124, World Bank, Available at http://go.worldbank.org/A8WTKBYI30

O'Donnell, O., van Doorslaer, E., Wagstaff, A., & Lindelow, M. (2008). Analyzing health equity using household survey data: A guide to techniques and their implementation. Washington, D.C.: World Bank. Available at http://siteresources.worldbank.org/INTPAH/Resources/Publications/459843-1195594469249/HealthEquityFINAL.pdf

van Doorslaer, E., & Wagstaff, A. (2001). Inequity in the delivery of health care: Methods and results for Jamaica. In investment in health: Social and economic returns. Scientific and Technical Publication No. 582, pp. 233-244. Washington, D.C.: PAHO.

van Doorslaer, E., Koolman, X., & Puffer, F. (2002). Equity in the use of physician visits in OECD countries: Has equal treatment for equal need been achieved? *Measuring up: Improving the performance of health systems in OECD countries* (pp. 225-248). Paris: OECD.

van Doorslaer, E., Masseria, C., & OECD Health Equity Research Group. (2004). *Income-related inequalities in the use of medical care in 21 OECD countries*. Paris: OECD.