HANDBOOK ON

Health Inequality Monitoring

with a special focus on low- and middle-income countries

World Health Organization

HANDBOOK ON

Health Inequality Monitoring

with a special focus on low- and middle-income countries

World Health Organization

WHO Library Cataloguing-in-Publication Data

Handbook on health inequality monitoring: with a special focus on low- and middle-income countries.

I.World Health Organization.

ISBN 978 92 4 154863 2

Acknowledgements

Ahmad Reza Hosseinpoor (World Health Organization, Geneva, Switzerland) coordinated the development of this handbook with the assistance of Nicole Bergen (Consultant, Geneva, Switzerland). The handbook was initially conceptualized by Ahmad Reza Hosseinpoor and Jennifer H. Lee (Consultant, Los Angeles, United States). The draft was prepared by Ahmad Reza Hosseinpoor, Nicole Bergen and Kyle Ragins (Intern, World Health Organization) as well as Aluisio J D Barros (Federal University of Pelotas, Brazil), Sam Harper (McGill University, Canada), Jennifer H. Lee and Cesar Victora (Federal University of Pelotas, Brazil). The work benefited greatly from the contribution of Ties Boerma (World Health Organization, Geneva, Switzerland), who reviewed the handbook and provided valuable comments.

Funding for this project was provided in part by the Public Health Agency of Canada (PHAC) and by the Rockefeller Foundation. The collaboration of the coordinating project team members from PHAC is gratefully acknowledged, in particular Jane Laishes, James McDonald and Andrea Long.

John Dawson provided copy-editing support and AvisAnne Julien proofread the document.

Design and layout by Paprika (Annecy, France)

Printed in Luxembourg

Contents

Figures

Tables

Foreword

I welcome this comprehensive handbook on monitoring health inequalities at a time when health inequalities continue to persist around the world in general, and in low- and middle-income countries in particular. Inequalities in health become strikingly apparent when looking at social determinants. They are evident in the unequal way that health services are accessed by people of different income levels, gender, social classes and ethnic groups; they manifest in variations in health outcomes according to education level, and in the tendency for health systems to better meet the needs of populations in certain geographical areas.

As social determinants of health and progress towards universal health coverage emerge as priorities for global health, now is the time for action to tackle health inequalities. This means ensuring that all people can obtain the health services that they need without suffering financial hardship or meeting other barriers, which are usually related to the social determinants of health. Effective inequality monitoring systems are essential to achieving meaningful progress in tackling health inequality and for improving accountability in public policy-making. A necessary prerequisite to creating an equity-oriented health sector is to systematically identify where inequalities exist, and then monitor how inequalities change over time.

The evidence generated from monitoring contributes to better-informed policies, programmes and practices, providing the necessary feedback to determine whether actions in the health sector and beyond are successful in reducing inequalities. In an effort to meet the demand for evidence-based results and accountability the World Health Organization, together with seven other agencies working in public health, have issued a call for action to strengthen the capacity for analysis, synthesis, validation and use of health data in countries.[1] This includes ensuring that comparable estimates for common health indicators are made using the best available data and the most suitable methods, recognizing the need for coordination across settings.

The *Handbook on health inequality monitoring: with a special focus on low- and middle-income countries* is a resource that enables countries to do just that. It presents a comprehensive yet clear overview of health inequality monitoring in a user-friendly manner. The handbook succeeds in giving those involved in health inequality monitoring an appreciation of the complexities of the process, as well as building the practical knowledge and skills for systematic monitoring of health inequalities in low- and middle-income countries. The use of the handbook will enable countries to better monitor and evaluate their progress and performance

1 M Chan et al. Meeting the demand for results and accountability: a call for action on health data from eight global health agencies. *PLoS Medicine*, 2010, 7(1):e1000223.

with a high degree of accountability and transparency, and allow them to use the results to formulate evidenced-based policies, programmes and practices to tackle inequalities in an effective manner.

By committing to major health goals such as universal health coverage and addressing the social determinants of health, low- and middle-income countries are on the path to reducing health inequality. To this end, improved health inequality monitoring in low- and middle-income countries is a critical and timely priority to ensure the betterment of health across all members of society, especially the most disadvantaged.

Marie-Paule Kieny
Assistant Director-General
Health Systems and Innovation Cluster
World Health Organization

Introduction

The World Health Organization developed the *Handbook on health inequality monitoring: with a special focus on low- and middle-income countries* to provide an overview for health inequality monitoring within low- and middle-income countries, and act as a resource for those involved in spearheading, improving or sustaining monitoring systems. The handbook was principally designed to be used by technical staff of ministries of health to build capacity for health inequality monitoring in World Health Organization Member States; however, it may also be of interest to public health professionals, researchers, students and others. We assume that the users of this handbook have basic statistical knowledge and some familiarity with monitoring-related issues. The aim of this handbook is to serve as a comprehensive resource to clarify the concepts associated with health inequality monitoring, illustrate the process through examples and promote the integration of health inequality monitoring within health information systems of low- and middle-income countries.

The early conceptualization of this handbook was informed by previous experiences working with ministries of health staff in low- and middle-income countries to develop competencies in health inequality monitoring. These experiences included developing and delivering training courses and modules and facilitating training workshops. This provided a foundation for the general approach of the handbook: to introduce and elaborate upon the stages of health inequality monitoring with a sustained focus on practical and useful applications of concepts at the country level.

The handbook presents the background and process of health inequality monitoring in five sections. The first section provides an overview of the health inequality monitoring process and its implications, and highlights considerations that underlie the selection of health indicators and equity stratifiers. Section 2 discusses issues related to finding appropriate data sources for inequality monitoring, including the types of data sources, their strengths, limitations and areas for improvement, and the process of data source mapping. In section 3, a number of measures used to calculate health inequality are introduced; the challenges that arise in their application and approaches to overcome these challenges are detailed. The guiding principles to navigate the task of reporting inequality monitoring are discussed in section 4. Finally, section 5 provides an example of health inequality monitoring in the Philippines, demonstrating how the concepts in sections 1–4 can be applied in the context of low- and middle-income countries.

One important feature throughout this handbook is the use of real examples from low- and middle-income country settings to explain and apply the main concepts. The examples primarily come from the field of reproductive, maternal and child health, because comparable data from low- and middle-income countries are readily available for inequality monitoring on this topic; however, the techniques and methods

described can be applied to any health topic in any country or at any administrative level. Unless otherwise indicated, the data for the examples contained in this handbook are published in the Global Health Observatory Health Equity Monitor.[1]

Readers of this handbook will encounter informative features throughout the text. This supplementary material appears alongside explanations of theoretical concepts to familiarize the reader with its application and relevance within low- and middle-income countries.

- **Tips:** Short explanations elaborate on how to apply concepts to the actual practice of health inequality monitoring.
- **Extra information:** Building on the material in the main text, this supplementary information offers interested readers a deeper appreciation of the complexities of the subject and related topics.
- **Read more:** Recommended readings provide additional explanations, examples and discussions that reinforce and supplement topics in health inequality monitoring.
- **Highlights:** Summaries are provided for the reader to recall and review the most important information in the preceding section.
- **Tables and figures:** Various data visualization techniques help the reader to become accustomed to interpreting different forms of data presentation. The graphs, tables and visualizations that appear throughout the text were created using various software programs, including both simple, widely available programs, and more specialized statistical and visualization programs.

This handbook was created so that individuals can become familiar with the steps of health inequality monitoring, and better interpret the vast literature available on the subject. It is our hope that this will enable the introduction of health inequality monitoring in areas where it is not currently conducted, and foster the improvement of current health inequality monitoring efforts.

1 World Health Organization. Global Health Observatory: Health Equity Monitor. http://www.who.int/gho/health_equity/en/index.html. The data used in the handbook were drawn from the Health Equity Monitor in April 2013, and subsequent updates are likely to have occurred.

Executive summary

Monitoring is a process of repeatedly observing a situation to watch for changes over time. Monitoring health at the population level helps to show if the health situation is improving, worsening or staying the same. The results of monitoring indicate whether policies, programmes and practices are accomplishing what they are designed to achieve. In the health sector, monitoring can be thought of as a continuous cycle. For any given health topic, the monitoring cycle can be broken down into five general steps: (1) identify relevant health indicators, (2) obtain data about the indicators, (3) analyse the data, (4) report the results, and (5) implement changes, when warranted, to improve relevant policies, programmes and practices. As the results of these changes unfold to shape a new health environment, the cycle begins anew.

This handbook explores health inequality monitoring, a specific type of health monitoring. Health inequality is the metric by which health inequity can be assessed. By extension, monitoring health inequality has the specific purpose of informing policies, programmes and practices to reduce differences in health that are unfair and unjust. Health inequality data provide a foundation for incorporating equity into evidence-based health planning, and also assessing whether current health initiatives promote equity. Throughout the handbook, the theoretical foundations and methodologies of health inequality monitoring are presented, focusing on applying the steps of the health monitoring cycle at the country level.

Before health inequality monitoring can begin, the concepts of *health* and *inequality* must be defined. Optimally, these should be construed broadly, inclusive of a wide range of health indicators and many dimensions of inequality. The World Health Organization's monitoring, evaluation and review framework categorizes health indicators into four components spanning various levels of the health sector: inputs and processes, outputs, outcomes and individual-level health impacts. Depending on the scope of the monitoring activity, health indicators may be selected to cover the entire health sector, or there may be a narrower focus on parts of the health sector that are directly related to a specific disease or health topic. Equity stratifiers – or the selected dimensions of inequality – should be relevant to both the population and the health indicator. Some commonly employed equity stratifiers include economic status, education level, sex, region, place of residence, and ethnicity or race. Identifying subgroups based on an equity stratifier can be a complex task; when possible, this should be done using systematic and established methods.

Health inequality monitoring requires linked data on health indicators and equity stratifiers (that is, the health indicator data can be associated with an individual or population subgroup). Data sources may be population based, such as household surveys, censuses and vital registration systems; institution based, such as resource records, service records and individual records; or based on surveillance systems,

which are a combination of population-based and institution-based data. Each of these sources has implicit advantages and disadvantages pertaining to data availability, scope, quality and representativeness. In low- and middle-income countries, household surveys are usually, by default, the most reliable data source of those available for health inequality monitoring, and thus the most commonly used. The process of assessing data sources begins with data source mapping, which catalogues all available data sources for health inequality monitoring according to the type of information contained within each source. Using data source mapping helps to identify where data can be obtained about health indicators and equity stratifiers of interest. Data source mapping can also reveal gaps where information is lacking.

Once relevant data have been obtained, the analysis step combines the health indicator and equity stratifier information. The mean level of the health indicator is calculated within each subgroup, and from here there are many diverse measures that can be used to analyse health inequality. Simple measures, such as difference and ratio, may be calculated to make pairwise comparisons between two subgroups. These measures are commonly used and easily interpreted; however, they cannot express inequality in more than two subgroups, and do not account for the subgroup size. Complex measures, such as slope index of inequality, concentration index, mean difference from the overall mean, Theil index and population attributable risk, may be useful in certain situations to overcome the limitations of simple measures. The selection of an appropriate set of measures to best quantify health inequality in a given situation requires an understanding of the distinctions – and their implications – that underlie these measures. Important distinctions are:

- measures that make pairwise comparisons between two subgroups versus those that summarize differences across numerous subgroups;
- measures of absolute inequality versus relative inequality;
- measures that show inequality across subgroups with a natural order (such as income- and education-based classifications) versus subgroups that are non-ordered (such as ethnicity and region);
- measures that consider the subgroups' population size (weighted data) versus those that do not (unweighted data);
- selection of the reference group (where applicable).

Reporting the results of health inequality monitoring strives to present a clear and complete overview of the situation, keeping the needs and technical knowledge of the target audience as the foremost priority. The main ways to present data include tables, graphs and maps. Well-designed tables, graphs and maps can be effective tools to visualize the most salient conclusions from health inequality monitoring. Reporting inequality at a national level should present data about the latest status, trend over time and benchmarking. These aspects of health inequality reporting provide an

overall impression of how a country is performing, and may be useful to help identify priority areas within a health topic. Although analyses may involve several complex measurements to quantify inequality, the main conclusions should, when possible, be reported using simple measures that are easily understood by the audience. Disaggregated health data that show mean values in each subgroup should always be presented alongside the summary measures of inequality. Reports should cover both absolute and relative measures of inequality, and national averages should be presented alongside inequality data to provide a more complete picture. The results of a health inequality report may be used by policy-makers and other stakeholders when prioritizing areas for action. One way to do this is using a data reduction and scoring system, which yields evidence that key stakeholders from government, civil society, professional bodies, donor organizations, communities and other groups can integrate into decision-making and planning processes.

The handbook concludes with a step-by-step example of health inequality monitoring in the Philippines, applying the concepts of inequality monitoring. Indicators are chosen from the topic of reproductive, maternal and child health, and each step of the health monitoring cycle is illustrated and applied. The entire process from start to finish illustrates how health indicators are selected, data are obtained from available sources, inequality is measured, a meaningful report on health inequality is created and priority areas for action are identified.

Overall, this handbook builds capacity for health inequality monitoring throughout all stages of the cycle of monitoring, emphasizing the application of concepts within low- and middle-income countries. Adopting and maintaining health inequality monitoring systems is important for countries that wish to deliver equity-based policies, programmes and practices.

1. Health inequality monitoring: an overview

1.1 What is monitoring?

Policies are created with the intent of improving the status quo. When there is a condition in a population that needs to be improved, a policy or programme is created to address it. However, it is sometimes difficult to judge whether policies and programmes accomplish the goals they set out to achieve.

Monitoring is a process that can help to determine the impact of policies, programmes and practices, and subsequently, to indicate whether change is needed. Generally speaking, monitoring is the process of repeatedly answering a given study question over time. In the world of policy, the study question usually pertains to the measurement of a condition that a policy seeks to impact. In this context, monitoring is useful and necessary as it has the ability to track policy outcomes over time and provides a means of evaluating the need for policy change. Once a policy has been changed, subsequent monitoring is necessary to evaluate the outcomes of the new policy, and thus monitoring should be an iterative and cyclical process that operates continuously.

While monitoring can help policy-makers identify success or problem areas, monitoring alone cannot typically explain the cause of troublesome trends. Rather, monitoring may be thought of as a warning system. In the case of health, monitoring picks up trends in health and allows policy-makers to target further research in those areas to determine the root cause of problems. Ongoing monitoring may identify subpopulations that are experiencing adverse trends in health. Thus, monitoring activities can both inform and direct research in a given area. While this handbook is primarily focused on one type of monitoring – health inequality monitoring – a general knowledge of monitoring can be applied to any field where a study question can be repeatedly asked and answered.

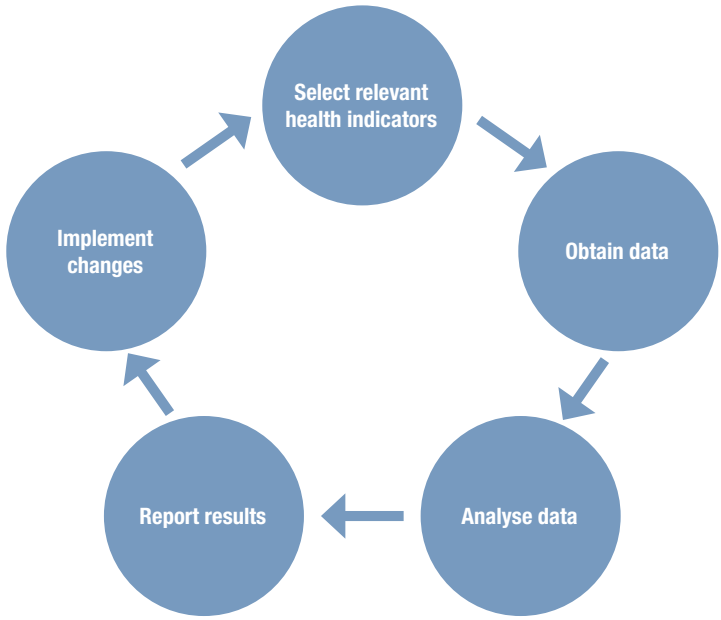
1.2 What is involved in health monitoring?

Cycle of health monitoring

Health monitoring is the process of tracking the health of a population and the health system that serves that population. In general, health monitoring is a cyclical process, as shown in Figure 1.1. The process begins by identifying health indicators that are relevant to the study question at hand, and then continues with the task of obtaining data about those health indicators. Data are then analysed to generate information, evidence and knowledge. Depending on the question at hand, the process of

analysing health data can be as simple as creating overall summary statistics about the population's health, or it can involve more complex statistical analyses. Following analysis, it is essential to report and disseminate the results so that they can be used to inform policy. Reporting can come in many forms, ranging from internal memos to press releases, technical reports and academic publications, each including various methods of presenting data (such as tables, graphs, maps or text). The goal should be to ensure that the results of the monitoring process are communicated effectively, and can be used to inform policies, programmes and practice. Selecting the most salient data to be presented in their clearest form is paramount in achieving this goal. Based on monitoring results, changes may be implemented that will impact and improve the health of the population. (This final stage will not be covered extensively in the handbook, but will be discussed briefly later in this section.) In order to monitor the effects of these changes, more data must be collected that describe the ongoing health of the population; thus, the cycle of monitoring is continuous.

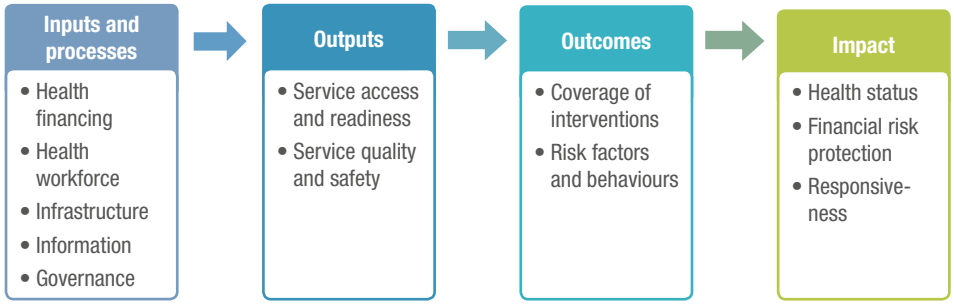
Figure 1.1 Cycle of health monitoring



Health indicators

In health monitoring, the general concept of health can be construed broadly to encompass indicators of all measurable aspects of health and the health sector. The World Heath Organization's monitoring, evaluation and review framework organizes health indicators into four components: inputs and processes, outputs, outcomes and impact (Figure 1.2).

Figure 1.2 Components of a national health sector monitoring, evaluation and review framework



Source: Adapted from *Monitoring, evaluation and review of national health strategies: a country-led platform for information and accountability.* Geneva, World Health Organization, 2011.

Within each component of the monitoring, evaluation and review framework, various categories of indicators are defined that allow the measurement of health at many levels. Indicators of inputs and processes are broad, affecting many other parts of the health sector. Indicators that fall under outputs and outcomes tend to be quite specific to a particular health topic, and may respond quickly to changes and progress in the health sector. Impact indicators, which are slower to respond to policy, programme and practice changes, are important to provide a snapshot of the health of a population. The monitoring, evaluation and review framework will be referenced and expanded upon throughout the handbook.

The components of the monitoring, evaluation and review framework can also be loosely linked to the type of data that are used. Outcomes and impact indicators tend to be calculated using individual- or household-level data, while others – mainly inputs and processes or outputs – are often calculated using subnational-level data. Certain inputs and processes indicators, such as total health expenditure, are calculated at the national level.

When choosing indicators for health monitoring, a package of several health indicators should be strategically selected to suit the topic of interest. The monitoring of expansive health topics requires a broad range of health indicators from each component of the monitoring, evaluation and review framework in such a way as to represent the entire continuum of health services within that topic. For example, the global movement towards equitable universal health coverage – a broad and ambitious agenda – relies on health monitoring of many diverse aspects of health. The package of indicators to measure progress towards universal health coverage will be strengthened by the inclusion of all relevant health indicators for which reliable data are available. It may, however, not always be appropriate to select a broad package of health indicators. For narrowly focused or disease-specific health monitoring, certain input and process indicators may be less relevant. Monitoring for a single disease such as malaria may not cover indicators such as governance and financing of the health care system,

which are related to all health topics but only peripherally related to malaria. It may be appropriate to look more closely at certain outputs and outcomes components that contain a number of health indicators that are highly relevant to the topic of malaria (for example, health service indicators can be subdivided into categories of malaria treatment indicators, malaria prevention indicators, and so on); it would also be appropriate to include relevant impact indicators, such as malaria incidence rate.

An example of a package of health indicators relevant to monitoring progress and performance in reproductive, maternal and child health is presented in Figure 1.3, reflecting indicators from all components of the monitoring, evaluation and review framework (Figure 1.2). Typically, the best indicators of progress in a priority health topic are those that are identified by countries rather than imposed from outside sources; indicators selected by a country may be of greater relevance to the needs of that country. Note that the general approach to monitoring health will be the same regardless of the health indicators that are selected.

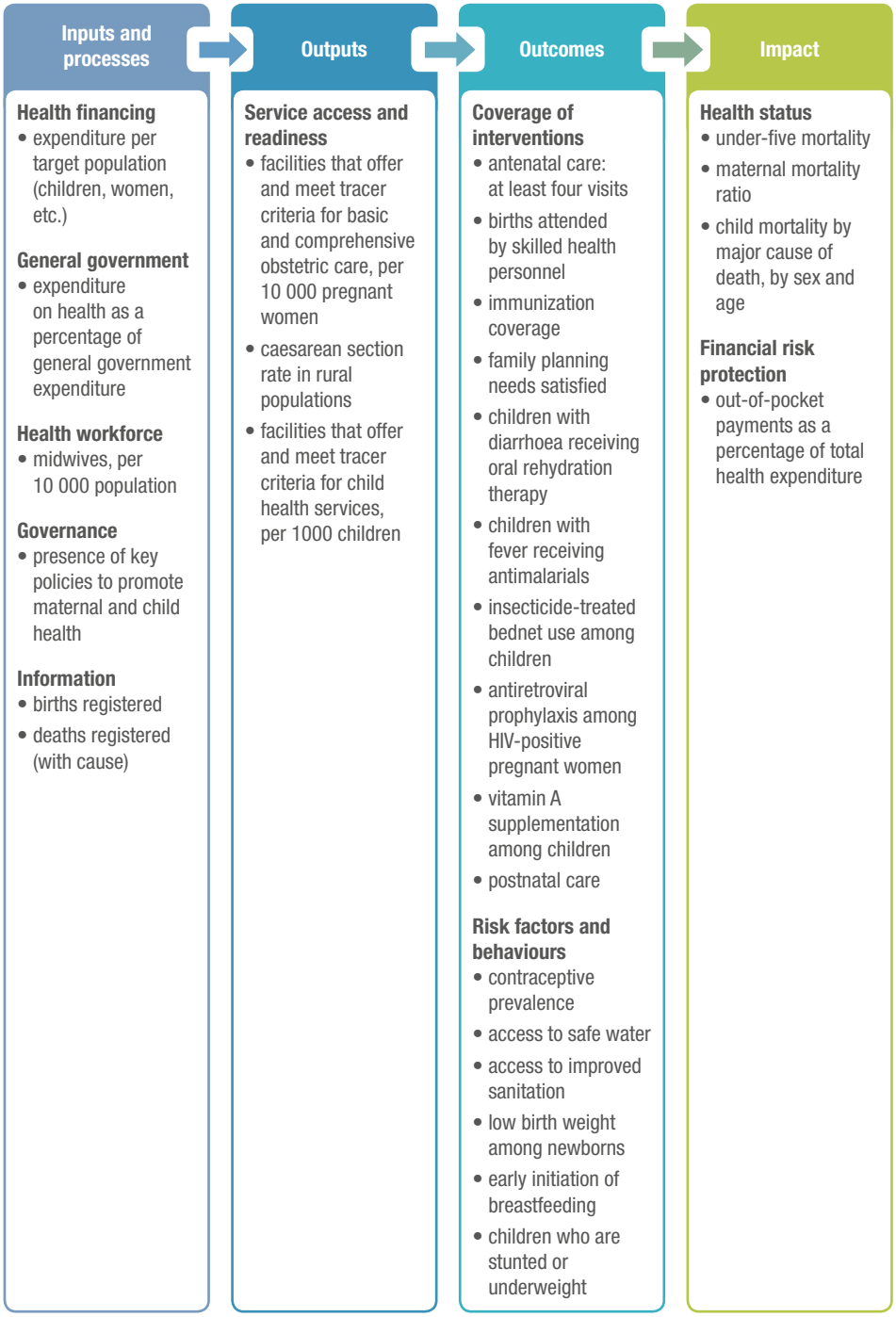
***Tip:* Tracer and composite indicators**

Tracer and composite indicators may be used to monitor health performance in a given health topic, or progress towards a health goal such as universal health coverage. A tracer indicator is a specific health indicator that is chosen to represent a broad health topic; a composite indicator is an index that is composed of several indicators within a health topic to represent that topic. Using tracer or composite indicators may be a concise way to report progress or performance in a health topic, and as an additional benefit, can help to facilitate comparisons between countries or over time.

For example, the topic of reproductive, maternal and child health could be covered by numerous indicators from all components of the monitoring, evaluation and review framework. A tracer indicator for health service coverage might be births attended by skilled health personnel, while a single composite indicator might include multiple indicators of maternal care, immunization, treatment of sick children and family planning.

Tracer indicators have the advantage of being easy to understand and report, but may lead to more resources being dedicated to an area simply because it is being monitored. Composite indicators tend to be more complex to report and understand. The monitoring of tracer and composite indicators is more meaningful when targets are set.

Figure 1.3 Example health indicators related to reproductive, maternal and child health, displayed within a monitoring, evaluation and review framework



Source: Adapted from *Monitoring, evaluation and review of national health strategies: a country-led platform for information and accountability.* Geneva, World Health Organization, 2011.

1.3 What is health inequality monitoring?

An explanation of health inequality monitoring begins with the concept of health inequity. Health inequities are the unjust differences in health between persons of different social groups, and can be linked to forms of disadvantage such as poverty, discrimination and lack of access to services or goods. While health inequity is a normative concept, and thus cannot be precisely measured or monitored, health inequality – observable differences between subgroups within a population – can be measured and monitored, and serves as an indirect means of evaluating health inequity.

Extra information: **Readings about ethics and inequity**

The ethical argument for the injustice of health inequity is beyond the scope of this handbook, but is discussed in other works, as follows.

Read more:

Marchand S, Wikler D, Landesman B. Class, health, and justice. *Milbank Quarterly*, 1998, 76:449–467.

Peter F, Evans T. Ethical dimensions of health equity. In: Evans T et al., eds. *Challenging inequalities in health: from ethics to action*. New York, Oxford University Press, 2001:25–33.

Whitehead M. The concepts and principles of equity and health. *International Journal of Health Services*, 1992, 22:429–445.

Health inequality monitoring describes the differences and changes in health indicators in subgroups of a population. The health indicators chosen for use in health inequality monitoring should be reasonably likely to reflect unfair differences between groups that could be corrected by changes to policies, programmes or practices. The process of monitoring social inequalities in health follows the same cycle as any type of health monitoring, although there are some aspects that are unique to health inequality monitoring, namely (a) the need for two different types of intersecting data, (b) the statistical measurement of inequality, and (c) the challenge of reporting on different health indicators by different dimensions of inequality in a way that is clear and concise. While health monitoring needs only to consider data related to health indicators, health inequality monitoring requires an additional intersecting stream of data related to a dimension of inequality (for example, wealth, education, region, sex). This is sometimes referred to as an equity stratifier.

Equity stratifiers

As with health indicators, many dimensions of health inequality should be covered by the selected equity stratifiers. Ideally, health inequality should be analysed and reported using every relevant dimension with available stratifying data. Historically,

the greatest emphasis has been placed on health inequality by economic status, and many analyses of health inequality include only wealth-based inequality. However, there are many other policy-relevant equity stratifiers to describe health inequality, including education, social class, sex, province or district, place of residence (rural or urban), race or ethnic background, and any other characteristic that can distinguish population minority subgroups (for example, language, immigrant status). The acronym PROGRESS summarizes the equity stratifiers most frequently assessed in health inequality monitoring, but is not an exhaustive list of the stratifiers available and possibly relevant for analysis.

- **P**lace of residence (rural, urban, etc.)
- **R**ace or ethnicity
- **O**ccupation
- **G**ender
- **R**eligion
- **E**ducation
- **S**ocioeconomic status
- **S**ocial capital or resources

Extra information: **Total health inequality versus social inequality in health**

Those who study health inequality should consider a fundamental decision of whether they wish to measure the overall distribution of health (total inequality) or inequalities between social groups (social inequality). Measures of total inequality consider only health indicator variables, and involve calculations such as standard deviation and variance. Studying social inequality in health requires at least two intersecting variables related to health indicators and equity stratifiers. Measures of social inequalities can indicate situations of health inequity when differences in health between social groups are unjust or unfair. This handbook describes techniques to measure social inequality in health; however, both are valid and important approaches that contribute to a comprehensive understanding of health inequality in societies.

Read more:

Braveman P, Krieger N, Lynch J. Health inequalities and social inequalities in health. *Bulletin of the World Health Organization,* 2000, 78(2):232–234.

Murray CJ, Gakidou EE, Frenk J. Health inequalities and social group differences: what should we measure? *Bulletin of the World Health Organization*, 1999, 77(7):537–543.

***Extra information:* Readings about equity stratifiers**

The acronym PROGRESS was first proposed in 2003 by Evans and Brown, but has been adopted by several other sources to convey common types of equity stratifiers. For a succinct overview of the strengths and weaknesses of common socioeconomic stratifiers, see the paper by Galobardes et al.

Read more:

Evans T, Brown H. Road traffic crashes: operationalizing equity in the context of health sector reform. *Injury Control and Safety Promotion*, 2003, 10(1–2):11–12.

Galobardes B et al. Indicators of socioeconomic position (part 1). *Journal of Epidemiology and Community Health*, 2006, 60(1):7–12.

There are a number of context-specific issues that may arise when deciding upon the dimension(s) of inequality to use in health inequality monitoring and defining the parameters of how to classify subgroups. Not all equity stratifiers are equally relevant in all populations, depending on the characteristics of that population. For example, in some cultures an individual's religion may – or may not – be closely tied to health-impacting behaviours or the types of health services that are accessed. Equity stratifiers may also vary in relevance depending on the health measure in question. For example, monitoring inequalities in traffic accidents may involve different dimensions of inequality than monitoring inequalities in modern contraceptive use.

***Extra information:* Age as an equity stratifier**

Demographic data about age are routinely collected by many data sources and are used by health information systems for several important purposes. Health indicator data are often age disaggregated to reveal differences between age groups. In some cases, these differences may be attributed to factors that are not deemed to be inequitable, such as the elderly having overall poorer health than young adults. When it comes to assessing health inequalities, age may be a relevant equity stratifier if the health differences are due to unfair or unjust access to health services on the basis of age. In other words, when age discrimination has the potential to influence health indicators, the stratifier should be included in health inequality monitoring. For example, an age-disaggregated analysis of contraceptive prevalence could reveal whether rates differed between adolescent and adult women.

Measuring equity stratifiers

Once having defined the types of relevant equity stratifiers, dividing a population into subgroups may seem like a straightforward task; however, looking closely at how individuals are categorized reveals several nuanced issues. The criteria that are used to define subgroups within a population may depend on data collection, data availability or population characteristics. For example, when measuring inequality by occupation, how should someone whose occupation has changed, or who is retired, be classified? Is it reasonable to compare the level of income across areas where the cost of living varies substantially? How many (and which) categories of race or ethnicity should be considered? Most equity stratifiers can be measured directly, or in some cases, using proxy measurements. To illustrate, economic status, one of the most common inequality dimensions, will be used to demonstrate how direct and proxy measures are constructed.

Direct measures of economic status include income and consumption or expenditure. One definition of income may measure all money received during a specified period of time, for labour or services, from sales of goods or property, as transfers from the government, other organizations or other households, or as earnings from financial investments; alternatively, income is sometimes simply the amount of compensation received for employment. Income may be considered on an individual basis or divided by the number of people living in the household. There are some limitations of using income measurements that are particularly pertinent to low- and middle-income country settings: (a) non-monetary income, such as in-kind gifts or trading, may not be captured by the measurement tool; (b) problems arise on how to calculate income level when income is transitory, irregular or received through informal employment; and (c) questions about income may be a sensitive topic, especially in poor households. For these reasons, reliable data about income are difficult and expensive to collect. Consumption and expenditure are other direct measures of wealth, which measure the final use of goods and services (consumption) and the money payments to obtain goods and services (expenditure). Measuring consumption and expenditure may have certain advantages in developing countries where income may be less predictable and the informal economy is more widespread. However, this information is usually not available from household health surveys, and may require a special set of questions specifically devoted to this measure.

Proxy measures of economic status strive to summarize household wealth using quickly and easily collected data about assets, housing and access to services. This may take the form of constructing simple asset indices, where equal weight is given to items on a list of assets, or more complex analyses, such as principal component analysis, which uses statistical methods to determine the weights of items in the index.

Extra information: **Principal component analysis**

Principal component analysis is a data reduction method that may be used to define and calculate household wealth. Using this statistical technique, it is possible to answer the question: how can several household assets be aggregated into a single proxy variable of household wealth?

Principal component analysis is often applied to construct wealth indices using, for example, household survey questions about the number of rooms per capita, ownership of a car, ownership of a bike, ownership of a fridge or type of heating device. The technique generates a set of uncorrelated principal components. The first component is that which explains the greatest amount of variance, and is commonly used to define the asset index. Weights are assigned to each of the assets, and an aggregated score can be calculated for each of the surveyed households within a population, which can then be grouped based on their ranking (for example, into quintiles, where the 20% with highest scores comprise quintile 5, etc.).

Read more:

Filmer D, Pritchett LH. Estimating wealth effects without expenditure data – or tears: an application to educational enrollments in states of India. *Demography*, 2001, 38(1):115–132.

Howe LD et al. Measuring socio-economic position for epidemiological studies in low- and middle-income countries: a methods of measurement in epidemiology paper. *International Journal of Epidemiology*, 2012, 41(3):871–886.

O'Donnell O et al. *Analyzing health equity using household survey data*. Washington, DC, World Bank, 2008.

Vyas S, Kumaranayake L. Constructing socio-economic status indices: how to use principal components analysis. *Health Policy and Planning*, 2006, 21(6):459–468.

1.4 Why conduct health inequality monitoring?

The primary reason to conduct health inequality monitoring is to provide information for policies, programmes and practices to reduce health inequity. Health inequality monitoring may be done to evaluate the progress of health interventions that are designed and delivered with specific equity targets, but it may also be done to assess how other types of health interventions affect inequality. The reduction of inequity is a common goal, not only desirable from an ethical standpoint, but also from a practical standpoint. If certain population subgroups continue to be underserved by the health system and suffer a disproportionate burden of morbidity, this endangers the well-being of a society at large and, in some situations, even holds back health progress for the most advantaged.

From a statistical standpoint of health monitoring, ignoring health inequality can present a variety of challenges. If only national averages of health indicators are monitored, they may not provide a complete representation of the changes in the health of a population. The national average of an indicator could remain constant over time, while certain population subgroups experience improvements in health and other population subgroups see their health deteriorating; it may even be possible to have improving national averages of health indicators while within-country inequality increases.

Disadvantaged population subgroups can also hold back a country's national figures as outliers that affect national averages. Even in countries that are not explicitly aiming to reduce health inequalities, if disadvantaged subgroups are ignored in the national health plan, national figures may not reach their full potential. Donors and the international community look for progress in national health indicators (and increasingly to health inequality explicitly) to make decisions in funding. Addressing health inequalities and improving these figures can thus lead to a better national health system for all, not only those currently disadvantaged.

***Extra information*: Making comparisons on a global level**

This handbook focuses on *within-country* inequality; that is, the inequalities that exist between subgroups within a country, based on disaggregated data and summary measures of inequality (for example, comparing the difference between infant mortality rates among urban and rural subgroups). This can be distinguished from *cross-country* inequality, which considers the inequalities between countries based on national averages (for example, comparing countries on the basis of national infant mortality rates). It is possible to make cross-country comparisons of within-country inequality. For example, countries could be compared based on the level of rural–urban inequality in infant mortality rate within each country.

1.5 How can health inequality monitoring lead to implementing change?

Considerations for agenda setting

The impact of health inequality monitoring would be limited unless the results are used to inform policies, programmes and practices to reduce inequities. Increasingly, policy-makers are looking to quantitative evidence to identify priority areas for action and inform decision-making processes. These analytic data serve as an important basis for identifying where inequalities exist and – when monitoring is done over time – how they change over time.

Extra information: **Equity-based interventions**

Interventions that are equity based seek to improve health outcomes in subgroups that are disadvantaged while, at the same time, improving the overall situation. Monitoring health inequalities helps to identify population subgroups that are underserved by health services and overburdened by morbidity or mortality; tracking national figures shows progress across the board.

In some cases, such as child health, there is evidence that targeting expansions in health services specifically towards the most disadvantaged may be more successful and cost effective than using limited resources to create across-the-board increases in services where they are not required by all.

Interventions that do not have an equity focus may inadvertently exacerbate inequalities, even when national averages indicate overall improvements. This happens when interventions fail to reach the most disadvantaged subgroups, and benefits are realized by other more advantaged subgroups. For example, media campaigns and workplace smoking bans are two types of interventions that showed evidence of increasing inequalities.

Read more:

Carrera C et al. The comparative cost-effectiveness of an equity-focused approach to child survival, health, and nutrition: a modelling approach. *Lancet*, 2012, 380(9850):1341–1351.

Lorenc T et al. What types of interventions generate inequalities? Evidence from systematic reviews. *Journal of Epidemiology and Community Health*, 2013, 67(2):190–193.

Beyond the priorities identified by measuring inequality, the tasks of agenda setting and implementing reforms must consider many factors. Deciding which changes to implement requires a comprehensive understanding of contextual factors, including those related to politics and regulations, economics, social values, demographics and technology. Although a particular area may be identified as a priority based on the results of health inequality measures, improvements in the area are only likely to be realized if the environment for change is favourable. Consideration should be given to the amount of political and popular support for the proposed change, and its funding, feasibility, timing and likely effects on outcomes. Cost-effectiveness is another key consideration. Given that resources are limited, decision-makers must sometimes take into account the trade-off between efficiency and equity considerations. A programme that improves the health of only a small subgroup of a population may not be justified if an alternative programme could impact the health of a greater segment of the population for the same resource cost. These types of decisions may call into question normative issues of what is important and acceptable for a society.

Developing strategies to tackle health inequalities often begins by considering what has already been done in other environments, and whether previous successes are likely to be replicable in a new environment. This step should involve a systematic consideration of evidence to gather information about previous approaches to address a given problem. Experts with experience in the area may be consulted to offer suggestions and recommendations. After learning what has been done by others, decision-makers can begin to consider what might work in their situation. The more thorough the understanding of the situation at hand, the more appropriate a response can be developed.

Key stakeholders

In general, the process of implementing change should involve a diverse group of stakeholders, as appropriate for the health topic. There are several complementary approaches for improving equity in health. One such approach, which gained wide attention due to the World Health Organization's Commission on Social Determinants of Health, is a multisectoral effort to tackle the "causes of causes", or the social, economic and political factors that underlie the origins of inequities. Another approach entails focusing on what the health sector can do on its own, or by linking with other sectors.

Key stakeholders may include representatives from government, civil society, professional bodies, donor organizations, communities and any other interested group. Consulting with stakeholders helps to ensure a high degree of acceptability and "buy-in" across sectors, which ultimately promotes the success and longevity of a new policy, programme or practice. Because health and health inequality issues are indirectly related to many sectors and levels of government, they should be framed as broad problems; intersectoral approaches help to drive multifaceted solutions and garner the support of a wider community.

1.6 How are the social determinants of health related to health inequality monitoring?

The social determinants of health are related to health inequalities, as health inequalities tend to stem from social inequalities. That is why the equity stratifiers (dimensions of inequality) used in health inequality monitoring typically reflect social conditions, such as level of wealth or education, place of residence and gender. A description of social determinants of health encompasses all aspects of living conditions across all life stages, including the health system and wider environment; they are largely shaped by the distribution of resources and power at global, national and local levels. To distinguish, the social determinants of health are often pinpointed as the cause of health inequalities. Monitoring health inequalities has the capacity to reveal differences in how social groups experience health; it does not, however, explain the drivers that cause and perpetuate inequality. For this, in-depth quantitative and qualitative studies may be done under the framework of social determinants of health.

***Extra information*: Recommendations for promoting equity within the health sector**

Recognize that the health sector is part of the problem. Health services do not, on their own, gravitate towards equity. Both public and private services contribute to generating inequalities in health if they are more accessible to the better off.

Prioritize diseases of the poor. When choosing which interventions to implement, an essential starting point is to match them closely to the local epidemiological profile of conditions affecting the poor. This requires assessing the burden of disease and allocating resources accordingly.

Deploy or improve services where the poor live. Because health services tend to be more accessible to the urban and better-off populations, there is a natural tendency for new interventions to reach them first. Several recent examples show, however, that this logic can be subverted. Rather than introducing new interventions or programmes initially in the capital and nearby districts, countries can prioritize remote areas where mortality and malnutrition are usually highest.

Employ appropriate delivery channels. The same intervention may be delivered through more than one channel. For example, micronutrients or nutritional counselling may be delivered to mothers and children who spontaneously attend facilities, through outreach sessions in communities, or on a door-to-door basis. Either facility-based or community health workers may be used. Equity considerations are fundamental in choosing the most appropriate delivery channel for reaching the poorest families, who often live far away from the facilities and require community or household delivery strategies.

Reduce financial barriers to health care. Out-of-pocket payments are the principal means of financing health care in most of Africa and Asia. However, this often places extra burden on the sick, who are most likely to be poor, children or elderly. Such user fees would probably not have been instituted in most countries had equity considerations been high on the health agenda. Countries adopting a universal health system without any type of user fees, such as Brazil, have effectively removed inequities in access to first-level health facilities.

Set goals and monitor progress through an equity lens. Progress towards equity depends on the continuous cycle of health inequality monitoring. Each component of the cycle can be strengthened and improved to match the goals of health equity.

Source: Based on unpublished work by Cesar G Victora, Fernando C Barros, Robert W Scherpbier, Abdelmajid Tibouti and Davidson Gwatkin.

Read more:

Bryce J et al. Reducing child mortality: can public health deliver? *Lancet*, 2003, 362(9378):159–164.

Gwatkin DR, Bhuiya A, Victora CG. Making health systems more equitable. *Lancet*, 2004, 364(9441):1273–1280.

Marmot M. Achieving health equity: from root causes to fair outcomes. *Lancet*, 2007, 370(9593):1153–1163.

Victora CG et al. Are health interventions implemented where they are most needed? District uptake of the integrated management of childhood illness strategy in Brazil, Peru and the United Republic of Tanzania. *Bulletin of the World Health Organization*, 2006, 84(10):792–801.

Actions to lessen the impact of the social determinants of health promote equity, and thus reduce health inequalities. The Commission on Social Determinants of Health recommends three principles of action to achieve health equity:

- improve the conditions of daily life (the circumstances in which people are born, grow, live, work and age);
- tackle the inequitable distribution of power, money and resources – the structural drivers of the conditions of daily life – at global, national and local levels;
- measure the problem, evaluate action, expand the knowledge base, develop a workforce that is trained in the social determinants of health and raise public awareness about the social determinants of health.

The movement to garner support to address social determinants of health is inextricably linked to reducing health inequality and achieving health equity. Health inequality monitoring contributes to this end by providing data, direction and evidence.

Extra information: **Readings about social determinants of health**

Commission on Social Determinants of Health. *Closing the gap in a generation: health equity through action on the social determinants of health*. Final report of the Commission on Social Determinants of Health. Geneva, World Health Organization, 2008.

Marmot Review. *Fair society, healthy lives: strategic review of health inequalities in England post 2010*. London, Institute of Health Equity, 2010.

World Health Organization. *Social determinants of health*. World Health Organization website: http://www.who.int/social_determinants/en/.

Highlights: Section 1

- The main steps of health inequality monitoring involve: (1) selecting relevant indicators and equity stratifiers for a given health topic; (2) obtaining data about health indicators and equity stratifiers; (3) analysing inequality between population subgroups; (4) reporting the results of the analysis; and (5) applying inequality measures to improve health-related policies, programmes and practices.
- *Health inequities* describe health differences that are unfair or unjust. Measuring and monitoring *health inequalities* shows objective differences in health, which can be used to evaluate and improve the state of health inequity in a population.
- Health inequality monitoring is important for all members of a population, for ethical and practical reasons. Integrating health inequality monitoring into agenda setting and decision-making can lead to reduced within-country health inequities and improved national health figures.

Read more:

Asada Y. A framework for measuring health inequity. *Journal of Epidemiology and Community Health*, 2005, 59(8):700–705.

Braveman P. Monitoring equity in health and healthcare: a conceptual framework. *Journal of Health, Population and Nutrition,* 2003, 21(3):181–192.

Braveman P. *Monitoring equity in health: a policy-oriented approach in low- and middle-income countries*. Geneva, World Health Organization, 1998.

Brownson RC, Gurney JG, Land GH. Evidence-based decision making in public health. *Journal of Public Health*, 1999, 5(5):86–97.

Commission on Information and Accountability for Women's and Children's Health. *Country health information systems: a review of the current situation and trends*. Geneva, World Health Organization, 2011.

Gakidou E, Fullman N. *Monitoring health inequalities: measurement considerations and implications*. Health Information Systems Knowledge Hub. Brisbane, University of Queensland, 2012.

Kawachi I, Subramanian SV, Almeida-Filho N. A glossary for health inequalities. *Journal of Epidemiology and Community Health*, 2002, 56(9):647–652.

Nolen LB et al. Strengthening health information systems to address health equity challenges. *Bulletin of the World Health Organization*, 2005, 83(8):597–603.

O'Donnell O et al. *Analyzing health equity using household survey data*. Washington, DC, World Bank, 2008.

Public Health Agency of Canada and World Health Organization. *Health equity through intersectoral action: an analysis of 18 country case studies*. Ottawa and Winnipeg, PHAC, and Geneva, World Health Organization, 2008.

Rockefeller Foundation Center. *Measurement of trends and equity in coverage of health interventions in the context of universal health coverage*. Meeting report, Bellagio, 17–21 September, 2012.

Wirth M et al. *Monitoring health equity in the MDGs: a practical guide*. New York, CIESIN and UNICEF, 2006.

World Health Organization. *Monitoring, evaluation and review of national health strategies: a country-led platform for information and accountability*. Geneva, World Health Organization, 2011.

2. Data sources

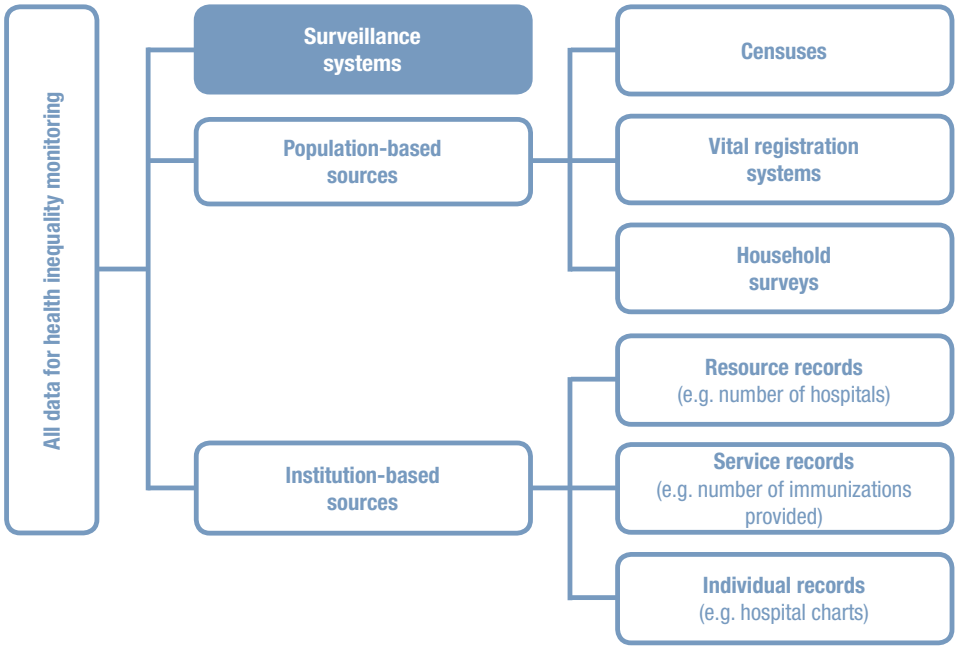
Describing the state of health inequality in a population requires valid and reliable data, which are acceptable for use from an ethical and cultural standpoint. The infrastructure that collects and organizes data is important to consider, as its strength will affect the merit of the data. Ideally, data for health monitoring should come from an information-producing system that has strong legitimacy, high-level political support and transparency, and includes policy, technical, academic and civil society constituencies. Sometimes health information infrastructure is created with the express purpose of collecting data for health monitoring, as is the case with large household surveys. Other times, data that are used for health monitoring are created for other purposes originally, but can also be applied for use in health monitoring.

Two intersecting types of data are necessary to monitor health inequalities: (a) health data; and (b) data describing a given dimension of inequality (such as wealth, education, region or sex). There are a variety of sources from which information in these two intersecting streams (health data and equity stratifiers) can be derived. This section presents various options for sources of data that can be used for inequality monitoring at a national level, along with their advantages, disadvantages and possibilities for improvement. At the end of this section, a four-step data source mapping process is detailed.

2.1 Data source types

There are essentially two broad categories of data sources: (a) population based; and (b) institution based (Figure 2.1). Surveillance systems, which combine population-based and institution-based data, are sometimes classified as a third category of data sources. Population-based data sources include sources that have information on every individual in a population (for example, census data) and sources that have information on a representative sample of the population (for example, household surveys). Institution-based sources gather data in the course of administrative and operational activities, and thus only include people that have had interaction with a given institution. It is possible that administrative data from institution-based sources could reflect the individual or household level (for example, waiting time to elective surgeries or surgical wound infection rate), or at the national or subnational level (for example, general service readiness or total health expenditure per capita).

Figure 2.1 Data sources for health inequality monitoring



Extra information: **Surveillance systems**

There are several types of surveillance systems. Outbreak disease surveillance systems aim to track cases of epidemic-prone diseases as well as their risk factors. Frequent reporting by health facilities, including laboratories, is the main source of data, but other sources are also used, such as media. Sentinel surveillance systems, in which a sample of clinics is used for intensified monitoring, are used by several disease programmes, such as HIV and malaria. Risk factor surveillance is a term used to describe data collection and analysis in noncommunicable disease monitoring, and often focuses on data obtained through surveys. Finally, many low- and middle-income countries have established demographic surveillance sites. These sites have a longitudinal birth and death registration system for a local population where cause of death and other health-related data are often also collected.

Read more:

INDEPTH Network. *Health equity*. http://www.indepth-network.org/index.php?option=com_content&task=view&id=1090&Itemid=5.

2.2 Population-based data sources

Censuses

Most countries now conduct population and household censuses every 10 years. In many countries, the census provides information on sex, socioeconomic status, race or ethnicity, age and geographical area, all of which can be used as equity stratifiers for inequality monitoring. These data are essential for determining the size of populations, and demographic characteristics of the subgroups within the population. This type of information is essential to ensure that survey data are representative of the entire population. However, the census is not usually health focused, and typically includes few health data. As a result, censuses may have limited utility for health inequality monitoring unless there is a means to link census data to other sources of health information (for example, using an individual's social security number to link data from two different sources). Linkages often exist in high-income countries, but not in many low- and middle-income countries. Thus, the usefulness of census data may be limited to deriving demographic characteristics for various population subgroups.

One improvement that could be made to censuses in low- and middle-income countries in order to increase its utility for health inequality monitoring would be to include small-area identifiers, such as postal codes, to link with data from other sources. While individual-level identifiers would be ideal for providing such data linkages, small-area identifiers, if standardized across different data sources, could be more easily implemented and used for this purpose.

Additionally, censuses could be strengthened by collecting high-quality data about mortality and cause of death. Many low- and middle-income country censuses collect information such as recent births and deaths within a family or household. Including this type of information in censuses particularly is useful in countries where it is not reliably available from other information systems. Even cause of death, when evident, has sometimes been included in censuses, although these data are often of poor quality unless standardized verbal autopsy questionnaires are used. However, in many low- and middle-income countries mortality – particularly infant, child and maternal mortality – goes unreported. The inclusion of mortality-related questions in the census could allow for more accurate correction of underreporting and provide additional data for health inequality monitoring.

Vital registration systems

Vital registration systems (officially called civil registration and vital statistics systems) record the occurrence of births, deaths, marriages and divorces in a population. In countries where these systems are functioning properly, they serve as the best and most reliable source for fertility, mortality and cause-of-death data. Countries that have strong vital registration systems can reliably determine and track mortality rates, life expectancies and causes of death at a population level. Additionally, vital registration systems often include information on geographical region, sex, and in some cases, education level and occupation; this provides necessary data about equity stratifiers that is useful for inequality monitoring.

***Extra information:* Global status of vital registration systems**

As of 2009, only 25% of the world population lived in countries where at least 90% of births and deaths are registered. Worldwide, only 34 countries (representing 15% of the global population) have high-quality cause-of-death data; 74 countries lack these data altogether. In many low- and middle-income countries, vital registration systems are far from complete, and have little utility for inequality monitoring. In the African Region of the World Health Organization, for example, 42 out of 46 countries reported having no death registration data.

World Health Organization. *World Health Statistics 2012*. Geneva, World Health Organization, 2012.

Expanding the coverage of existing vital registration systems is the single most important change that could improve the utility of vital registration systems for health inequality monitoring. If full coverage could be achieved with vital registration systems, including individual (or small-area) identifiers, cause of death, birth weight, gestational age and at least one socioeconomic stratifier, those systems would be quite useful for inequality monitoring.

Household surveys

Household surveys are currently the most common and overall most reliable data source for health inequality monitoring in low- and middle-income countries. Household surveys are conducted with the purpose of evaluating the status of a specific topic (or topics) at a national level, and may be administered by countries, aid organizations, nongovernmental organizations or international organizations. Usually, household surveys cover a large number of indicators, all related to a similar theme, such as reproductive, maternal and child health, or nutrition.

Household surveys often provide specific information on health topics of interest in low- and middle-income countries, in conjunction with both individual-level and household-level socioeconomic, demographic and geographical information. This

makes household surveys well-suited for use in health inequality monitoring. While several low- and middle-income countries conduct their own household surveys, there are also an increasing number of multinational, multiround household survey programmes. The repeated rounds of these multinational surveys allow for the tracking of progress in inequalities over time; the inclusion of multiple countries allows for benchmarking between countries using comparable data methodologies.

By design, household surveys draw information from a sample of the population rather than each individual within the population. The uncertainty inherent in the estimation process of describing an entire population based on a sample of the population can be exacerbated in the course of health inequality monitoring, as the total sample is divided into several subgroups. While household surveys are generally designed to have sufficient sample size to draw precise conclusions about the overall population, they are not necessarily designed with the purpose of having sufficient sample sizes in all subgroups. If it is anticipated that the survey will have a low sample size in a certain subgroup, the design may compensate by oversampling. This may involve drawing larger samples from certain minority groups, regions, education levels, age groups or other categories, though these subgroups may represent a relatively small proportion of the overall population.

Household surveys could be improved for use in inequality monitoring through regular repetition and harmonization of questions across countries. Additionally, increasing sample sizes could improve the capacity for use in inequality monitoring.

Extra information: **Examples of multinational household survey programmes**

Survey name	Organization	Website
AIDS Indicator Survey (AIS)	United States Agency for International Development	http://www.measuredhs.com/What-We-Do/Survey-Types/AIS.cfm
Demographic and Health Survey (DHS)	United States Agency for International Development	http://www.measuredhs.com/
Living Standards Measurement Study (LSMS)	World Bank	http://go.worldbank.org/IPLXWMCNJ0
Malaria Indicator Survey (MIS)	United States Agency for International Development	http://www.malariasurveys.org/
Multiple Indicator Cluster Survey (MICS)	United Nations Children's Fund	http://www.unicef.org/statistics/index_24302.html
Study on Global Ageing and Adult Health (SAGE)	World Health Organization	http://www.who.int/healthinfo/systems/sage/en/
World Health Survey (WHS)	World Health Organization	http://www.who.int/healthinfo/survey/en/index.html

2.3 Institution-based data sources

Institution-based data sources produce administrative data in the course of government and health system activities. Examples of administrative data include the many institutional records that exist for individuals, such as medical charts, police records, employment records and school records. Institution-based data sources also include the internally-kept records describing the activities of institutions, such as health facility resource records that contain district-level information about the personnel deployed in a given region, or the records of services delivered, for example, number of vaccines given or number of bednets distributed. These data sources tend to be numerous, and provide detailed data at the community level. Data from institution-based sources may reflect any component of the monitoring, evaluation and review framework; health indicators that are listed in the inputs and processes component are often derived from institution-based data sources.

Almost every government ministry from education to justice will have administrative records that might be used to determine equity stratifiers for health inequality monitoring; however, it is often difficult or impossible to link these administrative data to health databases. Administrative data only capture information on individuals who interact with a given institution. For example, health centre records cannot provide any information on those who do not access the health centre. In health inequality monitoring, however, populations with limited institutional access are often of high interest. Furthermore, at the country level, the use of administrative data is limited by its lack of standardization and fragmentation. For these reasons, institution-based data sources tend to be of lesser importance for health inequality monitoring at a national level, especially in low- and middle-income countries, and thus the various types of administrative data will not be discussed in detail here. However, it should be noted that administrative data could be useful for inequality monitoring in low- and middle-income countries at lower administrative levels (such as a district level), as they provide a high level of detail that may not exist in other data sources; at the local level, administrative data can be some of the best data available.

Extra information: **Data availability in low- and middle-income countries**

Because of the large reliance on household survey data, health inequality monitoring in low- and middle-income countries is limited to the health indicators for which data are available. Often there is a focus on two components of the monitoring, evaluation and review framework: the outcomes component (for example, coverage of health interventions) and the impact component (with an emphasis on health status indicators, such as mortality and morbidity). Because health indicators related to inputs and processes, and outputs are generally collected from institution-based sources, the inclusion of these indicators in health inequality monitoring in low- and middle-income countries is uncommon.

Thus, certain health topics might be challenging to monitor in low- and middle-income countries due to a lack of data. However, there are occasionally studies in low- and middle-income countries that are specifically dedicated to cover these oft-neglected topics. As detailed in the references below, Li et al. (2012) provide examples of health inequality reporting using impact indicators related to financial risk protection in China, and Sousa, Dal Poz and Carvalho (2012) report health inequalities in Brazil using inputs and processes indicators related to the health workforce.

Read more:

Li Y et al. Factors affecting catastrophic health expenditure and impoverishment from medical expenses in China: policy implications of universal health insurance. *Bulletin of the World Health Organization*, 2012, 90(9):664–671.

Sousa A, Dal Poz MR, Carvalho CL. Monitoring inequalities in the health workforce: the case study of Brazil 1991–2005. *PLoS One*, 2012, 7(3):e33399.

2.4 Strengths and limitations of key data sources

Each of the key data sources used in health inequality monitoring has its own unique advantages and disadvantages. Some of these have already been discussed either implicitly or explicitly, and many of them will vary from country to country. Table 2.1 presents a summary of the advantages and disadvantages of each source.

Table 2.1 Strengths, limitations and possible areas for improvement of key data sources for health inequality monitoring

Data source	Examples	Advantages	Disadvantages	Possible improvements
Census	National population and household censuses implemented every 10 years	Data cover the entire population (or nearly so), providing accurate denominator counts for population subgroups	Contains only limited information on health Timing of data collection is not consistent	Include individual or small-area identifiers
Vital registration system (civil registration and vital statistics system)	National birth, death or marriage registries	Can be used to generate reliable estimates for mortality rate, life expectancy and sometimes cause-of-death statistics Often linked to information on sex, geographical region, occupation, education	Incomplete in most low- and middle-income countries Does not regularly include information on equity stratifiers other than sex	Expand coverage Include at least one socioeconomic indicator Include cause of death, birth weight and gestational age (when not included)
Household survey	Demographic and Health Survey, Multiple Indicator Cluster Survey, World Health Survey, Study on Global Ageing and Adult Health, Living Standards Measurement Study	Data are representative for a specific population (often national) Have rich data on a specific health topic as well as living standards and other complementary variables Often repeated over time, allowing for measurement of time trends Conducted in multiple countries, allowing for benchmarking	Sampling and non-sampling errors can be important Survey may not be representative of small subpopulations of interest (so cannot be used to assess cross-district inequality)	Repeat surveys on a regular basis Enhance comparability over time and between countries by harmonizing survey questions Increase sample sizes
Institution-based records (administrative data)	Resource records (e.g. number of hospitals, health workers) Service records (e.g. number of immunizations given) Individual records (e.g. medical charts)	Data are readily and quickly available Can be used at lower administrative levels (e.g. district level)	Data may be fragmented or of poor quality Often data cannot be linked to other sources Data may not be representative of whole population	Include individual or small-area identifiers Create standardization of electronic records across institutions
Surveillance system	Outbreak disease surveillance Sentinel surveillance Risk factor surveillance Demographic surveillance	Can provide detailed data on a single condition or from selected sites Sentinel surveillance site data useful for correction of overreporting or underreporting	Not always representative of population Some systems may collect little information relevant to equity stratifiers	Include individual or small-area identifiers Integrate surveillance functionality into larger health information systems with full coverage

Source: Adapted from O'Donnell O et al. *Analyzing health equity using household survey data*. Washington, DC, World Bank, 2008.

2.5 Data source mapping

Data source mapping involves cataloguing and describing all data sources available for a given country (or province, district or other administrative unit) to determine which sources can be used for health inequality monitoring. Ideally, the selection of health indicators occurs simultaneously with an inventory of available data. Clearly, it is not possible to conduct health inequality monitoring for indicators where no data exist. In addition to revealing which dimensions of inequalities can be measured with current available data, the process of data source mapping can also identify important gaps that indicate where a country lacks data about health indicators or equity stratifiers.

***Tip:* Overcoming data unavailability**

In the long term, health inequality monitoring need not be dictated by data availability. If the monitoring infrastructure of a country wishes to monitor certain priority health topics or indicators for which there are no data currently available, immediate analysis would be impossible. However, a current lack of data does not preclude monitoring in the future. Faced with a situation of data unavailability, the next step is to advocate the collection of additional data so that future analysis is possible. Strengthening, modifying or expanding existing data sources may be feasible options to generate new information.

Data source mapping can be broken down into four steps, each building on the previous. These steps are outlined below and, for the sake of brevity, illustrated by partial tables. In practice, the tables generated during data source mapping may each consist of multiple pages. For an applied example of data source mapping in the Philippines, see section 5. Note that the steps described below provide only one approach to data source mapping for health inequality monitoring; however, the method shown here is not the only way to conduct this exercise. Any of the following steps may be modified to suit the needs of the users.

Step 1. The process of data source mapping begins by creating a list of available data by source type (census, administrative, household survey, etc.), name, and year(s) of data collection. A *Notes* column may be added for relevant comments, such as the frequency of data collection. A partial list of data sources is shown below.

List of data sources by type (partial table)

Data source type	Data source	Year(s) of data collection	Notes
Census	National census	1990, 2000, 2010	
Administrative	Immunization records	2000–2006	Annual collection
Household survey	Standard DHS	1994, 1999, 2004, 2009	
…			

Note: DHS = Demographic and Health Survey.

Step 2. Next, the list is expanded to include the availability of equity stratifiers within these data sources. If one database does not contain information about a particular equity stratifier, it may sometimes be linked to other databases that do contain this information. In order to identify possible linkages, it is necessary to first make a list of every existing data source that provides information on each equity stratifier.

In creating this list, it is important to recognize that different data may be available in different years for a given data source. For example, a household health survey conducted in 2004 may not have information on household wealth, whereas a household health survey conducted in 2009 may contain this information. For this reason, a table may be created with an expanded list of data sources by year. For easy reference in the next steps, each row (data source and year) is numbered. A *Notes* column may be added for relevant comments or additional information, such as how equity stratifiers are grouped. Here, a check mark (√) indicates that the equity stratifier data are contained within the data source. A sample list of unique data sources with information on equity stratifiers contained within them might look like:

List of data sources and equity stratifiers (partial table)

No.	Data source and year	Equity stratifier				Notes
		Sex	Wealth	Place of residence	Province or region	
1	Immunization records 2000–2006				√	
2	DHS 2009	√	√	√	√	17 provinces
3	DHS 2004	√		√	√	13 provinces
	…					

Step 3. Create a list of priority health topics and indicate whether they are described within the various data sources. Alongside each health topic, the data source number (as indicated in step 2) can be listed to show the data sources that contain data on that topic. A partial table combining health topics and data sources is shown below.

List of health topics and corresponding data sources (partial table)

Health topic	Data source number			
Child health	1	2	3	…
Maternal health	2	3	…	
…				

Step 4. Create a data source map that combines the lists from the previous two steps. The list of health topics within unique data sources (from step 3) should be the starting point for this map. From this point, each unique data source on a given health topic and its association with equity stratifiers should be considered. To create the map, data sources with information on each health topic should be listed by their connection to the equity stratifier information, in a single table. A partial data source map is shown below. (Note that the numbers refer to the unique data sources, as introduced in step 2.)

Data source map (partial table)

	Equity stratifier			
Health topic	Sex	Wealth	Place of residence	Province or region
Child health	2, 3 …	2 …	2, 3 …	1, 2, 3 …
Maternal health	Not applicable	2 …	2, 3 …	2, 3 …
…				

Using a data source map enables the selection of health indicators with available data for health inequality monitoring. Once data have been sourced and obtained, the next step of the health inequality monitoring cycle is to measure health inequality. The process of measuring health inequality is described in the next section of this handbook.

Highlights: Section 2

- In general, data sources used for health inequality monitoring are population based (such as censuses, vital registration systems and household surveys) or institution based (such as health facility records).
- For many low- and middle-income countries, household health surveys are, by default, the main data source. Household surveys typically collect data pertaining to a large number of health indicators and many equity stratifiers at the individual level.
- Vital registration systems in low- and middle-income countries are often incomplete, and censuses may be irregular; many low- and middle-income countries do not have systems in place to collect reliable and complete health information through institutions.
- Expanding the number of health indicators and equity stratifiers covered by data sources, as well as linking and harmonizing between data sources, would enhance the capacity for health inequality monitoring.
- Data source mapping – compiling and assessing all available data sources – can help to identify the sources that can be used to monitor health inequality, and the gaps in available information.

Read more:

Braveman P. *Monitoring equity in health: a policy-oriented approach in low- and middle-income countries*. Geneva, World Health Organization, 1998.

Gakidou E, Fullman N. *Monitoring health inequalities: measurement considerations and implications*. Health Information Systems Knowledge Hub. Brisbane, University of Queensland, 2012.

Health Metrics Network. *Framework and standards for country health information systems*, 2nd ed. Geneva, World Health Organization, 2008.

Mahapatra P et al. Civil registration systems and vital statistics: successes and missed opportunities. *Lancet*, 2007, 370(9599):1653–1663.

Nolen LB et al. Strengthening health information systems to address health equity challenges. *Bulletin of the World Health Organization*, 2005, 83(8):597–603.

O'Donnell O et al. *Analyzing health equity using household survey data.* Washington, DC, World Bank, 2008.

3. Measurement of health inequality

Inequality is a complex and ambiguous concept that can be measured and conveyed using a variety of statistical techniques. When measuring health inequality the goal is always the same: to provide a quantitative estimate of health inequality in a population. To this end, one may have to use a variety of measures to fully explore a situation of health inequality.

When approaching the task of measuring health inequalities, a first step involves calculating mean values of health across disaggregated subgroups. This provides a starting point for visual inspection of the health indicator across subgroups. Building on this, this section identifies some of the key measures of inequality, and their strengths and limitations. Understanding the characteristics that make specific measures better suited to certain situations, one can decide which measures of inequality will be best to employ.

3.1 How can health inequalities be measured?

At the most basic level, measures of inequality can be divided into simple and complex measures. Simple measures make pairwise comparisons of health between two subgroups, such as the most and least wealthy. Simple pairwise comparisons have historically been the dominant type of measurement used in inequality monitoring, as their simplicity makes them intuitive and easily understood. Complex measurements, on the other hand, make use of data from all subgroups to assess inequality. When describing the inequality in a health indicator by region, for instance, pairwise comparisons can be used to describe the inequality between two selected regions – such as worst versus best – whereas complex measures could provide a description of the inequality that exists among all regions.

While pairwise comparisons of inequality have certain limitations that complex measures overcome, they will be described here at length as they play an important role in inequality monitoring. Because they are straightforward in nature they are preferable over complex measures in situations where complex measures do not present a substantially improved picture of inequality.

3.2 Simple measures of inequality (pairwise comparisons)

The two most basic measures that can be used to describe inequality are difference and ratio. Difference is an expression of the *absolute* inequality that exists between two subgroups; that is, the mean value of a health indicator in one subgroup subtracted from the mean value of that health indicator in another subgroup. Ratio is an expression of the *relative* inequality that exists between two subgroups; that

is, the mean value of a health indicator in one subgroup divided by the mean value of that health indicator in another subgroup. When there are only two subgroups to compare, difference and ratio are the most straightforward ways to measure the absolute and relative inequality between those two subgroups.

***Tip:* Absolute and relative inequality**

For a given health indicator, *absolute inequality* reflects the magnitude of difference in health between two subgroups. Hypothetically, if health service coverage were 100% and 90% in two subgroups of one population, and 20% and 10% in subgroups of another population, both cases would report absolute inequality of 10 percentage points (using simple difference calculation). Absolute inequality retains the same unit of measure as the health indicator, and conveys an easily understood concept.

Relative inequality measures show proportional differences in health among subgroups. Using a simple ratio calculation, the relative inequality in a population with health service coverage of 100% and 50% in two subgroups would equal 2 (100/50 = 2); the relative inequality in a population with health service coverage of 2% and 1% in two subgroups would also equal 2 (2/1 = 2).

Tables 3.1 and 3.2 each illustrate difference and ratio calculations for a particular health indicator, equity stratifier and setting. In Colombia, the difference between coverage of four or more antenatal care visits in urban and rural areas was lower in 2010 than in previous years, due to accelerated coverage increases in rural areas. In Egypt, the 2000 Demographic and Health Survey (DHS) reported a male/female ratio of 1.0 in under-five mortality rates; in 2008, this ratio was 1.4 due to larger decreases in female mortality than male mortality over this time period.

Table 3.1 Area-based inequality in antenatal care (at least four visits) in Colombia, DHS 1995, 2000, 2005 and 2010

Survey year	Coverage in rural area (%)	Coverage in urban area (%)	Difference (urban – rural) (percentage points)	Ratio (urban / rural)
1995	53.8	82.4	28.6	1.5
2000	64.7	84.9	20.2	1.3
2005	73.1	87.1	14.0	1.2
2010	80.5	90.3	9.8	1.1

Table 3.2 Sex-based inequality in under-five mortality rates in Egypt, DHS 1995, 2000, 2005 and 2008

Survey year	Female (deaths per 1000 live births)	Male (deaths per 1000 live births)	Difference (male – female) (deaths per 1000 live births)	Ratio (male / female)
1995	98.9	92.1	–6.8	0.9
2000	69.3	68.6	–0.7	1.0
2005	46.3	52.1	5.8	1.1
2008	27.7	38.4	10.7	1.4

When there are more than two subgroups to compare, difference and ratio can still be used, but only two subgroups can be compared simultaneously. When the subgroups have a natural ordering (for example, wealth or education), it is intuitive to make a single comparison between those subgroups on the extreme ends of the ordering. In Table 3.3, for example, the population of the Philippines was divided into wealth quintiles, and simple measures of inequality were calculated based on the mean value of coverage of births attended by skilled health personnel in the poorest quintile and the mean value of that health indicator in the richest quintile. While this calculation ignores the health of the population in the middle three quintiles, it can give an overall indication of the wealth-based inequality.

Table 3.3 Wealth-based inequality in births attended by skilled health personnel in the Philippines, DHS 1998, 2003 and 2008

Survey year	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (quintile 5 – quintile 1) (percentage points)	Ratio (quintile 5 / quintile 1)
1998	21.2	45.9	72.8	83.9	91.9	70.7	4.3
2003	25.1	51.4	72.4	84.4	92.3	67.2	3.7
2008	25.7	55.6	75.8	86.0	94.4	68.7	3.7

***Tip:* Ordered and non-ordered groups**

Groups may be either ordered or non-ordered, depending on the dimension of inequality (equity stratifier). Ordered groups have an inherent positioning and can be ranked. For example, wealth has an inherent ordering of subgroups in the sense that those with less wealth unequivocally have *less* of something compared to those with more wealth. Non-ordered groups, by contrast, are not based on criteria that can be logically ranked. Regions, ethnicity, religion and place of residence are examples of non-ordered groupings. This is an important distinction for health inequality monitoring, as certain inequality measures are appropriate for ordered groups or non-ordered groups.

***Tip:* Two subgroups and more than two subgroups**

Some equity stratifiers naturally generate two subgroups (for example, sex, urban-rural place of residence), while others may comprise multiple subgroups (for example, economic status, education level, region). Depending on the available data and the definition adopted, many equity stratifiers could be classified either way. For example, urban-rural subgroups could be expanded to differentiate between people living in large cities, small cities, towns, villages or countryside; economic status could be dichotomized to those living above or below the poverty line.

In cases where there are two subgroups, it is appropriate to use pairwise comparisons of inequality (difference and ratio) to compare between subgroups directly. Complex measures of inequality are useful to measure inequality across more than two subgroups.

When there is no natural ordering to the subgroups (for example, region or race/ethnicity), the selection of the "extreme" subgroups becomes more complex. Simply expressing the difference or ratio between those subgroups with the highest and lowest values of a health indicator can be effective (and could also be applied in the case of naturally ordered subgroups). In other cases, it may be appropriate to calculate and present additional differences or ratios between other specific, "non-extreme" pairs. For example, when analysing the region-based inequality in a health indicator, the capital region of a country may have the most favourable situation (for example, lowest level of an adverse event such as under-five mortality, or highest level of a favourable event such as health service coverage), while a remote rural region may have the worst situation. If only the difference between these two extreme cases were presented as representative of absolute inequality, then nothing would be known about the difference between the capital and other regions in the country.

When more than two subgroups are present it is also possible to calculate pairwise comparisons of inequality for each subgroup against a single reference subgroup – or a set of subgroups with the better situation. This produces a series of pairwise comparisons that describes the inequality among several subgroups. For example, in a case where wealth-based inequality is being described by quintile, the richest quintile may be selected as the reference group, and differences and ratios could be calculated for each of the four poorer quintiles. However, this would produce four separate estimates of "inequality" for difference and four for ratio, with each figure representing part of the level of inequality. It might be difficult to try to understand four numbers simultaneously when contemplating a single health indicator in a single dimension of inequality. For this reason, when difference or ratio is used to measure inequality, generally only the most extreme differences or ratios are emphasized.

3.3 Limitations of simple measures of inequality

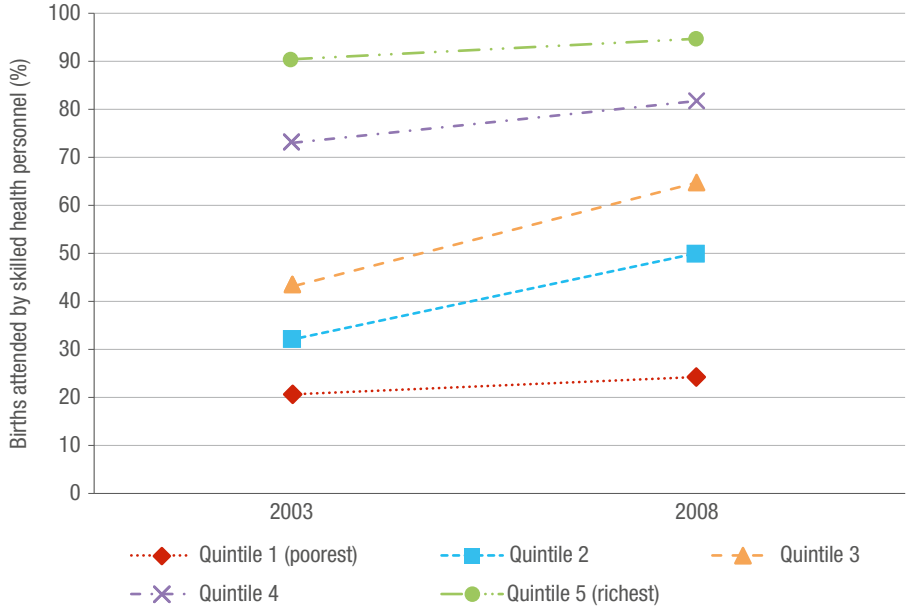
There are two major limitations to simple measures of inequality. The first is that pairwise comparisons ignore all other subgroups that are not being compared (for example, "middle" or "non-extreme" subgroups). The following example of wealth-based inequality in coverage of births attended by skilled health personnel in Ghana (Table 3.4) illustrates the problems that can occur when the middle subgroups are ignored by simple measures of inequality.

Table 3.4 Wealth-based inequality in births attended by skilled health personnel in Ghana, DHS 2003 and 2008

Survey year	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (quintile 5 – quintile 1) (percentage points)
2003	20.6	31.9	43.3	73.0	90.4	69.8
2008	24.2	50.0	64.8	81.7	94.6	70.4

From Table 3.4 it is possible to conclude, based on the difference values, that wealth-based absolute inequality in the coverage of births attended by skilled health personnel was almost unchanged in Ghana from DHS 2003 to DHS 2008. However, viewing this information in graphical form (Figure 3.1), it becomes clear that the simple measures of inequality do not tell the whole story. Each of the middle wealth quintiles (quintile 4 and especially quintiles 2 and 3) experienced notably improved coverage over this period, moving closer to the level of coverage in quintile 5, a trend that is not captured by the pairwise difference comparison between the extreme subgroups (quintile 5 and quintile 1).

Figure 3.1 Births attended by skilled health personnel in Ghana, by wealth quintile, DHS 2003 and 2008

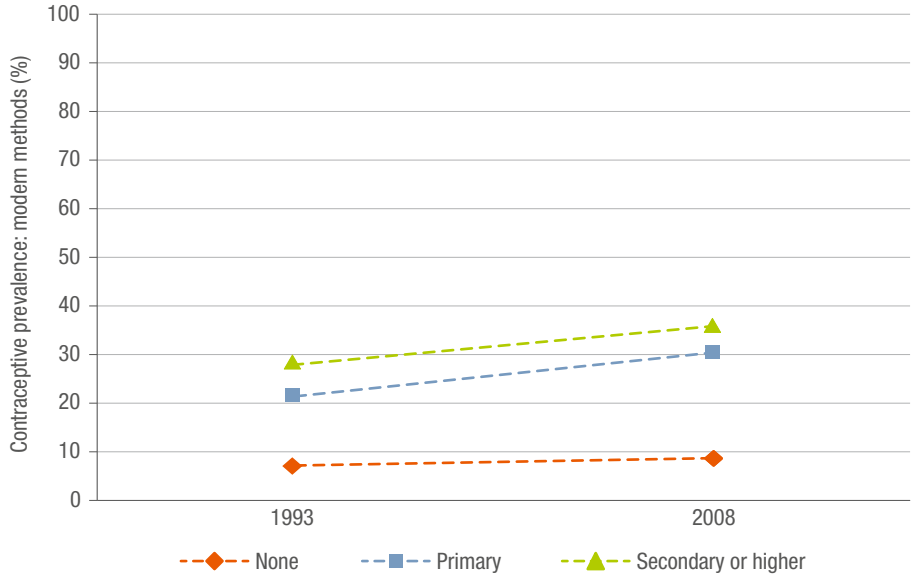


The second major limitation to simple measures of inequality is that the sizes of the subgroups are not taken into consideration. Table 3.5 and Figure 3.2 illustrate this limitation using a case of population shift between education subgroups in the Philippines.

Table 3.5 Education-based inequality in contraceptive prevalence (modern methods) in the Philippines, DHS 1993 and 2008

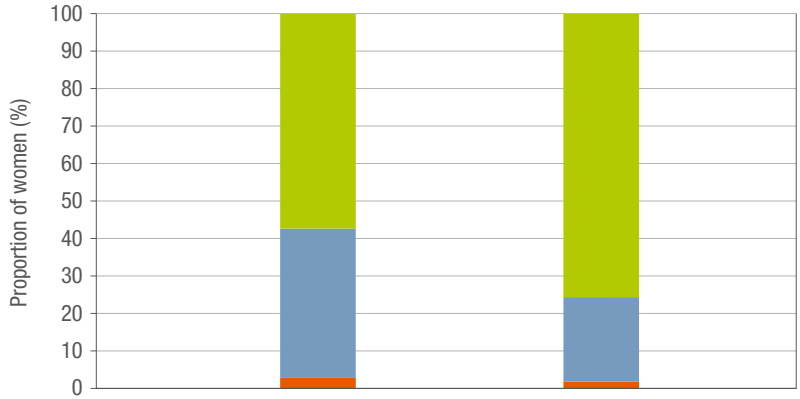
Survey year	None (%)	Primary (%)	Secondary or higher (%)	Difference (secondary or higher – none) (percentage points)
1993	7.2	21.5	28.0	20.8
2008	8.7	30.3	35.8	27.1

Figure 3.2 Contraceptive prevalence (modern methods) in the Philippines, by education level, DHS 1993 and 2008



Judging from the simple measures of inequality presented in Table 3.5, and graphed in Figure 3.2, it would seem that education-based absolute inequality in modern contraceptive prevalence in the Philippines increased between DHS 1993 and DHS 2008, mainly due to increased coverage in the most-educated subgroups. However, when the proportion of the population in each of these population subgroups is taken into account, the picture becomes more complex than suggested by the simple measures of inequality (Figure 3.3).

Figure 3.3 Proportion of women of reproductive age in the Philippines, by education level, DHS 1993 and 2008



	1993	2008
Secondary or higher	57.4	75.7
Primary	39.9	22.6
None	2.7	1.7

Source: Data provided by: International Center for Health Equity, Federal University of Pelotas, Brazil.

The data presented in Figure 3.3 show that the population of women of reproductive age shifted among education subgroups substantially between 1993 and 2008 in the Philippines: the proportion of the population with lower levels of education decreased, while the proportion of the population with the highest level of education increased. Why might this shift have occurred? One possibility is that government policy may have expressly pursued increasing education as a means to reduce the number of persons in a socially disadvantaged position. Essentially, more women were getting an education at the secondary or higher level. This means that in 2008, a smaller proportion of the population – the non-educated subgroup – had lower prevalence of modern contraceptive use than in 1993; given the different distribution of population between education subgroups, simple measures of health inequality between the two periods would not be directly comparable.

Looking at this example, there are several possible interpretations that may arise. Some may take the view that inequality decreased due to the larger number of women who belong to the secondary or higher subgroup and have higher health service coverage. To illustrate how this might happen, one can imagine that the government may have extended the availability of (or promoted the use of) modern contraceptives to women who were listed in the "none" education category in 1993, but in the subsequent years those women received more education, leading them to be listed in the "primary" or "secondary or higher" category in DHS 2008. Intuitively, the increase in modern contraceptive use among these previously uncovered women

would result in a decrease in inequality; however, if the newly covered population moves out of the lowest education subgroup, the extension of coverage achieved would go unnoticed using simple measures of inequality.

Considering that the subgroup with no education comprised less than 3% of the population throughout the period analysed, and over 97% of the population was in the two most educated subgroups, are the simple pairwise comparisons appropriate? The answer to this question depends on how the data are intended to be used. There are certain cases where it is justified to ignore population size when measuring inequality. For example, when considering small indigenous populations it may be important to recognize health inequalities that exist in disparate groups. If the education-based inequality presented above wished to represent the difference between subgroups with no education and secondary or higher education, the experience of a small percentage of the population in the "none" education subgroup would be valid. If, however, one wished to take into account the distribution of the population between the subgroups, complex measures of inequality would need to be used. A follow-up to this example showing how inequality can be measured using complex measures can be found in subsection 3.5 of this handbook.

There are other challenges in interpretation that can occur as a result of population shifts from one subgroup to another when simple measures are used. For example, more-educated subgroups may appear to be losing coverage of a health service over time, when in reality this could be the result of a population shift of uncovered persons from less-educated subgroups into more-educated subgroups. When populations are shifting from one subgroup into another, assessing time trends using simple measures of inequality may lead to different conclusions than would complex measures that account for population sizes and shifts. To minimize this confusion, in cases of population shifts the relative size of the population subgroup should be reported alongside disaggregated mean values of a health indicator.

While the major problems related to simple measures and group size occur when individuals are shifting between subgroups, ignoring group size can also exacerbate differences in the conclusions about inequality when using simple measures of inequality that overlook middle subgroups in a distribution. Complex measures, which alleviate the limitations of simple measures, will be described in the following subsection.

***Tip:* Unweighted and weighted data**

Calculations that are based on *weighted data* take into account the population size of each subgroup. This is a feature of complex measures, where calculations consider the proportion of the total population comprised by each subgroup. By contrast, calculations based on *unweighted data* treat each subgroup as equally sized. Simple, pairwise measures of inequality are based on unweighted data, and some complex measures can also be calculated using unweighted data (for example, mean difference from the overall mean may be weighted or unweighted).

3.4 Complex measures of inequality

Complex measures of inequality produce a single number that is an expression of the amount of inequality existing across all subgroups of a population. Complex measures of inequality can be calculated using statistical software, but can usually be calculated using more basic software programs as well.

There are two major types of complex measures of inequality: (a) those that measure inequality across a series of subgroups with a natural ordering; and (b) those that measure inequality across a series of subgroups, but do not require a natural ordering. The difference between these two cases – those with natural ordering of subgroups and those without – affects the choice of measure of inequality to be used.

***Extra information:* Ordered geographical regions**

Occasionally the geographical regions used in health inequality monitoring are assigned a "natural" ordering. This is usually done when an individual-level equity stratifier and health indicator data do not directly link, so regional mean values for health indicators and equity stratifiers are used to link the data streams for inequality analysis. For example, a given dataset may record infant deaths and also the geographical region in which they occurred. However, individual-level data on the wealth of families that did and did not experience infant deaths may not be available. In this case, if the average wealth in each geographical region is known, regions can be ranked by wealth and used as a proxy mechanism to assess wealth-based inequality in infant mortality to compare mortality rates from the richest to the poorest regions.

Read more:

Braveman P. *Monitoring equity in health: a policy-oriented approach in low- and middle-income countries.* Geneva, World Health Organization, 1998.

3.5 Complex measures of inequality in ordered groups

The two most common complex measures to summarize health inequality in a series of subgroups with a natural ordering are the slope index of inequality (to assess absolute inequality) and the concentration index (to assess relative inequality). A common strength of both of these measures is that their calculation involves weighting by the size of the population, enabling them to yield a single number that describes inequality among all subgroups, taking into account the population size.

Slope index of inequality

The slope index of inequality is used to show the gradient of health across multiple subgroups with natural ordering (most commonly education or wealth). The slope index of inequality represents the absolute difference in predicted values of a health indicator between those with the highest level of education or wealth and those with the lowest level of education or wealth, while taking into consideration the entire distribution of education or wealth using an appropriate regression model.

To calculate the slope index of inequality, a weighted sample of the whole population is ranked from the most disadvantaged subgroup (at rank zero or 0) to the most advantaged (at rank 1) according to, for example, education or wealth. This ranking is weighted, accounting for the proportional distribution of the population within each subgroup. The population of each wealth or education category is then considered in terms of its range in the cumulative population distribution, and the midpoint of this range. Then, the health indicator of interest is regressed against this midpoint value for wealth or education subgroups using an appropriate model, and the predicted values of the health indicator are calculated for the two extremes (rank 1 and rank 0). The difference between the predicted values at rank 1 and rank 0 (covering the entire distribution) generates the slope index of inequality value. Thus, the slope index of inequality represents the difference between the lowest and the highest, while considering all other subgroups in the regression (that is, the effect of change in the whole distribution of population by education or wealth). When the slope of the regression line is flat, the slope index of inequality is 0. When ranking from the most disadvantaged to the most advantaged, positive values indicate that the health indicator of interest is more prevalent in the most advantaged subgroup, whereas negative values mean that the indicator is more prevalent in the most disadvantaged subgroup.

The slope index of inequality value has straightforward meaning and has the same unit of measure as the health indicator, making it very useful. Non-technical audiences can understand the slope index as an estimate of the difference in a given health indicator between the worst-off and best-off individual in a population, though they may initially understand little about how the number is calculated or why it provides an advantage over simple difference.

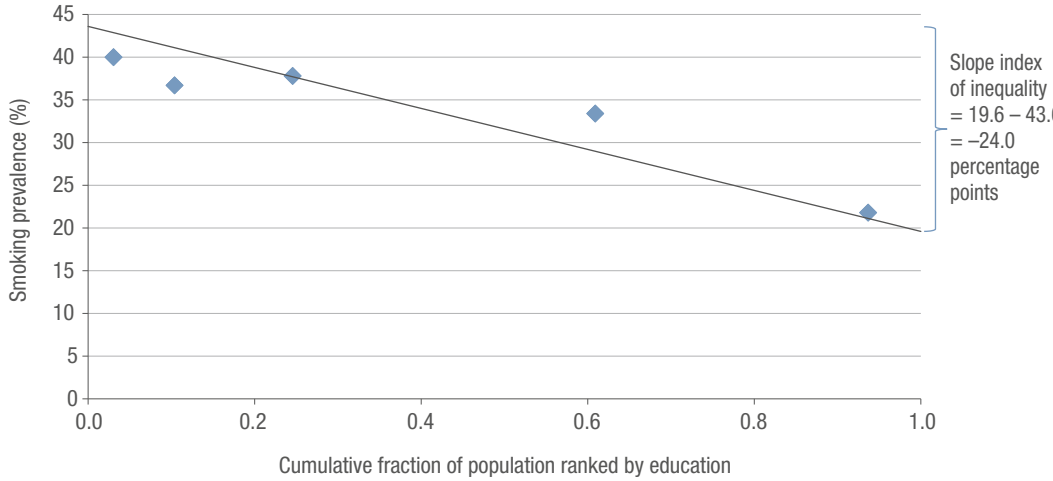
To illustrate how the slope index of inequality is calculated, Table 3.6 breaks down the proportional distribution of the population, cumulative range of the population and midpoint of the cumulative range of population values for education subgroups among men living in 27 middle-income study countries. The smoking prevalence in each education level is shown alongside. These columns represent the *x* axis (midpoint of cumulative range) and *y* axis (smoking prevalence) in corresponding Figure 3.4.

Table 3.6 Arriving at midpoint values of cumulative range based on education subgroups, for a population of men living in 27 middle-income countries and associated smoking prevalence, World Health Survey 2002–2004

Education level	Proportional distribution of population	Cumulative range of population	Midpoint of cumulative range of population (x axis)	Smoking prevalence (%) (y axis)
No formal schooling	0.0610	0.0000–0.0610	0.0305	40.0
Less than primary school	0.0856	0.0610–0.1466	0.1038	36.7
Primary school completed	0.1980	0.1466–0.3446	0.2456	37.8
Secondary/high school completed	0.5287	0.3446–0.8734	0.6090	33.4
College completed or above	0.1266	0.8734–1.0000	0.9367	21.8

Source: Data derived from Hosseinpoor AR et al. Socioeconomic inequalities in risk factors for noncommunicable diseases in low-income and middle-income countries: results from the World Health Survey. *BMC Public Health*, 2012, 12:912.

Figure 3.4 Slope index of inequality: absolute inequality in smoking prevalence in a population of men living in 27 middle-income countries, World Health Survey 2002–2004



Source: Data derived from Hosseinpoor AR et al. Socioeconomic inequalities in risk factors for noncommunicable diseases in low-income and middle-income countries: results from the World Health Survey. *BMC Public Health*, 2012, 12:912.

Building on this information, the prevalence of smoking within each education subgroup is regressed against the midpoint of cumulative range (Figure 3.4). This provides the predicted values of smoking prevalence among the individuals with the lowest and the highest education level (43.6% at rank 0 and 19.6% at rank 1). The slope index of inequality – or the difference between these two values – is calculated to be –24.0 percentage points (19.6 minus 43.6), demonstrating absolute, education-based inequality in smoking among men living in middle-income study countries. The negative sign indicates that smoking is more prevalent among the least educated.

Concentration index

The concentration index is a relative measure of inequality that shows the health gradient across multiple subgroups with natural ordering (most commonly education or wealth). It indicates the extent to which a health indicator is concentrated among the disadvantaged or the advantaged. Given that a population is ranked by increasing socioeconomic status, the concentration index has a negative value when the health indicator – whether a favourable indicator such as measles immunization coverage or an adverse indicator such as under-five mortality – is concentrated among the disadvantaged (for example, the poor or less educated); and it has a positive value when the health indicator is concentrated among the advantaged (for example, the rich or more educated). When there is no inequality, the concentration index is 0. If a single individual (the smallest possible population subgroup) accounted for 100% of a health indicator in a population (the highest relative inequality that is theoretically possible), this would cause the concentration index to approach its maximum absolute value of either –1 or +1. While ±1 is the theoretical maximum of a concentration index, in practice absolute values for the concentration index will rarely exceed 0.5, and a value of 0.2 to 0.3 is considered to represent a reasonably high level of relative inequality.

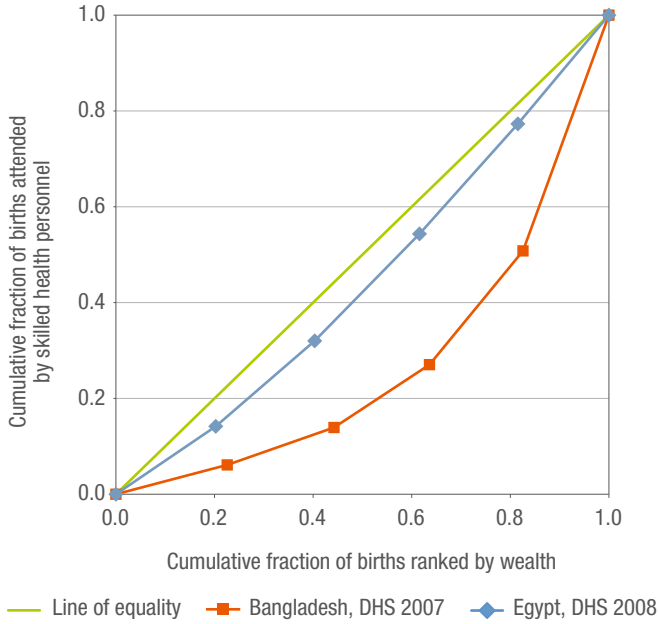
The visual way to illustrate the concentration index is to use a related concept called the concentration curve. Like the slope index of inequality, it starts with ranking a weighted sample of the whole population from the most-disadvantaged subgroup (at rank 0) to the most-advantaged (at rank 1) according to, for example, education or wealth (*x* axis). The *y* axis indicates the cumulative fraction of the health indicator corresponding to each subgroup. The concentration curve is drawn by connecting the dots. The concentration curve lies below the 45° diagonal line from the bottom left corner to the top right – the so-called line of equality – if the health indicator is concentrated among the advantaged; the concentration curve lies above the line of equality if the health indicator is concentrated among the disadvantaged. When there is no inequality, the concentration curve lies on the line of equality. The concentration index is calculated as twice the area between the hypothetical line of equality and the concentration curve.

Table 3.7 shows how to arrive at the components of the concentration curve and concentration index using wealth-disaggregated data from Bangladesh and Egypt. The highlighted columns represent the values that are plotted to create the concentration curves. Concentration curves can be graphed by plotting the cumulative fraction of births ranked by household wealth against the cumulative fraction of births attended by skilled health personnel (Figure 3.5). With a reference line of hypothetical equality (shown in the figure in green), curved lines for each country demonstrate how far the country deviates from equality. In this example, it is clear that Bangladesh has more wealth-based relative inequality than Egypt, because the red line falls farther from the green line than does the blue line.

Table 3.7 Arriving at cumulative fraction values for births and births attended by skilled health personnel using wealth-disaggregated data from Bangladesh and Egypt, DHS 2007 and 2008

Country	Household wealth	Number of births (in weighted sample)	Proportion of births	Cumulative fraction of births	Number of births attended by skilled health personnel (in weighted sample)	Proportion of births attended by skilled health personnel	Cumulative fraction of births attended by skilled health personnel
Bangladesh, DHS 2007	Quintile 1 (poorest)	1367	0.226	0.226	66	0.061	0.061
	Quintile 2	1312	0.217	0.442	85	0.078	0.139
	Quintile 3	1173	0.194	0.636	143	0.131	0.270
	Quintile 4	1149	0.190	0.826	258	0.237	0.508
	Quintile 5 (richest)	1056	0.174	1.000	535	0.492	1.000
Egypt, DHS 2008	Quintile 1 (poorest)	2145	0.203	0.203	1183	0.142	0.142
	Quintile 2	2125	0.201	0.403	1490	0.178	0.320
	Quintile 3	2251	0.213	0.616	1865	0.223	0.543
	Quintile 4	2113	0.200	0.815	1917	0.230	0.773
	Quintile 5 (richest)	1956	0.185	1.000	1896	0.227	1.000

Figure 3.5 Relative wealth-based inequality in births attended by skilled health personnel in Bangladesh and Egypt, represented using concentration curves, DHS 2007 and 2008



The concentration index values for Bangladesh and Egypt, along with other countries, are shown in Table 3.8. These values are shown alongside ratio values to provide an idea of concentration index values that may be generated in health inequality monitoring. Data about the coverage of the health indicator (births attended by skilled health personnel) and the distribution of total births among wealth quintiles are also provided.

In subsection 3.3, the case of education-based inequality in modern contraceptive prevalence in the Philippines was used to illustrate a limitation of using pairwise comparisons that occurs when populations shift between subgroups. Complex measures overcome these limitations by accounting for subgroup sizes. While simple measures of inequality showed an increase in difference and only a small increase in ratio, complex measures accounted for population shift, showing only a small reduction in absolute inequality (the slope index of inequality) but a halving of relative inequality (concentration index) (Table 3.9).

Table 3.8 Wealth-based relative inequality in births attended by skilled health personnel in selected countries, DHS 2006–2010

Country	Household wealth	Births attended by skilled health personnel (%)	Proportion of total births	Ratio (quintile 5 / quintile 1)	Concentration index
Colombia, DHS 2010	Quintile 1 (poorest)	83.7	0.25	1.2	0.04
	Quintile 2	96.4	0.23		
	Quintile 3	98.7	0.22		
	Quintile 4	99.3	0.18		
	Quintile 5 (richest)	99.4	0.12		
Rwanda, DHS 2010	Quintile 1 (poorest)	61.2	0.23	1.4	0.07
	Quintile 2	63.5	0.22		
	Quintile 3	66.7	0.20		
	Quintile 4	72.6	0.19		
	Quintile 5 (richest)	85.9	0.17		
Egypt, DHS 2008	Quintile 1 (poorest)	55.2	0.20	1.8	0.11
	Quintile 2	70.1	0.20		
	Quintile 3	82.8	0.21		
	Quintile 4	90.7	0.20		
	Quintile 5 (richest)	96.9	0.18		
Uganda, DHS 2006	Quintile 1 (poorest)	28.7	0.22	2.7	0.21
	Quintile 2	32.0	0.23		
	Quintile 3	35.3	0.20		
	Quintile 4	50.0	0.19		
	Quintile 5 (richest)	77.1	0.16		
Philippines, DHS 2008	Quintile 1 (poorest)	25.7	0.27	3.7	0.24
	Quintile 2	55.6	0.23		
	Quintile 3	75.8	0.19		
	Quintile 4	86.0	0.18		
	Quintile 5 (richest)	94.4	0.14		
Ghana, DHS 2008	Quintile 1 (poorest)	24.2	0.26	3.9	0.25
	Quintile 2	50.0	0.22		
	Quintile 3	64.8	0.19		
	Quintile 4	81.7	0.19		
	Quintile 5 (richest)	94.6	0.14		
Bangladesh, DHS 2007	Quintile 1 (poorest)	4.9	0.23	10.4	0.48
	Quintile 2	6.5	0.22		
	Quintile 3	12.2	0.19		
	Quintile 4	22.5	0.19		
	Quintile 5 (richest)	50.6	0.17		

Note: Due to rounding country totals may not equal exactly 1 in proportion of total births column.

Table 3.9 Education-based inequality in contraceptive prevalence (modern methods) in the Philippines, DHS 1993 and 2008

Survey year	Simple measures of inequality		Complex measures of inequality	
	Difference (secondary school or higher – none) (percentage points)	Ratio (secondary school or higher / none)	Slope index of inequality (percentage points)	Concentration index
1993	20.8	3.9	15.7	0.08
2008	27.1	4.1	14.3	0.04

Using complex measures to account for population shifts is particularly important when health inequality monitoring is carried out to assess the effects of social policy. Broad social policies that are successful in alleviating poverty, increasing educational opportunities or creating jobs can result in a decrease in the size of disadvantaged subgroups. Evaluating the impact of such policies on health inequality is often of interest to those involved in the policy-making process. In order to generate measures that can be compared across time, health inequality monitoring should be sensitive to such changes in population characteristics.

***Tip:* Slope index of inequality and concentration index – other applications**

The descriptions and examples of the slope index of inequality and the concentration index presented in this handbook involve calculations from group-level data; however, both of these indices can also be calculated from individual-level data.

In addition to using the slope index of inequality to show absolute inequality, it is also possible to use an analogous measure to calculate relative inequality (the relative index of inequality). The relative index of inequality is generated in the same manner as the slope index of inequality, except the predicted values (at rank 1 and rank 0) are divided rather than subtracted. This measure can also be easily understood by audiences with no technical expertise in the area. When ranking from the most disadvantaged (the least educated at rank 0) to the most advantaged (the most educated at rank 1), a relative index of inequality value greater than 1 represents higher prevalence in the most advantaged.

Similarly, there is a version of the concentration index that expresses absolute inequality. This is derived by plotting the cumulative fraction of the population ranked by socioeconomic status against the cumulative *amount* of the health indicator, instead of the cumulative *fraction* of the health indicator.

3.6 Complex measures of inequality in non-ordered groups

While the slope index of inequality and the concentration index are useful complex measures of absolute and relative inequality, they are not appropriate in cases where subgroups are non-ordered. (This is because they require a natural ordering in order to determine the cumulative fractional rank variables that are used in the initial plotting for each measure.) When using a stratifier whose groupings have no evident order, absolute mean difference is a useful measure of absolute inequality, while the Theil index is a useful measure of relative inequality.

Absolute mean difference from the overall mean

The absolute mean difference from the overall mean is an intuitive measure of absolute inequality among subgroups, because it answers the question, how different is each subgroup, on average, from the population average? To calculate the absolute mean difference from the overall mean, the absolute value of the difference between the mean of a health indicator in each population subgroup and the mean in the total population are summed, then this sum is divided by the number of subgroups. In a theoretical population where there are four subgroups, each of which has a mean health indicator value equal to the mean of the total population, the mean difference from the overall mean would equal its minimum value of 0. If the four subgroups are distributed such that two of the subgroups have mean health indicator values that are 1 unit below the population mean, and two subgroups have mean health indicator values that are 1 unit above the population mean, then the mean difference from the overall mean would be 1. This value is intuitive: on average, each subgroup differs from the population mean by 1, so the absolute mean difference from the overall mean is 1. Only positive values can be generated for the mean difference from the mean, so it cannot describe which direction subgroups tend to be differing from the population mean. This is different from the slope index of inequality and the concentration index, which can produce both negative and positive values indicative of the direction of inequality. Absolute mean difference from the overall mean is generally used in cases when there is no natural ordering of population subgroups, so it is logical that an indication of directionality would not be possible.

Weighted absolute mean difference from the overall mean

The rudimentary calculation for mean difference from the overall mean presented above disregards the size of the subgroups. To account for cases where subgroups differ in size, this calculation can also be done by weighting each difference by the size of the subgroup. A weighted mean difference from the overall mean is calculated by taking the difference of each subgroup's mean from the population average and multiplying

these differences by each subgroup's population size. These weighted differences are then summed and divided by the total population size in order to calculate the weighted mean difference from the overall mean. Depending on the situation at hand, this weighted measure may be a more appropriate representation of inequality.

***Tip:* Reference points**

For both the weighted and unweighted mean difference, the reference for the comparison of each population subgroup does not have to be the overall population mean value. In some cases, it may be more logical to use the best-performing subgroup – or justify a target – as a reference for comparison. Calculating the difference of each subgroup from the best subgroup and taking the average of those differences in the calculation indicates the mean difference from the best-performing subgroup. This is also referred to as shortfall inequality. The advantage of using the best subgroup as a reference point rather than the overall mean is that if inequalities were to be reduced, the goal would be to bring all subgroups up to the level of the best-performing subgroup, not simply bring all subgroups to the level of the overall population mean.

Read more:

Hosseinpoor AR et al. International shortfall inequality in life expectancy in women and in men, 1950–2010. *Bulletin of the World Health Organization*, 2012, 90(8):588–594.

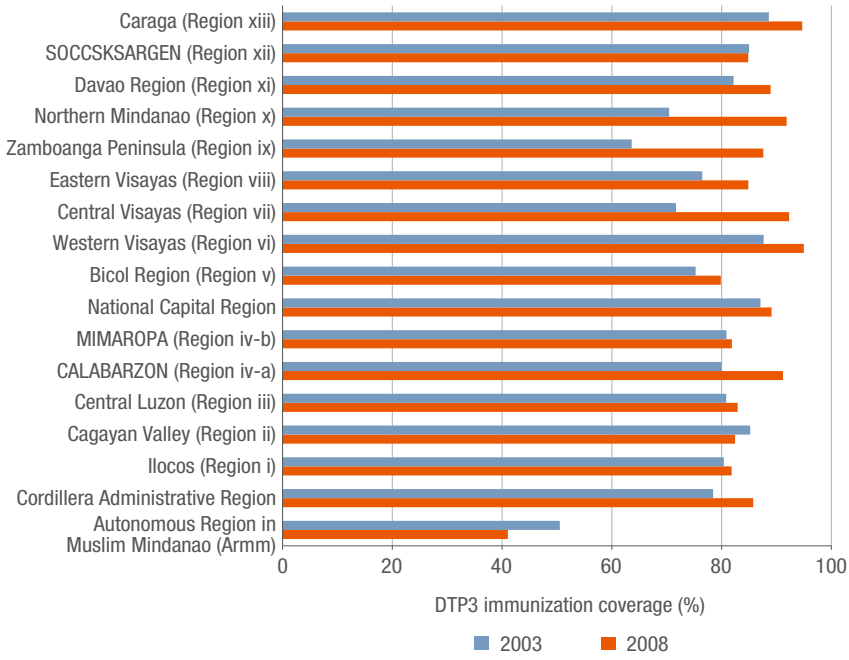
Pearcy JN, Keppel KG. A summary measure of health disparity. *Public Health Reports*, 2002, 117(3):273–280.

The following example, which considers the time trend in region-based absolute inequality in diphtheria–tetanus–pertussis (DTP3) immunization in the Philippines, illustrates how mean difference from the mean calculations can differ from simple difference calculations. If difference alone were used to describe inequality, one would conclude that absolute inequality greatly increased between DHS 2003 and DHS 2008; however, measures that take into account all regions suggest that there was no change (Table 3.10). Examining the trends in Figure 3.6, it becomes clear that the increase in absolute difference is due to a decrease in coverage in the Autonomous Region in Muslim Mindanao (the region with the lowest coverage in both DHS 2003 and 2008), while the Caraga region (the region with the highest coverage in both DHS 2003 and 2008) had an increase in coverage during the same period. The mean difference from the best region and the mean difference from the national average capture the changes across all regions, while simple difference calculations show only the situation in the regions with the highest and lowest immunization coverage.

Table 3.10 Region-based inequality in DTP3 immunization coverage among 1-year-olds in the Philippines, DHS 2003 and 2008

Survey year	Difference (high – low) (percentage points)	Mean difference from the best region	Mean difference from national average
2003	38.1	10.7	6.7
2008	53.9	10.5	6.5

Figure 3.6 Region-based inequality in DTP3 immunization coverage among 1-year-olds in the Philippines, DHS 2003 and 2008



Source: Disaggregated data provided by: International Center for Health Equity, Federal University of Pelotas, Brazil.

***Extra information:* Other measures similar to mean difference from the overall mean**

Like mean difference from the overall mean, standard deviation, variance and index of disparity are other measures that can be applied to assess health inequality in non-ordered subgroups. For example, Movahedi et al. (2009) and Moradi-Lakeh et al. (2013) used standard deviation and index of disparity to show absolute and relative geographical inequality over time in selected health indicators in rural areas in the Islamic Republic of Iran.

Moradi-Lakeh et al. Geographical disparities in child mortality in the rural areas of Iran: 16-years trend. *Journal of Epidemiology and Community Health*, 2013, 67(4):346–349.

Movahedi M et al. Trends and geographical inequalities of the main health indicators for rural Iran. *Health Policy and Planning*, 2009, 24(3):229–237.

Theil index

The Theil index allows for measurement of relative inequality between subgroups in cases where there is no natural ordering among population subgroups. The Theil index is calculated with the following mathematical formula:

$$T = \sum_{i=1}^{N} p_i r_i ln(r_i)$$

where, for subgroup i, p_i is the proportion of the population, and r_i is the ratio of the health indicator prevalence in the subgroup i to the overall health indicator prevalence in the population.

Values of the Theil index may be difficult for non-technical audiences to interpret. To help explain, imagine a theoretical scenario where four equally sized population subgroups are being compared, each of which accounts for 25% of the prevalence of modern contraceptive use. This situation would have no relative inequality, as each subgroup would have a proportionate share of the overall prevalence. Consequently, the Theil index would be 0. Each subgroup will have a mean value of the health indicator that is equal to the total population mean (so the ratio of these means will be 1), and as a result the products calculated for summation for the Theil index will all include the natural log of 1 (and $ln(1) = 0$), leading the Theil index to be 0. As relative inequality increases, this ratio will move away from 0 and the Theil index increases. Greater values for the Theil index indicate higher levels of relative inequality with no maximum. While components of the summation for the Theil index can be negative, the Theil index itself will always be a positive value.

The Theil index is used in the example in Table 3.11 to show relative inequality in coverage of antenatal care (at least four visits) among regions in Egypt at four time points. The Theil index is a good choice of inequality measure in this case because the subgroups are non-ordered regions, and each subgroup comprises a different proportion of the population. For easier comprehension, the Theil index components were all multiplied by 1000. At each time point it is clear that relative inequality is decreasing, as Theil index values are approximately half of the previous survey period.

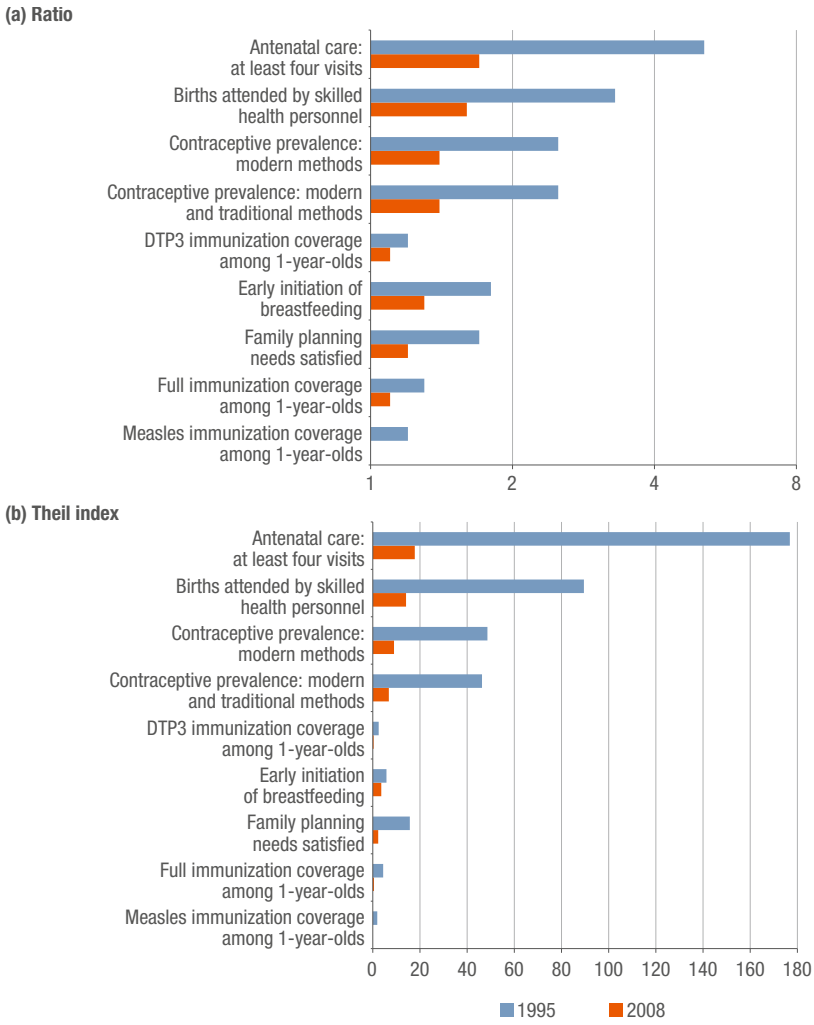
To become more familiar with values of the Theil index, both ratio and Theil index values are presented for a number of health indicators in Figure 3.7. (Ratio was calculated based on the regions with the highest and lowest coverage for each indicator.) This provides a representation of the relative inequality among regions in Egypt, across the years and indicators described. The utility of the Theil index becomes evident as conclusions can easily be drawn (for example, the level of relative inequality decreased for all indicators from DHS 1995 to 2008; in 1995, the level of relative inequality was high for antenatal care (at least four visits) and births attended by skilled health personnel but low for immunizations).

Table 3.11 Arriving at Theil index values for antenatal care (at least four visits), using region-disaggregated data from Egypt, DHS 1995, 2000, 2005 and 2008

Region	Coverage of antenatal care: at least four visits (%)	Proportion of the population (p_i)	Ratio of coverage in region *i* to national coverage (r_i)	Natural log of ratio of coverage in region *i* to national coverage ($ln(r_i)$)	Theil index components ($p_i r_i ln(r_i)$), multiplied by 1000	Theil index, multiplied by 1000
DHS 1995						
Frontier governorates	32.6	0.01	1.07	0.07	0.71	176.78
Lower Egypt: rural	21.5	0.29	0.71	–0.35	–71.71	
Lower Egypt: urban	53.3	0.10	1.75	0.56	100.53	
Upper Egypt: rural	10.8	0.29	0.36	–1.04	–107.55	
Upper Egypt: urban	41.2	0.11	1.35	0.30	45.79	
Urban governorates	55.4	0.19	1.82	0.60	209.01	
National coverage	*30.4*					
DHS 2000						
Frontier governorates	30.2	0.01	0.77	–0.26	–2.97	68.10
Lower Egypt: rural	34.9	0.31	0.90	–0.11	–30.63	
Lower Egypt: urban	56.0	0.12	1.44	0.36	60.45	
Upper Egypt: rural	21.1	0.28	0.54	–0.61	–93.05	
Upper Egypt: urban	51.7	0.11	1.33	0.28	41.61	
Urban governorates	56.9	0.17	1.46	0.38	92.69	
National coverage	*39.0*					
DHS 2005						
Frontier governorates	60.6	0.01	1.00	0.00	–0.03	34.59
Lower Egypt: rural	62.4	0.31	1.03	0.03	8.61	
Lower Egypt: urban	81.7	0.10	1.34	0.30	39.89	
Upper Egypt: rural	39.4	0.30	0.65	–0.43	–84.66	
Upper Egypt: urban	68.4	0.13	1.13	0.12	16.70	
Urban governorates	80.1	0.15	1.32	0.28	54.07	
National coverage	*60.7*					
DHS 2008						
Frontier governorates	65.8	0.01	0.99	–0.01	–0.15	17.78
Lower Egypt: rural	63.9	0.34	0.96	–0.04	–13.23	
Lower Egypt: urban	78.5	0.10	1.18	0.16	19.57	
Upper Egypt: rural	50.3	0.27	0.76	–0.28	–57.30	
Upper Egypt: urban	75.6	0.11	1.14	0.13	15.65	
Urban governorates	85.6	0.16	1.29	0.25	53.25	
National coverage	*66.5*					

Source: Disaggregated data provided by: International Center for Health Equity, Federal University of Pelotas, Brazil.

Figure 3.7 Region-based relative inequality in selected reproductive, maternal and child health indicators in Egypt shown using (a) ratio and (b) Theil index, DHS 1995 and 2008



Source: Disaggregated data provided by: International Center for Health Equity, Federal University of Pelotas, Brazil.

3.7 Population attributable risk

Population attributable risk is a measure of absolute inequality, and is based on the premise that inequality could be eliminated by improving the level of a health indicator in a population to match the best-performing subgroup. Simply put, population attributable risk shows the improvement possible if all subgroups had the same rate as a reference subgroup. This measurement can be used for ordered or non-ordered groups, and can take into account subgroups of different sizes. In practice, the reference subgroup typically is that which has the best outcome (for example, highest coverage of a health service) or, when the subgroups are ordered, the highest social position (for example, richest, most educated).

Population attributable risk is a useful measure to explain the contribution of within-country inequality to a country's progress towards universal health coverage. The gap in health service coverage represents the proportion of health services that were required but not received – that is, the increase in coverage needed to achieve universal coverage. A lower national gap indicates that a country is closer to achieving universal coverage. Looking at coverage of family planning needs satisfied by wealth quintile, for example, population attributable risk shows the reduction in national coverage gap (increase in proportion of family planning needs satisfied) that would be achieved if the total population were to have the same coverage as the richest quintile. To calculate population attributable risk, the coverage gap of family planning needs satisfied in the richest quintile is subtracted from the coverage gap in the total population.

An analogous measure, population attributable risk percentage, can be used to express relative inequality. This is calculated by dividing the population attributable risk by the overall rate in the total population. The outcome, a value between 0 and 100, represents the proportional improvement possible by eliminating inequality between subgroups (to the level of the reference subgroup). In situations of pronounced inequality, where rate of the health indicator differs greatly between the reference subgroup and other subgroups, population attributable risk percentage will be high.

Table 3.12 displays measures of population attributable risk and population attributable risk percentage for the coverage gap in family planning needs satisfied, using the richest wealth quintile as the reference group. Notice that, while Cameroon and Chad have the same population attributable risk (absolute inequality), population attributable risk percentage shows higher relative inequality in Cameroon than Chad due to lower coverage gap in Cameroon. This again demonstrates the importance of using both absolute and relative measures to explain inequality.

Table 3.12 Wealth-based inequality in the coverage gap in family planning needs satisfied in selected African countries, DHS 2000–2008

Country	National coverage gap (%)	Coverage gap in richest wealth quintile (%)	Population attributable risk (percentage points)	Population attributable risk percentage
Benin	64	44	20	31
Burkina Faso	68	41	27	40
Cameroon	44	26	18	40
Chad	88	70	18	20
Congo	27	20	7	27

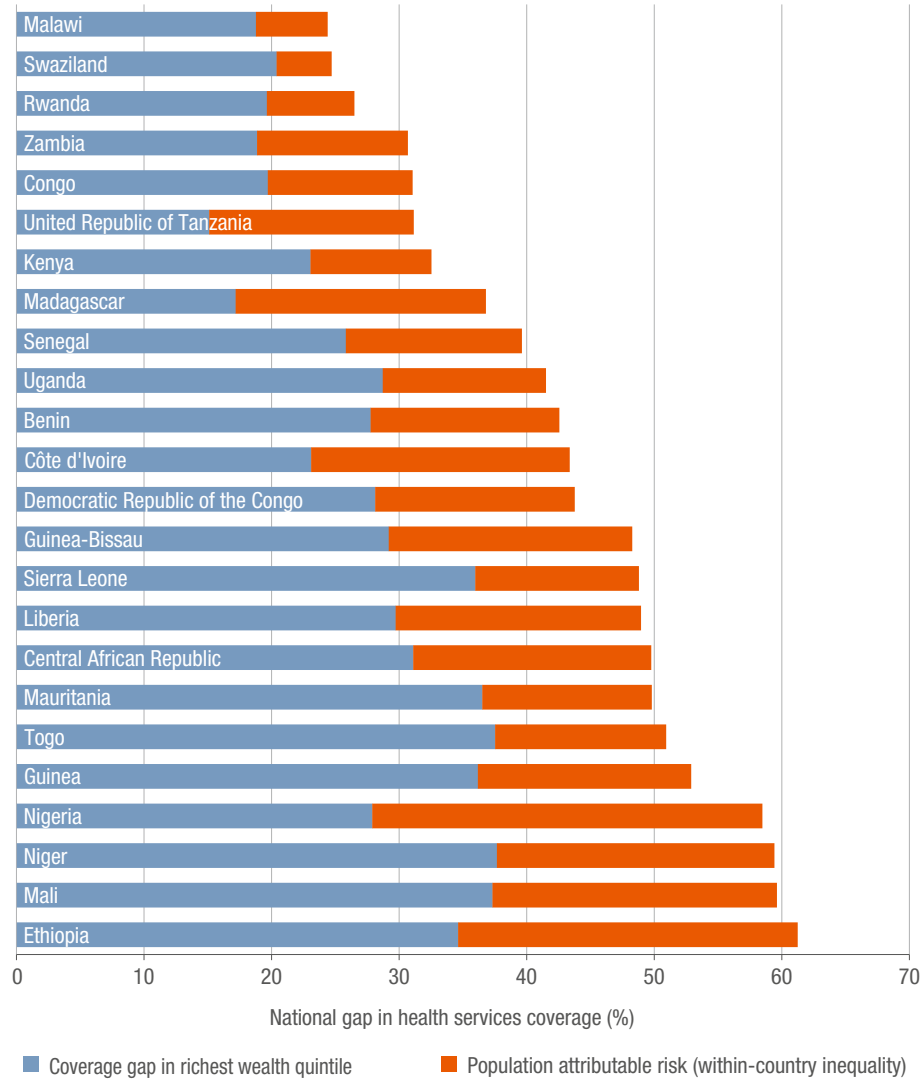
Source: Hosseinpoor AR et al. Towards universal health coverage: the role of within-country wealth-related inequality in 28 countries in sub-Saharan Africa. *Bulletin of the World Health Organization,* 2011, 89(12):881–890.

The outputs of the population attributable risk calculations are easy to comprehend and explain, and take into account subgroup size. These measures are particularly useful to communicate the impact of social conditions on health burden.

In Figure 3.8, 24 African countries are ordered according to national gap, represented by the length of the horizontal bar: countries at the top of the figure are closest to achieving universal coverage in reproductive, maternal and child health services, while countries towards the bottom have the most progress to make. National coverage gap is further decomposed into two components: coverage gap in the richest quintile and within-country inequality, indicated by blue and orange shading. For the majority of study countries (22 out of 24 countries), the national average gap could be reduced by one quarter or more if the whole population had the same coverage as the richest quintile (thus eliminating within-country inequality); in three countries (Madagascar, Nigeria and United Republic of Tanzania), national average gap could be halved. The data in this example are based on an index that includes eight coverage indicators of maternal care, immunization, treatment of sick children and family planning.

When conducting health inequality monitoring, any of the measures described in this section – difference, ratio, slope index of inequality, concentration index, mean difference from the mean, Theil index and population attributable risk – might be correct to use in a given situation. In fact, it would not be incorrect to calculate all of the measures that apply to a given case as part of inequality analysis. When it comes to reporting data, however, specific measures should be chosen carefully. Section 4 addresses the issue of how to best report results of health inequality monitoring.

Figure 3.8 National average gap in coverage of reproductive, maternal and child health services and within-country wealth-based inequality in coverage gap in 24 low- and middle-income African countries, DHS and MICS 2005–2011



Note: DHS = Demographic and Health Survey; MICS = Multiple Indicator Cluster Survey.

Highlights: Section 3

- Simple measures of inequality – such as difference and ratio – are best suited for comparisons between two subgroups. They are generally easy to understand, but cannot simultaneously compare more than two subgroups, nor do they account for population size or population shifts.
- Slope index of inequality and concentration index are two measures used to illustrate health inequality in ordered subgroups, accounting for differently-sized subgroups. Slope index of inequality shows absolute inequality, taking into account the mean value of the health indicator in each subgroup. The concentration index is a measure of relative inequality, expressing the disproportionate distribution of a health indicator among subgroups.
- Health inequality in non-ordered subgroups can be measured using mean difference from the mean and Theil index. Mean difference from the mean measures show the extent to which the mean values of a health outcome in subgroups deviate from the overall mean or a select reference value, expressing absolute inequality. The Theil index allows for measurement of relative inequality.
- Population attributable risk shows the improvement possible if inequality was eliminated and all subgroups had the same level as a reference group.
- Health inequality monitoring may use a number of measures to express absolute and relative inequalities, depending on the specifics of a given situation.

Read more:

Anand S et al. Measuring disparities in health: methods and indicators. In: Evans T et al., eds. *Challenging inequities in health: from ethics to action.* New York, Oxford University Press, 2001:48–67.

Harper S, Lynch J. *Methods for measuring cancer disparities: using data relevant to Healthy People 2010 cancer-related objectives*. Bethesda, MD, National Cancer Institute, 2005.

Keppel K et al. Methodological issues in measuring health disparities. *Vital and Health Statistics*, 2005, (141):1–16.

Mackenbach JP, Kunst AE. Measuring the magnitude of socio-economic inequalities in health: an overview of available measures illustrated with two examples from Europe. *Social Science and Medicine*, 1997, 44(6):757–771.

O'Donnell O et al. *Analyzing health equity using household survey data*. Washington, DC, World Bank, 2008.

Regidor E. Measures of health inequalities: part 1. *Journal of Epidemiology and Community Health*, 2004, 58(10):858–861.

Regidor E. Measures of health inequalities: part 2. *Journal of Epidemiology and Community Health*, 2004, 58(11):900–903.

Wagstaff A, Paci P, Doorslaer EV. On the measurement of inequalities in health. *Social Science and Medicine*, 1991, 33(5):545–557.

4. Reporting health inequalities

4.1 Audience-conscious reporting

Reporting health inequality data may entail communicating to researchers, public health practitioners, policy-makers, the general public and others. The target audience should always be considered when deciding how to report data, as different audiences will have different levels of understanding, technical expertise and requirements of what they need to take away from the data. For example, if a report is to be used internally by researchers with strong statistical expertise it may be appropriate to present complex and subtle conclusions revealed in the data using complex measures. For audiences with less technical expertise, it is usually best to present the most salient conclusions in a straightforward way. The ultimate goal of health inequality monitoring is to help inform policies, programmes and practices to reduce inequality; for this reason, no matter the immediate audience of a given report, the issue of reporting should be viewed through the lens of how data can best be selected and presented to inform policies, programmes and practices.

4.2 Methods of presenting data

The methods used to present health inequality data, in the most basic sense, are no different from those used to present other types of data, health-related or otherwise. There are three main tools used to present health inequality data: tables, graphs and maps. This section concentrates on how these methods are employed in health inequality monitoring.

In health inequality monitoring, tables, graphs and maps should be presented in such a way that each health indicator can be disaggregated by each equity stratifier. This means that the information displayed shows the situation for a single health indicator in a single dimension of inequality (for example, infant mortality rate by education, measles immunization coverage by province). Tables, graphs and maps can be used in different combinations to highlight messages in the data.

Tables

In general, tables should provide a comprehensive presentation of every part of the data. This includes describing every relevant combination of health indicator and corresponding dimension of inequality. One advantage of tables is that there is no ambiguity about data values, as they are stated explicitly. A disadvantage of tables is that they lack the immediate visual interpretation of graphs or maps, and thus involve more effort on the part of the audience to derive conclusions. Tables may be made easier to interpret by highlighting salient values, colour-coding values or cells, or bolding font.

Table 4.1 presents data about contraceptive prevalence (modern methods) in Egypt by wealth quintile, presenting values for ratio and difference at three time points. This table presents a comprehensive view of the data, but leaves the tasks of interpreting the table and deriving conclusions to the audience. The more indicators, years, estimates and measures that are presented in a table, the greater the effort required of the audience to draw conclusions.

Table 4.1 Wealth-based inequality in contraceptive prevalence (modern methods) in Egypt, DHS 1995, 2000 and 2005

Survey year	National average (%)	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (quintile 5 – quintile 1) (percentage points)	Ratio (quintile 5 / quintile 1)
1995	45.5	28.2	39.0	47.1	52.0	57.4	29.2	2.0
2000	53.9	42.7	50.0	54.3	58.3	61.1	18.4	1.4
2005	56.5	50.0	54.4	57.2	60.0	59.6	9.6	1.2

***Tip:* Designing effective data visualizations**

Creating well-designed visual representations of data is an important skill that can greatly enhance the impact of a data communication product. Data presentation should be deliberate and comprehensible, conveying the appropriate amount and scope of data to the target audience. There is a wealth of data visualization technology that can help to present data in simple and sophisticated ways, using static and interactive options. Remember that the nature of the data and the needs of the audience should drive the choice of the visualization technique.

Through the examples of this handbook, a number of data visualization styles and programs are showcased. Data visualizations can be created using a range of software, from widely available software with many applications, to more specialized statistical software and visual analytics software. Depending on the expertise and resources available, reporting health inequality data can be done in many ways.

Read more:

Few S. *Now you see it: simple visualization techniques for quantitative analysis*. Oakland, Analytics Press, 2009.

Few S. *Show me the numbers: designing tables and graphs to enlighten*. Oakland, Analytics Press, 2004.

United Nations Economic Commission for Europe. *Making data meaningful, part 1: a guide to writing stories about numbers*. Geneva, UNECE, 2009.

United Nations Economic Commission for Europe. *Making data meaningful, part 2: a guide to presenting statistics.* Geneva, UNECE, 2009.

Graphs

When used appropriately, graphs can simplify the message of complex information. Graphs that report health inequality monitoring should present information simply, clearly and accurately. The values for health indicators should be easily distinguishable between subgroups, and the conclusion of the data should be evident. In general, graphs should highlight important or relevant aspects of the analysis. A more complete explanation of the full results, including the nuances and limitations of the data, should be included as accompanying text, tables or appendices. It is not appropriate to use graphs to show data that are very dispersed, contain too many values or show little or no variation.

***Tip:* Using graphs to show ratio as the relative measure of inequality**

There are two important considerations to bear in mind when creating graphs that contain ratio values. First, because a ratio value of 1 indicates a situation of no inequality, 1 should always be adopted as the baseline for the graph, reflecting the *no inequality* situation. Second, the graph axis showing ratio must have a logarithmic scale to accurately represent the magnitude of inequality. Remember that a ratio of 2 is equivalent to the reciprocal ratio of 0.5; these ratio values can only be shown as equivalent using a baseline of 1 and a logarithmic scale. Examples of graphs that show ratios can be found in subsections 4.4 and 4.5 of this handbook.

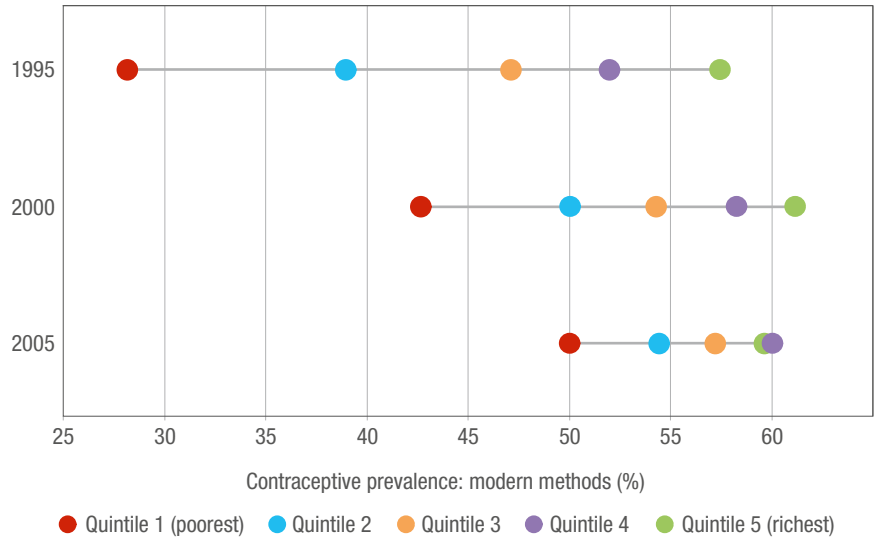
Read more:

Hosseinpoor AR, Abouzahr C. Graphical presentation of relative measures of association. *Lancet*, 2010, 375(9722):1254.

There are many types of graphs that may be useful for reporting health inequality, such as line charts, bar charts and scatter plots. Different types of data will lend themselves to different types of graphs. Using a variety of graphs to introduce data can help to display the message in different ways; however, it is generally best to stick to one or two types of graphs to maintain consistency throughout the report. All graphs should contain informative and straightforward labels, titles and legends (when applicable). If it is important that precise data values are available to the audience, these should be clearly visible on the graph or presented alongside the graph in a table.

Figure 4.1 presents the same information as in Table 4.1. In this case, the graph clearly shows how inequality in wealth-based modern contraceptive prevalence has decreased over time, as the circles (representing wealth quintiles) move closer together and the horizontal lines become shorter.

Figure 4.1 Contraceptive prevalence (modern methods) in Egypt, by wealth quintile, DHS 1995, 2000 and 2005



Maps

Maps can be an effective way to present health inequality data that have a geographical component, such as data that are disaggregated by region. Because maps are highly visual, they can communicate a large amount of information with minimal effort from the audience. When using maps in health inequality monitoring, it is important that there is a clear and objective message to be communicated. All colours, symbols, text or other effects that are used on a map should be explained. Be cautious about using maps to represent regions that are unfamiliar to the audience – this may require additional explanations or labels. Also keep in mind that the size of a country or region on the map may not correspond with the population size or density within that region.

4.3 Key aspects of health inequality reporting

Reporting health inequality should be done in a thorough manner, providing context for the data and a full picture of the current situation. Reporting should encompass three distinct elements: (a) latest status, (b) trend over time, and (c) benchmarking.

Latest status

The latest status is the most basic element to report, but perhaps also the most important. Latest status simply gives a picture of the state of inequality in various health indicators by equity stratifiers, using the most recent data available. Within latest status, the health indicators that have the greatest and least absolute and relative levels of inequality should be identified. In addition, the dimensions of inequality where

the situation is best and worst should be noted. Reporting on the latest status in this way helps answer questions such as: What is the situation? How is the country doing? What should be the current priority areas for action?

Table 4.2 provides a summary of the latest status of wealth-based inequality in a variety of reproductive, maternal and child health service indicators in Rwanda. When creating a report using this table, one might mention births attended by skilled health personnel as having the highest level of wealth-based relative and absolute inequality, and the early initiation of breastfeeding, antenatal care (at least one visit), DTP3 immunization, vitamin A supplementation and measles immunization as having the lowest levels of inequality.

Table 4.2 Latest status of wealth-based inequality in selected health service indicators in Rwanda, DHS 2010

Indicator	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (quintile 5 – quintile 1) (percentage points)	Ratio (quintile 5 / quintile 1)
Antenatal care: at least one visit	96.6	97.4	98.6	99.1	98.9	2.3	1.0
Antenatal care: at least four visits	34.1	34.5	32.6	34.4	42.5	8.4	1.2
Births attended by skilled health personnel	61.2	63.5	66.7	72.6	85.9	24.7	1.4
Contraceptive prevalence: modern methods	38.5	41.2	47.1	49.2	49.6	11.1	1.3
Contraceptive prevalence: modern and traditional methods	43.1	47.4	52.8	57.2	57.2	14.1	1.3
DTP3 immunization among 1-year-olds	96.1	95.7	97.1	97.9	98.7	2.6	1.0
Early initiation of breastfeeding	69.8	69.6	70.9	75.5	68.2	–1.6	1.0
Family planning needs satisfied	65.2	69.6	75.2	78.6	79.6	14.4	1.2
Full immunization coverage among 1-year-olds	87.2	87.2	91.7	92.5	95.5	8.3	1.1
Measles immunization among 1-year-olds	94.0	93.0	94.9	97.0	97.4	3.4	1.0
Vitamin A supplementation among children under five	91.5	91.7	92.3	95.2	94.6	3.1	1.0

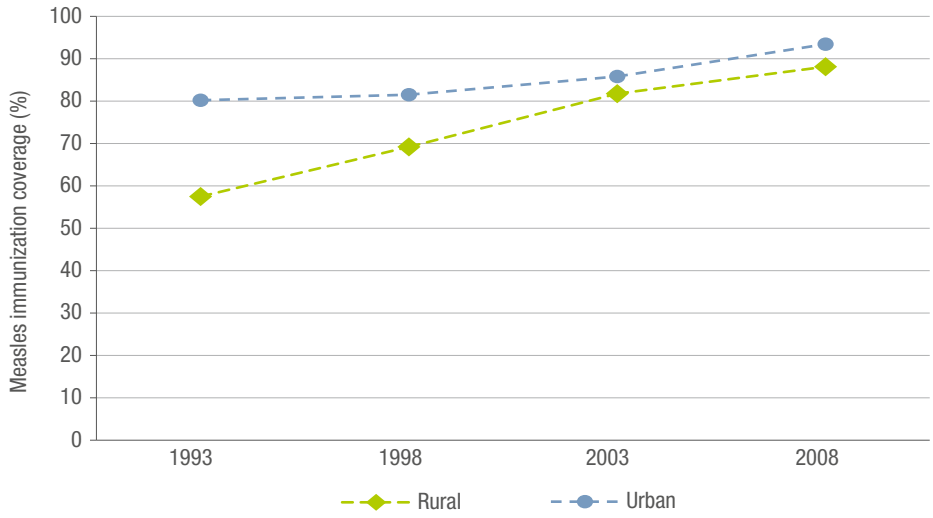
Time trend

A report on latest status of inequality is more meaningful when combined with a report on the time trend for inequality. Time trends indicate whether existing inequalities have improved or worsened over time, and thus help to elucidate whether current inequalities are newly emerging or enduring problems. When reporting time trends, indicators that show the greatest increases and decreases in inequality should be identified.

While time trends do not directly address the question of whether a policy or programme has made an impact – more complex and detailed studies would be necessary for this – they can be valuable for policy-makers to gauge whether change is warranted. For example, if wealth-based inequalities in immunization coverage were increasing over time, it does not necessarily mean that government efforts during that same time had no impact; however, this pattern may indicate to policy-makers that more should be done to address such inequalities. Presenting time trends can help to identify standout problem areas to be studied further to develop policy solutions or, conversely, time trends can identify success stories to be studied further to determine best practices and how they can be replicated.

Figure 4.2 presents the time trend in area-based inequality in measles immunization coverage in Colombia. It is evident from this graph that progress has been made in improving coverage in both rural and urban areas, and also in reducing inequality. This is an example of how a graph can present a salient and clear message of time trend data.

Figure 4.2 Time trend in measles immunization in Colombia, by place of residence, DHS 1993, 1998, 2003 and 2008



Benchmarking

Similar to time trend, benchmarking can help to give further context to understanding the status of inequality. Benchmarking is the process of comparing data from similar countries to get an idea of one country's level of inequality in relation to others. This can be helpful in trying to address the question, could – or should – a country be doing better? Benchmarking often involves comparing with other countries in the same region or income-level grouping.

Benchmarking can be performed using latest status data, or using time trend data; it may involve showing disaggregated data, or simple or complex measures of inequality against the national average. If a country shows high levels of inequality but there are even higher levels among comparable countries, this may indicate that the country is doing relatively well; efforts to lower the level of inequality even further may be difficult, expensive or not feasible within current conditions. On the other hand, if the level of inequality is high in one country and much lower among comparable countries, it may indicate that it is possible to reduce the level of inequality, as other comparable countries have been able to do so.

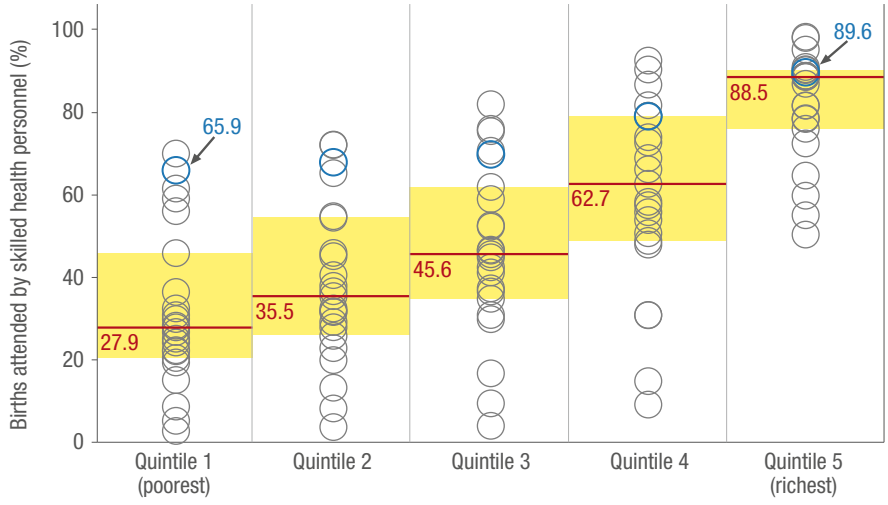
The following examples illustrate how benchmarking can be done for latest status disaggregated data (looking at births attended by skilled health personnel by wealth in Malawi against other low-income countries in the African Region); for latest status complex measures of inequality (looking at births attended by skilled health personnel by wealth in Vanuatu against other low- and middle-income Asia-Pacific countries); and for time trend disaggregated data (looking at under-five mortality rate by place of residence in Zambia, against other middle-income countries). The application of benchmarking to show time trends in simple measures is expanded upon in subsection 4.6.

Latest status, disaggregated data

Figure 4.3 shows Malawi (blue circles) benchmarked against other low-income countries (dark grey circles) in the World Health Organization African Region. The red horizontal lines show the median values of births attended by skilled health personnel in all countries within each quintile, and the yellow bands indicate interquartile range (middle 50% of countries). Here, the difference in births attended by skilled health personnel in Malawi is nearly 24 percentage points (89.6 – 65.9 = 23.7) between the richest and poorest subgroups, which initially may seem large. However, when benchmarked against other low-income African countries it is clear that the country is doing quite well, comparatively (Figure 4.3). The difference between the median values of all study countries in the richest and poorest quintiles is over 60 percentage points (88.5 – 27.9 = 60.6). Not only is inequality in Malawi far lower than that of a comparable group of countries, but coverage in each wealth quintile is also among the best of the group, falling above the interquartile range in quintiles 1, 2 and 3.

Benchmarking disaggregated data across a number of countries provides the context to judge the situation in Malawi against a group of other low-income African countries.

Figure 4.3 Benchmarking the latest status of births attended by skilled health personnel in Malawi against 22 other low-income African countries, by wealth quintile, DHS 2005–2010



Malawi

Benin, Burkina Faso, Burundi, Central African Republic, Democratic Republic of the Congo, Ethiopia, Gambia, Guinea, Guinea-Bissau, Kenya, Liberia, Madagascar, Mali, Mauritania, Mozambique, Niger, Rwanda, Sierra Leone, Togo, Uganda, United Republic of Tanzania, Zimbabwe

Circles indicate countries - each study country is represented on the graph by five circles.
Horizontal red lines and labels indicate the median values of all countries within each quintile.
Yellow bands indicate interquartile range (middle 50% of countries).

Latest status, complex measures

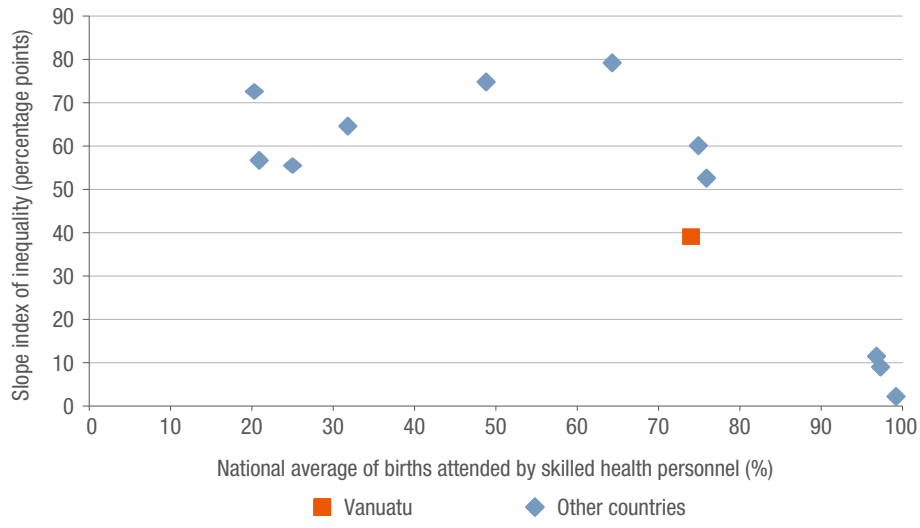
A second example of benchmarking considers the coverage of births attended by skilled health personnel in Vanuatu against other Asia-Pacific countries. In this case, inequality is presented using complex measures – concentration index (Table 4.3) and the slope index of inequality (Table 4.3 and Figure 4.4). The standard error values are provided for each estimate in the table to indicate data precision.

Considered by itself, the level of absolute inequality in Vanuatu might seem high, with a slope index of inequality value of nearly 40 percentage points. However, by benchmarking it against 11 other low- and middle-income Asia-Pacific countries, it is evident that the level of absolute inequality is even higher in most other countries – Vanuatu has the fourth lowest absolute inequality (Figure 4.4). Incorporating benchmarking into a report, it becomes clear that equality in births attended by skilled health personnel has been difficult to achieve by many countries of the region. While Vanuatu has a high level of inequality, it is still ahead of many of these Asia-Pacific countries.

Table 4.3 Wealth-based inequality in births attended by skilled health personnel in low- and middle-income Asia-Pacific countries, DHS and MICS 2005–2010

Country	Survey	National average (%) (standard error)	Slope index of inequality (percentage points) (standard error)	Concentration index (standard error)
Bangladesh	DHS 2007	20.9 (1.2)	56.7 (2.9)	0.46 (0.02)
Cambodia	DHS 2010	75.9 (1.4)	52.6 (3.1)	0.12 (0.01)
India	DHS 2005	48.8 (0.8)	74.8 (1.0)	0.28 (0.01)
Indonesia	DHS 2007	74.9 (1.1)	60.1 (2.3)	0.14 (0.01)
Lao People's Democratic Republic	MICS 2006	20.3 (1.9)	72.6 (4.0)	0.60 (0.03)
Maldives	DHS 2009	96.8 (0.6)	11.5 (2.5)	0.02 (< 0.01)
Mongolia	MICS 2005	99.2 (0.2)	2.2 (1.2)	< 0.01 (0.01)
Nepal	DHS 2006	25.0 (1.6)	55.5 (3.5)	0.38 (0.02)
Philippines	DHS 2008	64.3 (1.4)	79.2 (1.8)	0.23 (0.01)
Thailand	MICS 2005	97.3 (0.6)	9.0 (3.2)	0.01 (< 0.01)
Timor-Leste	DHS 2009	31.8 (1.6)	64.6 (2.6)	0.36 (0.02)
Vanuatu	MICS 2007	74.0 (2.9)	39.1 (7.9)	0.09 (0.02)

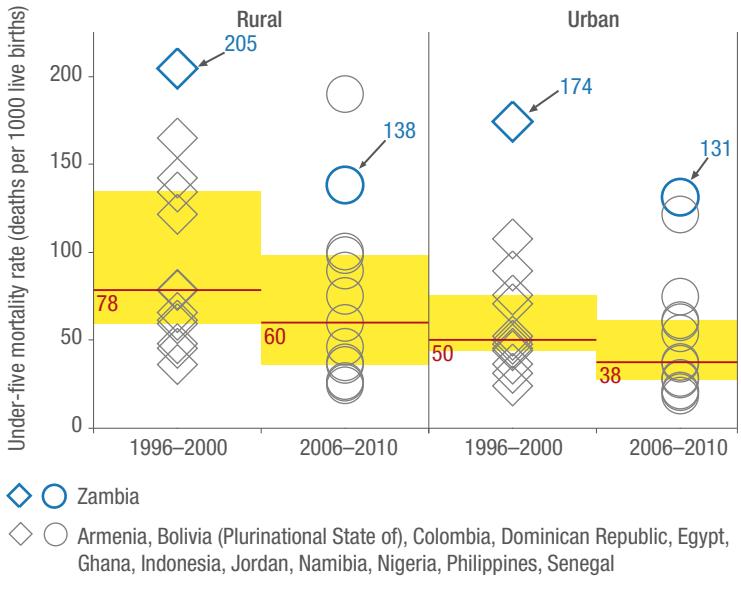
Figure 4.4 Benchmarking the latest status of wealth-based absolute inequality in births attended by skilled health personnel in Vanuatu against 11 other low- and middle-income Asia-Pacific countries, DHS and MICS 2005–2010



Time trend, disaggregated data

Figure 4.5 shows time trends in the rate of under-five mortality using data disaggregated by rural or urban place of residence in 1996–2000 (diamond shapes) and 2006–2010 (circle shapes). Between the two time periods Zambia (highlighted in blue) experienced a decrease in mortality in both rural and urban areas, as well as a decrease in inequality. In 1996, the difference between rural and urban under-five mortality in Zambia was 205 – 174 = 31 deaths per 1000 live births, and in 2007 the difference was 138 – 131 = 7 deaths per 1000 live births. Benchmarking Zambia against other middle-income countries helps to put the situation in context. Comparing with the group of middle-income countries, Zambia has relatively high levels of under-five mortality rates at both time points, falling well above both the median (red line) and the interquartile range (yellow bands). While the median values of all study countries saw a decrease in inequality between the time periods – rural–urban inequality decreased from 28 deaths per 1000 live births in 1996–2000 (78 – 50 = 28) to 22 deaths per 1000 live births in 2006–2010 (60 – 38 = 22), by 6 (28 – 22 = 6) – the decrease in rural–urban inequality in Zambia was more substantial (from 31 to 7 deaths per 1000 live births, a difference of 24).

Figure 4.5 Benchmarking time trend in under-five mortality rate in Zambia against 12 other middle-income countries, by place of residence, DHS 1996–2000 and 2006–2010



Diamonds and circles indicate countries - each study country is represented on the graph by four shapes.
Horizontal red lines and labels indicate the median values of all countries.
Yellow bands indicate interquartile range (middle 50% of countries).

***Tip:* Benchmarking time trends**

Benchmarking time trends may be done between countries, but it may also be particularly useful when done within countries (for example, based on provinces within a country or districts within a province). If, for example, all provinces had increasing or decreasing inequalities in a given health indicator, it may suggest that they are experiencing common forces beyond provincial borders that are driving the trend. Benchmarking time trends provides information that can help to guide policy-makers to take relevant action at an appropriate level.

When reporting benchmarking of time trends one must consider the level of the health indicator at baseline. A country that was already performing well at baseline may have little room to improve. On the other hand, a country that had poor levels of a health indicator at baseline has a lot of progress to make and might achieve greater improvements in terms of inequality but still be lagging behind. Thus, when reporting benchmarking of time trends it is important to give some indication of the baseline level.

Read more:

Asbu E et al. *Health inequities in the African Region of the World Health Organization*. Brazzaville, Regional Office for Africa, World Health Organization, 2010.

4.4 Selecting measures of health inequality to report

To get a sense of the situation it is important to always do an initial visual survey of the disaggregated dataset(s). What are the most salient conclusions to be communicated? Are there any apparent trends? What does the audience need to know to put the information into context? The types of measures that are selected to communicate latest status, time trends or benchmarking should answer all of these questions.

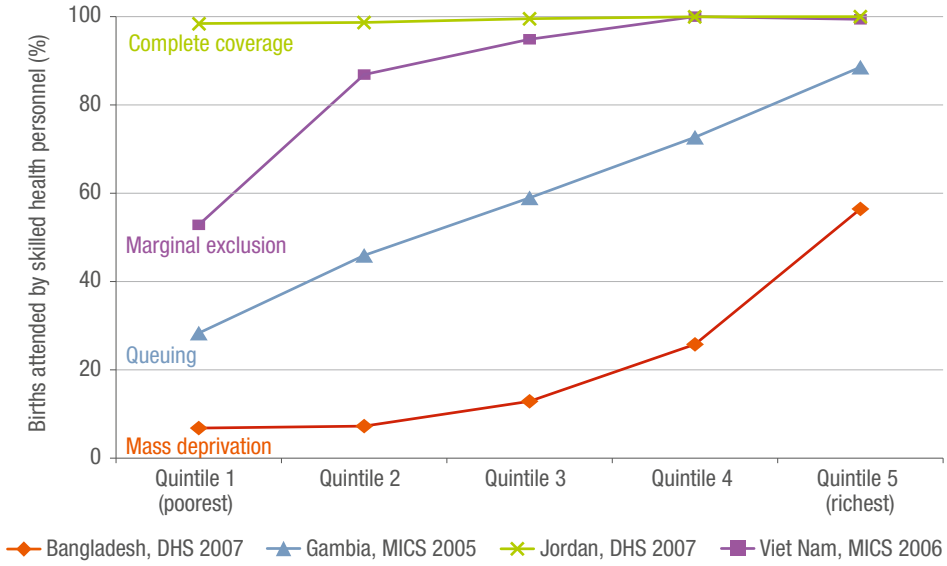
Describing patterns of health inequality using disaggregated data

Looking at disaggregated data, it is sometimes possible to distinguish characteristic patterns in the way that inequality is experienced across subgroups. Describing these patterns of inequality – also called shapes of inequality – is an effective way to communicate the nature of inequality, and may help to indicate appropriate responses to address inequality.

An example of a graph of latest status of coverage of births attended by skilled health personnel allows us to identify four predominant patterns: mass deprivation, marginal exclusion, queuing and complete coverage. Figure 4.6 highlights coverage in wealth quintiles of four selected countries. A pattern of mass deprivation is seen in Bangladesh (red line). Coverage of births attended by skilled health personnel was low or very low in all but the richest quintile, and most of the population did not have access to this health service. Viet Nam shows a second pattern of inequality,

marginal exclusion (purple line). Here, the poorest quintile demonstrated markedly lower coverage than the other four quintiles. In Gambia, queuing, a linear gradient of approximately equal increases in coverage across wealth quintiles, was observed (blue line). In some situations complete coverage has been achieved in all quintiles, such as in Jordan (green line). Here, we can say that there is universal coverage of births attended by skilled health personnel, and no inequality exists for this health indicator.

Figure 4.6 Patterns of health inequality, shown using coverage of births attended by skilled health personnel in Bangladesh, Gambia, Jordan and Viet Nam, by wealth quintile, DHS and MICS 2005–2007



Reporting simple or complex measures

In section 3, several different measures of inequality were described: difference, ratio, slope index of inequality, concentration index, absolute mean difference from the overall mean, Theil index and population attributable risk. This is by no means an exhaustive list of the measures of inequality that are available, though an accurate picture of inequality can almost always be portrayed by choosing among these measures.

In the majority of cases, inequality can be effectively shown using only difference and ratio (the simple, pairwise comparisons of inequality); together, these measures show both absolute and relative inequality, and are straightforward and easy to understand. Difference and ratio measures provide the descriptive information necessary to convey the status of health inequality, and can be interpreted with little effort.

When choosing whether to convey inequality using simple or complex measures of inequality, it is important to consider which measures will best represent conclusions that are evident from the data in the graph and table. For example, in examining the

health indicators in Figure 4.7 we can see three distinct shapes of inequality across wealth quintiles: antenatal care (at least four visits) shows a queuing pattern of near linearity, antenatal care (at least one visit) is approaching complete coverage and births attended by skilled health personnel demonstrates marginal exclusion.

***Extra information:* Types of interventions to address different shapes of inequality**

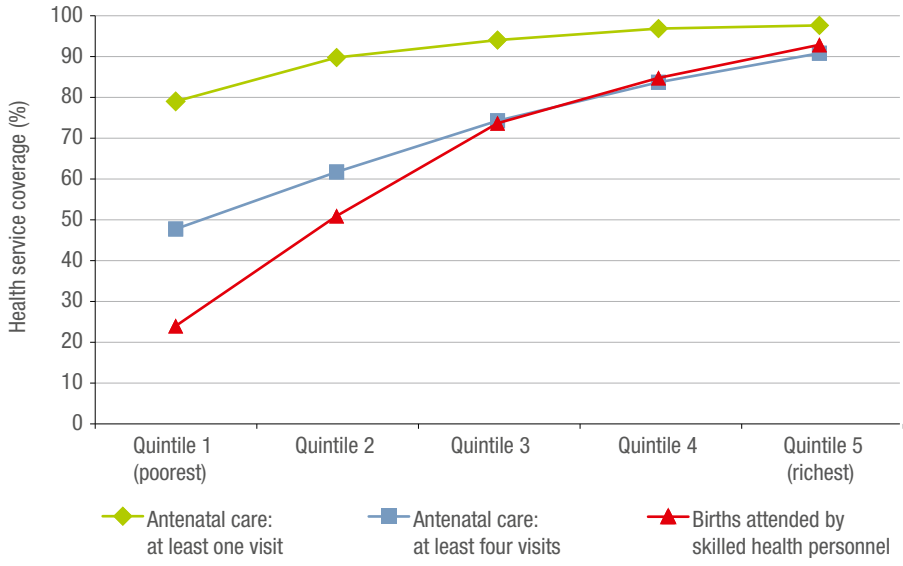
Generally speaking, the shape of inequality can be used as a guide to determine the appropriate types of policy, programme and practice interventions:

- An intervention to address *mass deprivation* calls for a whole population approach, where resources are invested in all (or most) subgroups.
- To address situations of *marginal exclusion*, health interventions should target the most disadvantaged subgroup(s) of the population.
- The *queuing pattern* requires an approach that combines population-wide and targeted interventions.
- Patterns of *complete coverage* probably do not require any further interventions, as full coverage has been achieved. Some ongoing monitoring may be warranted to ensure that the situation remains favourable.

Read more:

World Health Organization. *Women and health: today's evidence, tomorrow's agenda*. Geneva, World Health Organization, 2009.

Figure 4.7 Coverage of selected maternal health service indicators in the Philippines, by wealth quintile, DHS 2008



Here, looking at the simple measures of difference and ratio in Table 4.4, the following conclusions can be drawn: the wealth-based absolute and relative inequality is greatest in the coverage of skilled birth attendants and least in one antenatal care visit, with four or more antenatal care visits falling between the two other indicators. These are the same conclusions that are evident from the complex measures of inequality, which take into account the situation in all subgroups. Thus, simple measures are preferred for reporting inequality in this example because they convey the same message as complex measures, but in a more easily understood manner.

There are some cases when it may be preferable to present complex measures of inequality. Complex measures should be employed when the limitations of pairwise comparisons would change the overall conclusions (as detailed in section 3). For example, if there is a single outlier subgroup at an extreme (either very high or very low), the conclusions drawn from pairwise comparisons may be different from the conclusions drawn from complex measures, which reflect the overall situation in all subgroups.

Table 4.4 Wealth-based inequality in selected maternal health service indicators in the Philippines, DHS 2008

Indicator	Simple measures of inequality		Complex measures of inequality	
	Difference (percentage points)	Ratio	Slope index of inequality (percentage points) (standard error)	Concentration index (standard error)
Antenatal care: at least one visit	6.9	1.1	13.1 (2.0)	0.0187 (0.0024)
Antenatal care: at least four visits	32.0	1.5	41.5 (2.7)	0.0906 (0.0064)
Births attended by skilled health personnel	68.7	3.7	79.2 (1.8)	0.2283 (0.0084)

Reporting absolute and relative inequality

In most cases, absolute and relative inequality should be reported together as complementary measures of inequality. Reporting both absolute and relative inequalities can ease the task of making comparisons between indicators. Recall, from section 3, that relative measures (such as ratio) are unitless, showing relative inequalities between subgroups. Relative measures are particularly useful when making comparisons between indicators that have different units. Absolute inequality measurements have the same unit as the health indicator, and thus offer a concrete indication of the difference between subgroups.

Table 4.5 presents data about four different indicators at two time points, some of which have different units or meanings. Antenatal care coverage, family planning needs satisfied, and stunting are expressed as percentages in this table, while infant

mortality rate is expressed in deaths per 1000 live births. Presenting both relative and absolute inequality (difference and ratio) together, it is clear that infant mortality in 1998 had a much higher level of relative inequality than at least one antenatal care visit in DHS 1998. The comparison of unitless values (3.3 and 1.3) makes the situation clear. However, looking at absolute inequality, it is not feasible to compare the difference of 50 infant deaths per 1000 live births with the difference of 21 percentage points in antenatal care coverage. This comparison is markedly more difficult, as it requires putting deaths and receipt of antenatal care on some similar scale. Thus, presenting ratio has great value when comparing indicators with different units.

Table 4.5 Wealth-based inequality in selected reproductive, maternal and child health indicators in Ghana, DHS 1998 and 2008

Indicator	Survey year	Quintile 1 (poorest)	Quintile 2	Quintile 3	Quintile 4	Quintile 5 (richest)	Difference	Ratio
Antenatal care: at least one visit (%)	1998	77.0	87.4	92.4	95.0	98.0	21.0	1.3
	2008	92.5	93.2	96.1	97.7	99.1	6.6	1.1
Family planning needs satisfied (%)	1998	25.2	30.6	35.6	47.2	57.3	32.1	2.3
	2008	28.2	32.2	35.6	45.4	56.5	28.4	2.0
Infant mortality rate (deaths per 1000 live births)	1998	71.3	63.1	80.7	54.4	21.3	50.0	3.3
	2008	59.7	45.0	70.5	44.3	46.3	13.5	1.3
Stunting among children under five (%)	1998	39.7	34.7	33.1	20.5	16.3	23.4	2.4
	2008	33.4	34.2	28.0	20.9	14.3	19.2	2.3

Note: For infant mortality rate and stunting among children under five the richest quintile was used as the reference group for difference and ratio calculations, while the poorest quintile was used as the reference group for antenatal care (at least one visit) and family planning needs satisfied. For a further explanation, see the Tip box entitled "Selecting reference groups according to health indicator types" in subsection 4.4.

Presenting absolute inequality also has certain advantages. For example, in DHS 1998, family planning had a ratio of 2.3, and stunting had a ratio of 2.4 (Table 4.5). While these ratios show that the relative inequality was almost the same, there is no indication about the magnitude of the difference between wealth quintiles. Absolute inequality shows the scope of this gap: the difference was 32.1 percentage points for family planning compared to 19.2 percentage points for stunting. Such a comparison would not be possible using relative inequality alone. Absolute inequality also has the

advantage that the interpretation can be more intuitive. For example, it may be difficult to comprehend that the ratio for infant mortality rate in 2008 was 1.3 between the poorest and the richest quintiles, but easier to understand that the poorest mothers reported 14 more infant deaths per 1000 born than mothers in the richest quintile.

***Tip:* Selecting reference groups according to health indicator types**

In some cases, health indicators reflect a desirable outcome, such as coverage of a health service, level of satisfaction, number of health facilities available or life expectancy. In other cases, health indicators reflect an undesirable outcome, such as mortality rates, malnutrition or disease prevalence. When reporting health inequalities it is important to be aware of how different types of indicators may be presented and interpreted.

For example, looking at two indicators in India, it is obvious that stunting is more common in the poorer quintiles whereas full immunization coverage is more prevalent in richer quintiles (see table below). Calculating simple measures of inequality, the choice of reference group will affect difference and ratio values or signs (scenarios 1 and 2 below). Difference calculations yield the same numerical values (percentage point difference), with opposing positive or negative signs. Ratio calculations, however, yield a value below 1 (when the reference group has a higher value) and a value above 1 (when the reference group has a lower value). Although these numbers are reciprocal, it may be easier for some audiences to comprehend a ratio value that is greater than 1. For example, it is easy to understand that stunting was more than 2 times higher in the poorest than the richest quintiles, but less clear to conceptualize that the prevalence of stunting in the richest quintile was 0.4 of the prevalence in the poorest quintile. For this reason, it is usually more straightforward to choose for the reference group the subgroup that tends to experience the lower prevalence.

Wealth-based inequality in selected health indicators in India, DHS 2005

Indicator	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (percentage points)	Ratio
Stunting among children under five	59.9	54.4	48.8	40.8	25.6		
Scenario 1: reference group is quintile 1 (poorest)						–34.3	0.4
Scenario 2: reference group is quintile 5 (richest)						34.3	2.3
Full immunization coverage among 1-year-olds	24.4	33.3	47.1	55.5	71.0		
Scenario 1: reference group is quintile 1 (poorest)						46.6	2.9
Scenario 2: reference group is quintile 5 (richest)						–46.6	0.3

Reporting inequality and national average

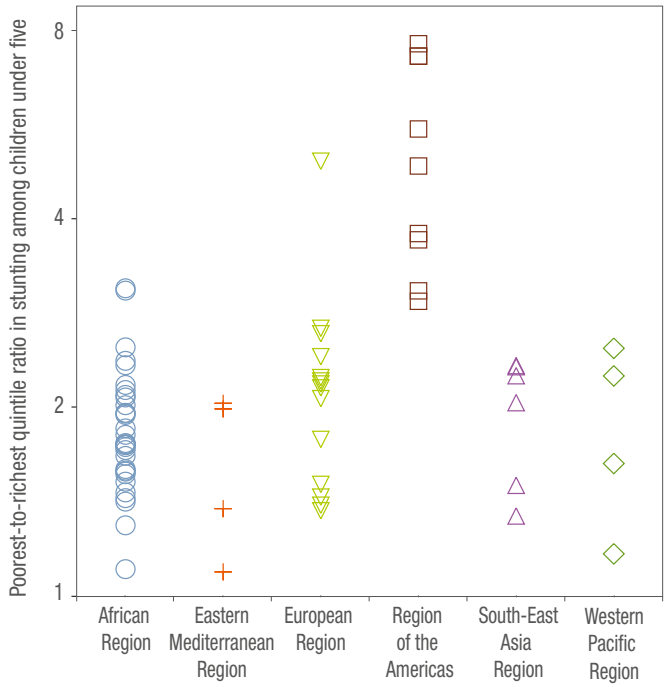
Health inequality reporting should present a comprehensive take on the status of the health indicator and its inequality within a population. It is generally recommended that the national average be reported along with disaggregated data and measures of inequality. If it is not possible or relevant to present all of these elements, this information could be included in the report as supplementary material, such as an appendix table.

To illustrate the importance of reporting measures of inequality together with subgroup mean values, consider the case of sex-based inequality in under-five mortality rates in Colombia. According to DHS 2010, the absolute difference between males and females was 4.6 deaths per 1000 live births, which may seem quite small when presented alone. However, when the values of under-five mortality rate for each population subgroup is considered, the picture changes slightly: the rate for males was 19.3 per 1000 live births, compared to 23.8 for females. The difference of 4.6 deaths appears a bit more substantial with this information in hand: the rate is nearly 25% higher for males than females. Providing additional information about subgroup mean values makes the interpretation of the inequality figures more accurate.

This same concept carries over to benchmarking. When presenting the values of inequality measures for each country, national levels of health indicators should always be presented alongside. For example, looking at under-five mortality it is possible that inequality in a country may be low, but the under-five mortality rate may also be high among all population subgroups. In other words, there may be low inequality explained by all population subgroups having equally high mortality. In a case like this, benchmarking inequality in the absence of subgroup mean or national average would give a falsely positive outlook, as the overall population may have much worse health than other countries.

Consider, for example, a comparison of wealth-based inequality in stunting among children under five in 70 countries from six World Health Organization geographical regions. Looking only at the poorest-to-richest quintile ratio, it appears as though countries in the Region of the Americas are doing worse than countries in other regions (Figure 4.8). With only this information, it is clear that relative inequality is elevated in countries of the Region of the Americas. However, this conclusion masks the fact that other regions may show low inequality because stunting is high across all wealth quintiles.

Figure 4.8 Wealth-based inequality in stunting among children under five in 70 countries, DHS and MICS 2005–2011



Shapes indicate countries within the specified World Health Organization region.
Each country is represented by one shape.

Presenting ratio and national average, Figure 4.9 shows a more complete take on the situation. Here, we can observe that many countries in the African Region reported low relative inequality, yet high national average of stunting. This is due to widespread stunting, even in the richest quintiles. Thus, it becomes apparent that no single measure in isolation should be assumed to accurately describe the full context of a situation. Figure 4.9 provides an example of how to effectively communicate a measure of inequality together with the national average.

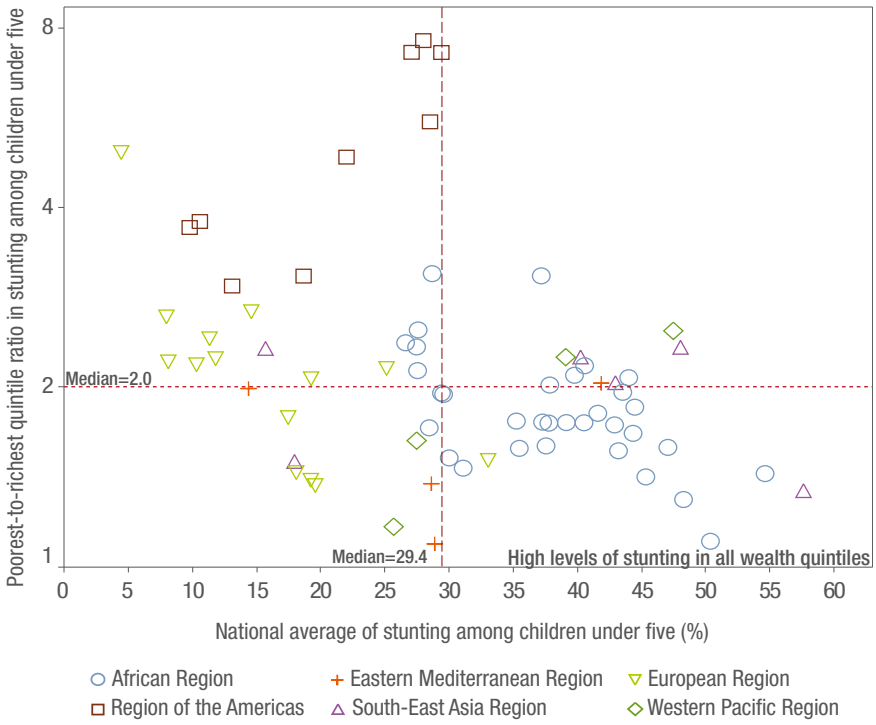
4.5 Special considerations

Small sample size

Household surveys are important data sources in low- and middle-income countries, but they may not always be designed to have sufficient sample size in each subgroup for inequality monitoring. Thus, precision is an important consideration when reporting health inequality. Monitoring health inequality for a given health indicator requires that an estimate is calculated within each subgroup. As the sample size of the subgroup

gets smaller, the estimate becomes more uncertain and the ability to compare between subgroups becomes more restricted.

Figure 4.9 Wealth-based inequality and national average in stunting among children under five in 70 countries, DHS and MICS 2005–2011



Shapes indicate countries within the specified World Health Organization region.
Each country is represented by one shape.

High levels of uncertainty in point estimates – broad confidence intervals – pose a special challenge for inequality monitoring. When precise estimates for population subgroups cannot be made, the resulting difference or ratio measures for these subgroups become less reliable. One possible option to overcome this limitation may be to use complex measures that combine all of the population to generate estimates of health inequality that have a reasonable confidence interval.

Reporting should take into account the situation of low sample sizes. When subgroup sample size is not sufficient to allow for meaningful estimates to be generated for comparisons between subgroups, the audience should be notified in a systematic way. In reports such as DHS publications and the Global Health Observatory Health Equity Monitor, data about health services are not reported when the sample size in a subgroup is less than 25 cases, and the reports contain notes to indicate low sample sizes of 25–49.

***Tip:* Reporting statistical significance**

Reporting the confidence interval or standard error values of point estimates can help the audience to better understand whether health indicators are statistically different between subgroups. Some caution is required, however, when using confidence measurements to draw conclusions about health inequality data. Estimates that are derived from large samples may prove to be statistically different mathematically, but in the realm of public health, this difference may not be meaningful. For example, a population survey that covers several thousand children may report a statistical difference between immunization coverage of 80% in rural areas and 82% in urban areas. In terms of public health policies, programmes and practices, this 2% difference bears little importance.

Nevertheless, this does not mean that sample size and confidence intervals should be ignored when reporting data. Rather, there is a need to ensure that point estimates do not lead to false conclusions and misinformed policy. This includes considering whether the confidence intervals of the point estimates are narrow enough to allow for meaningful conclusions about inequality. In cases where no meaningful conclusions can be drawn, point estimates for indicators in population subgroups should not be presented, to avoid confusion and misinformation.

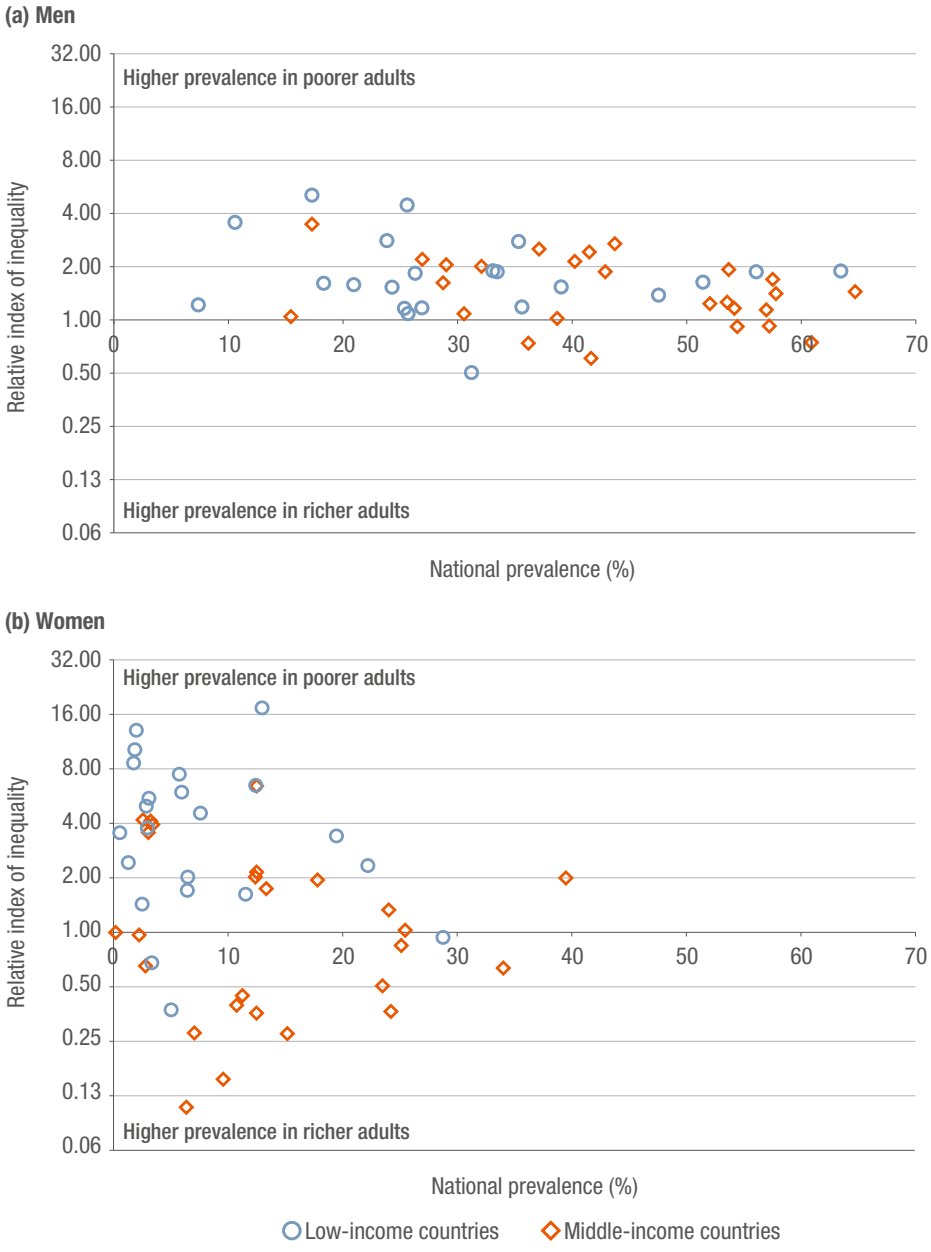
Reporting multiple dimensions of inequality simultaneously

In the majority of cases, it is preferable to present health inequality monitoring data by a single dimension of inequality at a time. Occasionally, however, it will make sense to combine multiple dimensions of inequality simultaneously. For example, socioeconomic inequalities in health may be very different in urban settings compared to rural settings. Identifying a situation where education-based health inequality is high in urban areas, but low in rural areas, may have important policy implications. In this case, it would be appropriate to combine multiple dimensions of inequality for the analysis, dividing the population first by place of residence, and then within each subgroup, dividing further by level of education. Education-based inequalities could be calculated, monitored and reported in urban and rural areas separately.

A study by Hosseinpoor et al. (2012) looked at inequalities in tobacco use across 48 low- and middle-income countries. Considering multiple dimensions of inequality, the authors found that wealth-based inequalities showed different patterns in men than in women. In most study countries, smoking rates among men were highest among the poor and lowest among the wealthy. In women, however, while some study countries also showed higher smoking rates in poorer adults, others, particularly countries in the middle-income group, reported higher smoking in richer adults. Figure 4.10 shows wealth-based relative inequality (relative index of inequality) and

national average of smoking prevalence for men and women. These disparate patterns have important implications for tobacco control initiatives and how they are targeted.

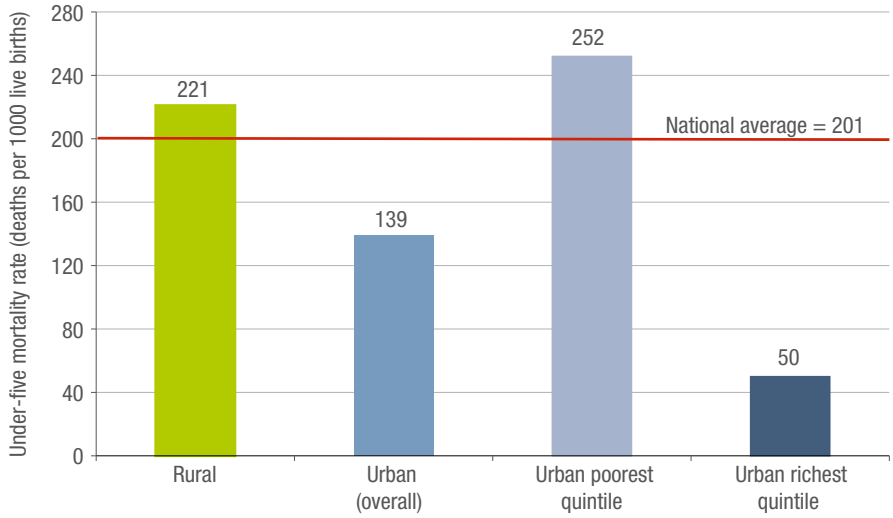
Figure 4.10 Relative wealth-based inequality and national prevalence in smoking in (a) men and (b) women in 48 low- and middle-income countries, World Health Survey, 2002–2004



Source: Hosseinpoor AR et al. Socioeconomic inequality in smoking in low-income and middle-income countries: results from the World Health Survey. *PLoS ONE*, 2012, 7(8):e42843.

Reporting on multiple dimensions of inequality may also require a close look at patterns within subgroups. For example, Figure 4.11 shows the variation of socioeconomic inequality among urban residents. In this example, rural areas have a higher under-five mortality rate than the overall rate in urban areas. However, if the urban population is divided by wealth, the poorest quintile of the urban population is found to have an under-five mortality rate that exceeds the rural rate. This disaggregation is important from a policy perspective because, if multidimensional analysis were not presented, policy-makers might concentrate effort in rural areas and neglect the disadvantaged urban poor.

Figure 4.11 Under-five mortality rate in Nigeria, by place of residence and wealth, DHS 2008



Source: Adapted from World Health Organization Centre for Health Development: country profiles on urban health, Nigeria http://www.who.int/kobe_centre/measuring/urban_health_observatory/uhprofiles/en/index1.html.

4.6 Reporting time trends

The four-quadrant view

The target audience can quickly become overwhelmed by the use of a large number of visualizations to present disaggregated data for various health indicators by several equity stratifiers at different time points. The four-quadrant view is an effective way to present time trends in inequality, along with national averages, for multiple health indicators or multiple countries. As discussed below, the four-quadrant view can be used to present absolute or relative inequality; in certain situations, both absolute and relative inequality can be presented simultaneously.

The premise of the four-quadrant view is that trends in health indicators can be divided into those that have improving overall averages and those that have worsening overall averages; likewise, trends in health indicators can also be divided into those that have increasing versus decreasing inequality (relative or absolute) in a given dimension. By using these two designations simultaneously, health indicators can be divided into four groups: (a) those that have improving national average with decreasing inequality (the "best outcome" scenario); (b) those that have improving national average with increasing or unchanged inequality; (c) those that have worsening national average with decreasing inequality; and (d) those that have worsening national average with increasing or unchanged inequality (the "worst outcome" scenario).

The four-quadrant view can be applied for multiple health indicators within one setting. Looking at eight reproductive, maternal and child health indicators in Cameroon, Table 4.6 provides a concise summary of time trends in wealth-based relative inequality and national average. It is immediately obvious to the audience which indicators are performing well and which are not. One limitation of this simplified table, however, is that there is no indication of the magnitude of performance within each quadrant, or how levels of absolute inequality may have changed over time.

Table 4.6 Four-quadrant view of the time trend in various health indicators in Cameroon, wealth-based inequality versus national average DHS 1998–2004

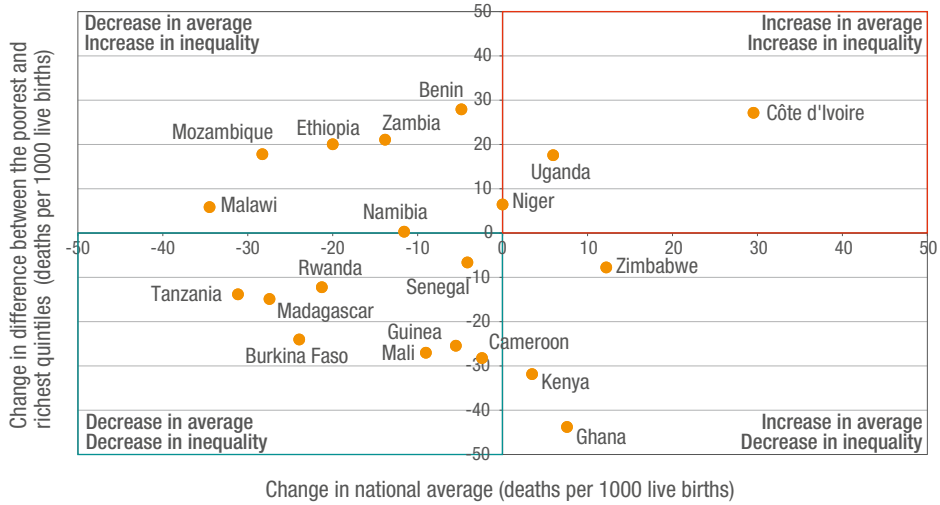
		Relative wealth-based inequality	
		Decreasing	**Increasing or status quo**
National average	**Improving**	***Best situation*** DTP3 immunization Births attended by skilled health personnel Contraception prevalence: modern methods Infant mortality rate Under-five mortality rate Prevalence of underweight among women	
	Worsening or status quo	Prevalence of overweight among women	***Worst situation*** Stunting among children under five

Source: Adapted from Asbu E et al. *Health inequities in the African Region of the World Health Organization.* Brazzaville, Regional Office for Africa, World Health Organization, 2010.

Similarly, the four-quadrant view can be used to summarize trends in a single health indicator across many countries (or settings) simultaneously using graphs. Countries are divided into the same four groups and listed based on whether their national levels of the chosen health indicator improved or worsened and whether the inequality in that indicator increased or decreased. In this way, a visual representation of benchmarking of time trends can be achieved. Figure 4.12 provides an example of a four-quadrant

view of absolute inequality in infant mortality rate in 20 African countries. Labels in each of the four corners of the figure make it easy to recognize the situation in each country, and how it compares to other study countries. In this graph, the countries with the greatest improvements are those in the bottom left quadrant: the average rate of infant mortality is decreasing, and the inequality is decreasing. Countries in the top right quadrant have reported increased national average and increased absolute inequality. (Note that it is not possible to judge the overall situation without knowing the baseline level of the indicator.)

Figure 4.12 Four-quadrant view of benchmarking time trends in infant mortality rate in 20 African countries over a five-year period, wealth-based inequality versus national average



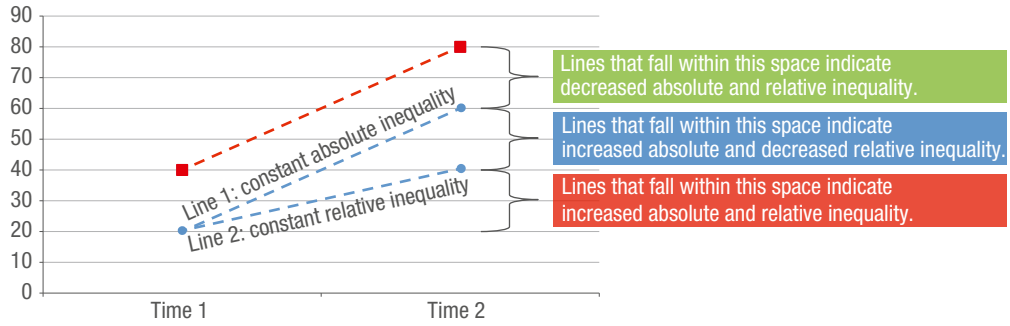
Source: Adapted from Asbu E et al. *Health inequities in the African Region of the World Health Organization.* Brazzaville, Regional Office for Africa, World Health Organization, 2010.

Showing time trends across subgroups

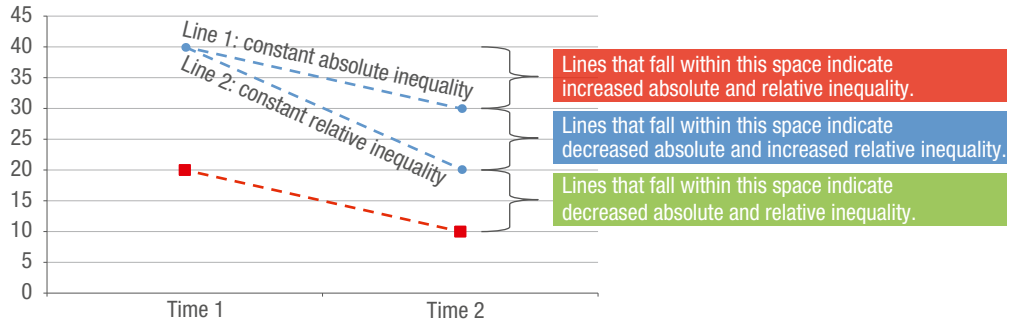
One of the shortcomings of Figure 4.12 is that it does not show how wealth quintiles are performing within each country. While it would be difficult to do this with a large sample of countries (as can be done in the four-quadrant view), a smaller sample of time trend data for subgroups can be presented efficiently using the technique shown in Figure 4.13. Here, the red line indicates the level of a health indicator in one subgroup, and the blue lines 1 and 2 indicate possible scenarios for that health indicator in a second subgroup. As indicated in the text beside the graph, this representation shows trends in both relative and absolute inequality, for indicators that may be increasing (such as contraceptive prevalence) or decreasing (such as under-five mortality rate). Note that, although both subgroups may experience an increase or decrease in the same direction, this does not necessarily reflect an improvement in absolute or relative inequality.

Figure 4.13 Time trends in inequality in subgroups in the case of (a) increasing prevalence and (b) decreasing prevalence of a health indicator, highlighting different scenarios for absolute and relative inequality

(a) Increasing prevalence of a health indicator



(b) Decreasing prevalence of a health indicator

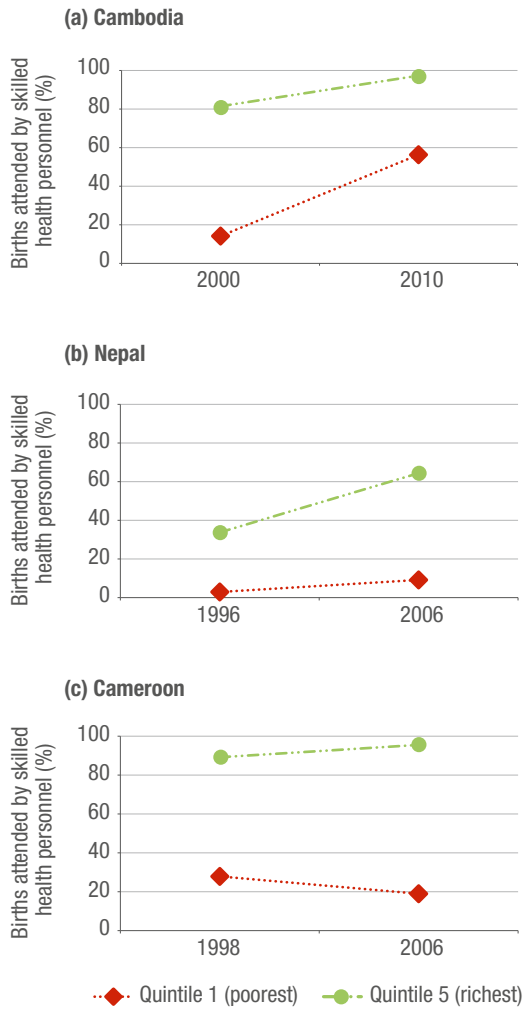


Source: Adapted from Barros AJD, Victora CG. Measuring coverage in MNCH: determining and interpreting inequalities in coverage of maternal, newborn, and child health interventions. *PLoS Medicine,* 2013, 10(5):e1001390. doi:10.1371/journal.pmed.1001390.

In the case of (a) increasing prevalence, the health indicator increased from 40% to 80% in the red subgroup between the two time periods. The blue subgroup, which began with a prevalence of 20%, may increase to 60% (line 1), in which case the absolute inequality would have remained constant (40 percentage points) and the relative inequality would have decreased. If the blue subgroup were to have a level greater than 60%, the absolute inequality would have decreased and, if less than 60%, the absolute inequality would have increased. If the blue subgroup followed line 2 to achieve 40% at the second time point, relative inequality would remain the same – the level of the health indicator would be half that of the red subgroup; if the blue subgroup reported any level below 40% this would indicate an increase in relative inequality. The situation in case (b) shows decreasing prevalence of a health indicator over time, and may be interpreted in a manner analogous to case (a).

Some applied examples illustrate scenarios in three countries where births attended by skilled health personnel increased in the richest quintile between two time periods, with variable changes in the poorest quintile (Figure 4.14). In Cambodia, the poorest quintile also experienced an increase in coverage of births attended by skilled health personnel to the extent that absolute and relative inequality both decreased – the best scenario. In Nepal, the poorest quintile had a modest increase in health service coverage, resulting in increased absolute inequality but decreased relative inequality. In Cameroon, coverage of births attended by skilled health personnel in the poorest quintile decreased over time, and thus absolute and relative inequality increased.

Figure 4.14 Time trends in births attended by skilled health personnel, in (a) Cambodia, (b) Nepal and (c) Cameroon, by wealth quintile, DHS and MICS 1996–2010



Source: Adapted from Barros AJD, Victora CG. Measuring coverage in MNCH: determining and interpreting inequalities in coverage of maternal, newborn, and child health interventions. *PLoS Medicine,* 2013, 10(5):e1001390. doi:10.1371/journal.pmed.1001390.

4.7 Defining priority areas

The process of inequality monitoring does not stop with the reporting of data, but must continue on to its translation for further action. After data are reported, a panel of stakeholders with data or statistics background and an ability to interpret health statistics convenes to assess the situation and decide which areas are priorities for action. These stakeholders take into account the inequality analyses (latest status, time trend and benchmarking), and also planned national targets and health care agendas. Typically, defining priority areas based on health inequality monitoring is a decision-making process that seeks to reach consensus among stakeholders.

When defining priority areas, inequalities across all health indicators by each equity stratifier should be taken into account. Looking at latest status, time trend and benchmarking, this can be a large amount of data to consider simultaneously. There are several options to determine priority areas in health. Here, one method is outlined of reducing the information to identify priorities based on a scoring system. This is illustrated through an applied example in section 5.

Looking at the results of health inequality monitoring, each indicator or equity dimension is assigned a score on a scale of 1 to 3 in each of the three reported aspects of inequality (latest status, time trend and benchmarking): 1 indicates that no action is needed, 2 indicates that action is needed and 3 indicates that urgent action is needed. The decisions of the magnitude of inequality that differentiates 1 (no action), 2 (action) and 3 (urgent action) must be agreed upon by those involved in the health inequality monitoring process. National averages for each indicator may be similarly scored. The mean of scores across all equity stratifiers is calculated for each indicator, and considered alongside national average to show where the priorities lie. Depending on the context and the preferences of the audience, other scales could easily be adopted that classify each situation as action needed or not needed (a binary scale) or alternatively, a multiple value scale might be adopted to rank the level of urgency by two, three, four or more values.

This method can be used to identify high-priority indicators by latest status, time trend and benchmarking. Similarly, this same method can be used to identify the equity stratifiers that are the highest priority. For example, all the numbers assigned in the status assessment of various health indicators' latest status by education could be averaged and compared to the average of all numbers assigned to indicators' latest status by wealth. In this way, priority setting may put higher importance on either education-based inequality or wealth-based inequality, as the case may be.

While this method lacks the ability to show nuances in the status of inequality, its simplicity is also a great asset. The eventual purpose of priority setting of both health indicators and equity stratifiers is to help policy-makers interpret the results of inequality monitoring. If those who monitor inequality can present a simple and

intuitive interpretation of the complicated inequality monitoring process presented in this handbook, they can help to improve the national health policy agenda for a country. A table that collectively summarizes the status of each indicator by each equity stratifier into a single number is highly accessible to policy-makers and the public.

The specifics of how to create a national health policy agenda based on the results of inequality monitoring is beyond the scope of this handbook; however, it is worth understanding that presenting simple and intuitive priority areas can be helpful in creating a national policy agenda. A good national policy does not always need to have the same priorities as those identified as the highest priority through the process outlined here.

Highlights: Section 4

- The main ways to visualize the results of health inequality monitoring are tables, graphs and maps. Visualizations and the data that they include should always reflect the needs and abilities of the audience to which they are presented.
- Effective reporting communicates three aspects of inequality: latest status, trend over time and benchmarking.
- Disaggregated data sometimes show characteristic patterns across subgroups, revealing shapes of inequality such as mass deprivation, marginal exclusion, queuing or universal coverage.
- Optimally, inequality reporting should include both relative and absolute inequality measures, and indicate subgroup as well as national or overall averages. One way to effectively present multiple types of information is using a four-quadrant view.
- Sample size is an important indication of the precision of inequality estimates; data reporting should take this into account.
- Depending on the context and intended use of inequality monitoring it may be appropriate to report a health indicator by more than one equity stratifier simultaneously, such as disaggregating first by sex and then by place of residence.

Read more:

Barros AJD, Victora CG. Measuring coverage in MNCH: determining and interpreting inequalities in coverage of maternal, newborn, and child health interventions. *PLoS Medicine*, 2013, 10(5):e1001390. doi:10.1371/ journal.pmed.1001390.

Braveman P. *Monitoring equity in health: a policy-oriented approach in low- and middle-income countries*. Geneva, World Health Organization, 1998.

Braveman P. Monitoring equity in health and healthcare: a conceptual framework. *Journal of Health, Population and Nutrition*, 2003, 21(3):181–192.

Harper S, Lynch J. *Methods for measuring cancer disparities: using data relevant to Healthy People 2010 cancer-related objectives.* Bethesda, MD, National Cancer Institute, 2005.

Keppel K et al. Methodological issues in measuring health disparities. *Vital and Health Statistics*, 2005, (141):1–16.

Minujin A, Delamonica E. Mind the gap! Widening child mortality disparities. *Journal of Human Development*, 2003, 4(3):397–418.

Wirth M et al. *Monitoring health equity in the MDGs: a practical guide*. New York, CIESIN and UNICEF, 2006.

5. Step-by-step health inequality assessment: reproductive, maternal and child health in the Philippines

This final section applies the concepts outlined in the previous sections of the handbook to an example of health inequality monitoring in the Philippines.[1] The objective of this section is not to provide a lengthy reiteration of the principles underlying health inequality monitoring, but rather to present a comprehensive, step-by-step illustration of each part of the cycle of health monitoring.

To begin to assess health inequalities, a health topic must be defined that is a high-priority area for improvement and maintenance in the Philippines. The health sector in the Philippines is seeking to implement universal health care to address inequities in the current health system. In particular, the Philippine Department of Health is committed to achieving reductions in child mortality and improved maternal health. The Philippines has set the following targets for 2015: 80% of pregnant women will have at least four antenatal check-ups, deliver in a health care facility and have at least two postnatal check-ups; 63% of men and women of reproductive age will have access to contraceptives; 80% of pregnant women will have at least two doses of tetanus toxoid vaccine; and 90% of infants below 1 year of age will be fully immunized. Thus, reproductive, maternal and child health is a relevant and appropriate topic for health inequality monitoring in the Philippines.

5.1 Selecting relevant health indicators and equity stratifiers

Inequalities in reproductive, maternal and child health may be assessed using indicators from all components of the monitoring, evaluation and review framework. However, outcomes and impact indicators tend to be the most relevant to this topic. This section illustrates inequality monitoring using health indicators from the outcomes component, covering health services that span contraceptive provision and family planning through pregnancy and childbirth to childhood health (Table 5.1). These indicators are the same as or closely related to indicators recommended by the World Health Organization's Commission on Information and Accountability for Women's

1 The content of this section is based on the national workshop on measuring and monitoring inequalities in reproductive, maternal and child health, held in June 2012 in Manila, Philippines, and facilitated by the World Health Organization, as part of the implementation of the recommendations of the Commission on Information and Accountability for Women's and Children's Health. Text, tables and figures are extracted/adapted from *Inequality in reproductive, maternal and child health: post-workshop report* (available online at: http://www.who.int/healthinfo/country_monitoring_evaluation/country_activities_Philippines/en/index.html), and other workshop materials.

and Children's Health. Five equity stratifiers were selected that have relevance in the Philippines: wealth, education, sex, urban or rural area, and region. The selection of health indicators and equity stratifiers were made in conjunction with the data source mapping process, which is detailed in the following subsection.

Table 5.1 Reproductive, maternal and child health service indicators for health inequality monitoring in the Philippines

Outcomes indicators	**Reproductive health services**	Contraceptive prevalence: modern methods
		Contraceptive prevalence: modern and traditional methods
		Family planning needs satisfied
	Maternal health services	Antenatal care: at least one visit
		Antenatal care: at least four visits
		Births attended by skilled health personnel
	Preventive care for children	Early initiation of breastfeeding
		DTP3 immunization coverage among 1-year-olds
		Full immunization coverage among 1-year-olds
		Measles immunization coverage among 1-year-olds
		Vitamin A supplementation among children under five
	Care seeking for children	Children under five with diarrhoea receiving oral rehydration therapy
		Children under five with acute respiratory infection symptoms taken to health facility

Extra information: **Global initiatives that include reproductive, maternal and child health**

A number of initiatives have defined, measured and reported reproductive, maternal and child health indicators for monitoring on a global scale, including the Millennium Development Goals, the Countdown to 2015 collaboration, the Commission on Information and Accountability for Women's and Children's Health, and the World Health Organization's Global Health Observatory Health Equity Monitor.

Read more:

Commission on Information and Accountability for Women's and Children's Health. http://www.who.int/woman_child_accountability/about/coia/en/index.html.

Countdown to 2015. *Maternal, newborn and child survival*. http://www.countdown2015mnch.org/.

United Nations Statistics Division. *Millennium Development Goals indicators.* http://mdgs.un.org/unsd/mdg/Host.aspx?Content=Indicators/OfficialList.htm.

World Health Organization. *Global Health Observatory: Health Equity Monitor*. http://www.who.int/gho/health_equity/en/index.html.

5.2 Data source mapping

The selection of the package of indicators in the above subsection occurred simultaneously (and iteratively) with an inventory of available data in the Philippines (data source mapping), which also showed the availability of equity stratifier data for each health indicator. The four steps of data source mapping are illustrated here using partial versions of each list.[1]

Step 1. The available data sources (by type) in the Philippines are listed, along with the years of data collection. This includes national-level data from institution-based (for example, administrative) and population-based (for example, vital registration and survey) sources. Note that this list is not exhaustive of all data sources in the Philippines but rather, for the purposes of this exercise, shows a sample of data sources at the national level. If desired, this process could be repeated creating lists of additional data available at the provincial, district and community levels.

Data sources at the national level in the Philippines (partial table)

Data source type	Data source	Year(s) of data collection				Notes
Administrative	Live births by attendance	1995–2008				Annual collection
Vital registration	Philippines vital registration (births and deaths)	Ongoing				
Survey	Philippines standard DHS	1993	1998	2003	2008	

Step 2. The next step considers the availability of equity stratifier information within each data source, listed by year (each is assigned a number in the left-most column of the table). The equity stratifiers included in the column headings reflect a broad range of dimensions of inequality that might be relevant, available and appropriate for health inequality monitoring of reproductive, maternal and child health. A check mark (√) indicates that the equity stratifier data are contained within the data source.

1 The original data source mapping exercise also included other health topics in addition to reproductive, maternal and child health.

Data sources with information on specified equity stratifiers in the Philippines (partial table)

No.	Data source and year	Equity stratifier				
		Income, expenditure, consumption or asset index	Education	Sex	Place of residence	Province or region
1	Live births by attendance 1995–2008					√
2	Vital registration (births and deaths)			√		√
3	DHS 2008	√	√	√	√	√
4	DHS 2003	√	√	√	√	√
5	DHS 1998	√	√	√	√	√
6	DHS 1993		√	√	√	√

Step 3. A selection of reproductive, maternal and child health subtopics related to health services are listed below. The data sources that contain information about each subtopic are listed using the numbers assigned in step 2.

Data sources with information on specified health topics in the Philippines (partial table)

Reproductive, maternal and child health subtopic	Data source number					
Reproductive health services	3	4	5	6	…	
Maternal health services	1	3	4	5	6	…
Preventive care for children	3	4	5	6	…	
Care seeking for children	3	4	5	6	…	

Step 4. The final step involves compiling all lists. The data source map now shows which data sources in the Philippines contain information about each subtopic of reproductive, maternal and child health, as well as a number of equity stratifiers. Recall that the numbers that appear in the final table reflect the data sources listed in step 2.

Data source map in the Philippines, compiling data source information on **specified** equity stratifiers and health topics (partial table)

Reproductive, maternal and child health subtopic	Equity stratifier				
	Income, expenditure, consumption or asset index	Education	Sex	Place of residence	Province or region
Reproductive health services	3, 4, 5 …	3, 4, 5, 6 …	Not applicable	3, 4, 5, 6 …	3, 4, 5, 6 …
Maternal health services	3, 4, 5 …	3, 4, 5, 6 …	Not applicable	3, 4, 5, 6 …	1, 3, 4, 5, 6 …
Preventive care for children	3, 4, 5 …	3, 4, 5, 6 …	3, 4, 5, 6 …	3, 4, 5, 6 …	3, 4, 5, 6 …
Care seeking for children	3, 4, 5 …	3, 4, 5, 6 …	3, 4, 5, 6 …	3, 4, 5, 6 …	3, 4, 5, 6 …

5.3 Data analysis

Once the data source mapping is complete, health indicators have been selected and the intersecting data have been obtained (health indicator data and equity stratifier data), the next stage is to analyse the data.[1] First, indicator means were calculated at the national level and by each equity stratifier, and then the appropriate measures of inequality were calculated according to each equity stratifier, across all health indicators. The calculations that were employed for each equity stratifier are shown in Table 5.2. Here, difference and ratio (simple measures of inequality) were used to measure inequality by every type of equity stratifier. For equity stratifiers that consist of two subgroups (urban–rural area and sex), pairwise comparisons are sufficient to show inequalities. For equity stratifiers that consist of more than two subgroups with natural ordering (wealth and education), additional complex measures (the slope index of inequality and the concentration index) were used to determine inequality across all subgroups; for region-based inequality, which consists of non-ordered subgroups, variance or mean difference from the overall mean and Theil index were used. Inequality measures were calculated for all data time points. Using these measures, it is possible to determine which indicators demonstrate the largest and smallest inequalities, and where inequalities have changed the most and least between the time points.

Table 5.2 Measures used to quantify health inequality, by five equity stratifiers

Equity stratifier	Simple measures of inequality		Complex measures of inequality	
	Absolute	Relative	Absolute	Relative
Wealth	Difference	Ratio	Slope index of inequality	Concentration index
Education	Difference	Ratio	Slope index of inequality	Concentration index
Area	Difference	Ratio		
Sex	Difference	Ratio		
Region	Difference	Ratio	Variance or mean difference from overall mean	Theil index

1 Although data source mapping revealed other sources of data in the Philippines that may have been incorporated into a full assessment of reproductive, maternal and child health inequality, for the sake of data comparability and availability at the national level at the time of the workshop, only DHS data were selected for this analysis.

5.4 Reporting inequality

In preparing to report these inequality data, it is important to thoroughly review all of the results (including national average, disaggregated data, and simple and complex measures of inequality) and consider their importance within the context of the Philippines. In cases where the sample size is too low, it may not be appropriate to report results of health inequality monitoring for indicators where uncertainty levels are high. In this analysis, two indicators had very low sample sizes when disaggregated, and were thus excluded from inequality reporting. These indicators were children with diarrhoea receiving oral rehydration therapy and children with acute respiratory infection symptoms taken to a health facility.

Reporting health inequalities may require judgement-based decisions relating to issues such as what level of inequality is deemed to be meaningful for a particular health indicator, what magnitude of difference over time indicates an improvement and against which other countries the Philippines could be benchmarked. It is also important to consider which indicators are highlighted throughout, where reporting emphasis is placed and whether simple measures can appropriately and completely represent the inequality. (While complex measures may not be reported, these results should factor into these pre-reporting decisions.) These types of decisions should be reached in consultation with stakeholders that are familiar with the reproductive, maternal and child health agenda in the Philippines, and also have a good understanding of health inequality measurements and their limitations and application.

Based on the measurement calculations outlined in the previous subsection, the following text and visualizations provide a brief example of reporting latest status, time trends and benchmarking. To illustrate the application of these concepts, the sample report focuses solely on wealth-based inequality, although a comprehensive report would include all equity stratifiers. Note that, although both simple and complex measures of inequality were calculated for wealth-based inequality, mainly pairwise comparisons are reported here. This makes for a more concise and readable report of the main conclusions from the data. (A complete table of disaggregated data and inequality measurements for wealth-based inequality at all time points could be included in an appendix of a report.) Depending on the audience and intended purposes of reporting, a more extensive and detailed report could explore the nuanced results of complex measures.

Wealth-based inequality in reproductive, maternal and child health in the Philippines

Latest status

In DHS 2008, 5 of the 11 reproductive, maternal and child health service indicators showed low levels of absolute wealth-based inequality, with the difference between the richest and poorest quintiles at less than 10 percentage points (Table 5.3). The indicators with absolute levels of inequality at less than a 10-percentage-point gap included contraceptive prevalence (modern methods), contraceptive prevalence (modern and traditional methods), antenatal care (at least one visit), early initiation of breastfeeding and vitamin A supplementation. All of these indicators had relative ratios of inequality equal to or less than 1.3. In contrast, 4 of the 11 indicators saw high levels of wealth-based inequality in DHS 2008, with an absolute gap between the richest and poorest quintiles of over 20 percentage points. These indicators included antenatal care (at least four visits), births attended by skilled health personnel, DTP3 immunization and full immunization. Three of these four indicators had absolute gaps between 22 and 32 percentage points, with relative ratios between quintiles ranging from 1.3 to 1.5. The presence of a skilled birth attendant was an outlier of extreme inequality. Coverage of births attended by skilled health personnel had the most wealth-based inequality of any indicator, with an absolute gap between the richest and poorest quintiles of 68.7 percentage points and a relative ratio of 3.7.

Time trend

The Philippines achieved substantial decreases in wealth-based inequality from DHS 1998 to DHS 2008 in 4 of the 11 reproductive, maternal and child health indicators (Figure 5.1). The indicators that showed decreases in wealth-based inequality included family planning needs satisfied, antenatal care (at least one visit), antenatal care (at least four visits) and vitamin A supplementation.

Table 5.3 Latest status of wealth-based inequality in selected reproductive, maternal and child health service indicators in the Philippines, DHS 2008

Indicator	National average (%)	Quintile 1 (poorest) (%)	Quintile 2 (%)	Quintile 3 (%)	Quintile 4 (%)	Quintile 5 (richest) (%)	Difference (quintile 5 – quintile 1) (percentage points)	Ratio (quintile 5 / quintile 1)
Contraceptive prevalence: modern methods	34.0	26.0	35.7	36.6	38.5	33.1	7.2	1.3
Contraceptive prevalence: modern and traditional methods	50.7	40.8	52.7	54.0	55.8	50.0	9.2	1.2
Family planning needs satisfied	69.4	59.1	69.9	72.0	74.1	70.9	11.8	1.2
Antenatal care: at least one visit	96.1	91.6	95.7	97.4	98.8	98.5	6.9	1.1
Antenatal care: at least four visits	77.8	61.1	71.5	82.4	88.9	93.1	32.0	1.5
Births attended by skilled health personnel	62.2	25.7	55.6	75.8	86.0	94.4	68.7	3.7
Early initiation of breastfeeding	53.5	59.0	54.1	50.9	50.3	50.3	–8.7	0.9
DTP3 immunization among 1-year-olds	85.6	71.6	86.7	88.5	93.4	94.0	22.4	1.3
Full immunization coverage among 1-year-olds	79.5	63.6	81.6	82.3	89.4	87.1	23.5	1.4
Measles immunization among 1-year-olds	84.5	71.4	85.1	86.8	93.2	91.3	19.8	1.3
Vitamin A supplementation among children under five	75.9	67.1	78.1	80.3	81.9	74.7	7.7	1.1

Figure 5.1 Time trend of selected reproductive, maternal and child health service indicators in the Philippines, by wealth quintile, DHS 1998, 2003 and 2008

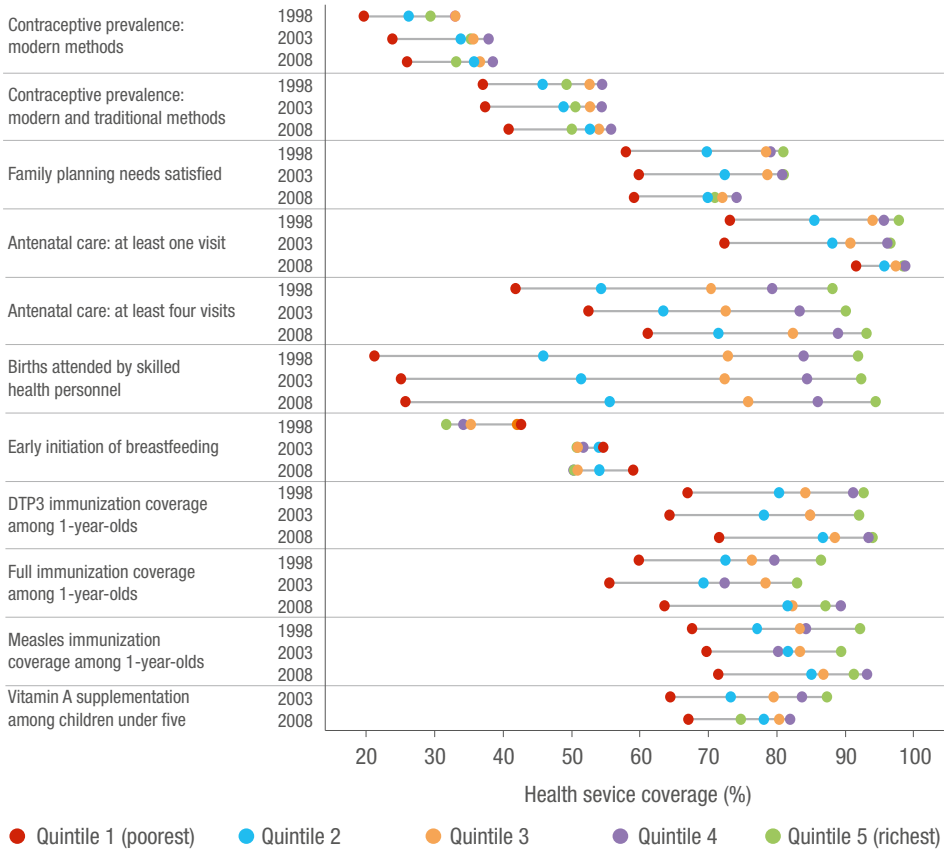
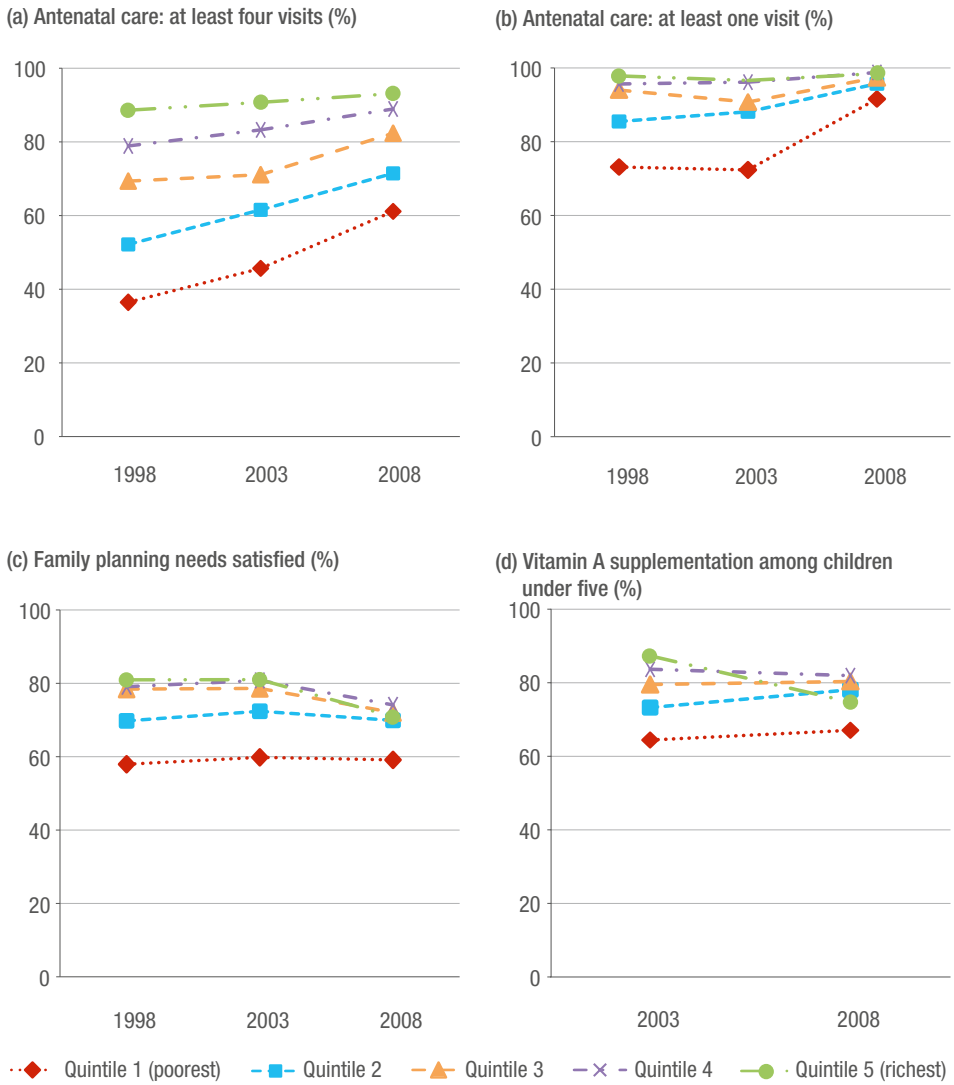


Figure 5.2 takes a closer look at the indicators with decreasing wealth-based inequality. Of these four indicators, antenatal care (at least four visits) saw the greatest decrease in both absolute and relative inequality over the 10-year period: the absolute gap between the richest and poorest quintiles decreased from 52.1 percentage points in DHS 1998 (88.6% - 36.5%) to 32.0 percentage points in DHS 2008, while the relative ratio of these quintiles went from 2.4 to 1.5 in the same period (Figure 5.2a). The indicator with the second largest decrease in inequality was coverage of antenatal care (at least one visit), with the absolute difference between richest and poorest quintiles decreasing from 24.7 percentage points (97.8% - 73.1%) to 6.9 percentage points over the same 10-year period, and the relative ratio of the quintiles decreasing from 1.3 to 1.1 (Figure 5.2b).

As evident in Figure 5.2, the large decrease in inequality in antenatal care coverage (at least four visits) occurred over both time periods, but especially the second five-year interval, as poorer quintiles reported rapid improvements in coverage from DHS 2003 to DHS 2008. In coverage of at least one antenatal care visit, the drop in inequality was largely driven by an improvement in the poorest quintile.

Figure 5.2 Time trend of (a) antenatal care (at least four visits), (b) antenatal care (at least one visit), (c) family planning needs satisfied and (d) vitamin A supplementation among children under five in the Philippines, by wealth quintile, DHS 1998, 2003 and 2008



Conversely, for family planning the decrease in inequality was not driven by improvements in coverage. Instead, there was a decrease in coverage in the upper three quintiles in the DHS 2003 to DHS 2008 period, leading to convergence among quintiles (Figure 5.2c). The case was similar in vitamin A supplementation coverage: the poorest wealth quintile remained an outlier over the DHS 2003 to DHS 2008 period (1998 data were not available), and the drop in inequality was primarily driven by a decrease in coverage in the richest quintile, coupled with a slight improvement in coverage of the second poorest quintile (Figure 5.2d).

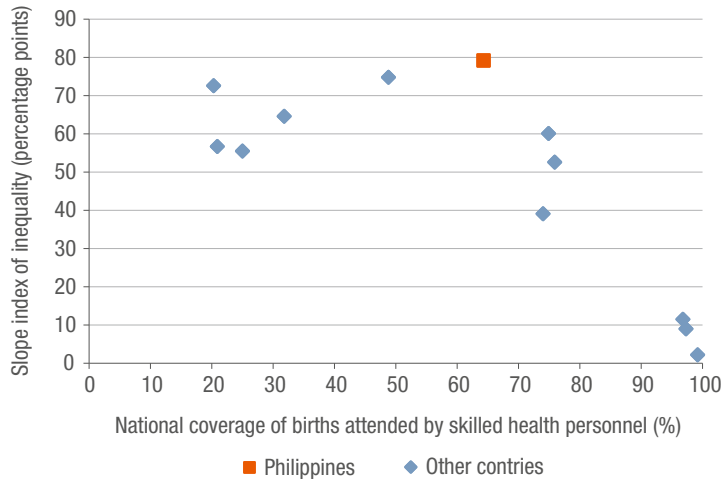
During the DHS 1998 to DHS 2008 period, 7 of the 11 indicators assessed by wealth showed no substantial change in inequality: contraceptive prevalence (modern methods), contraceptive prevalence (modern and traditional methods), births attended by skilled health personnel, early initiation of breastfeeding, DTP3 immunization, full immunization and measles immunization. Of these seven indicators, three – contraceptive prevalence (modern methods), contraceptive prevalence (modern and traditional methods) and early initiation of breastfeeding – had low levels of inequality at the first period, with absolute gaps between richest and poorest quintiles around 10 percentage points. Four indicators had higher levels of inequality, with absolute gaps of over 20 percentage points: births attended by skilled health personnel, DTP3 immunization, full immunization and measles immunization. Early initiation of breastfeeding was the only indicator for which inequality favoured the poorest quintile (that is, the poorest quintile achieved the highest coverage). In all other indicators, inequality favoured wealthier quintiles.

Benchmarking

The Philippines was benchmarked against 11 other low- and middle-income Asia-Pacific countries for which comparable data were available. Looking at the latest status of wealth-based absolute inequality, the Philippines fell in the middle one third of countries for 8 of the 11 studied reproductive, maternal and child health service indicators. These indicators included contraceptive prevalence (modern methods), contraceptive prevalence (modern and traditional methods), family planning needs satisfied, antenatal care (at least one visit), antenatal care (at least four visits), DTP3 immunization, full immunization and measles immunization.

In 2 of 11 indicators assessed, the Philippines was among the one third of countries with the highest wealth-based absolute inequality. These indicators were births attended by skilled health personnel and vitamin A supplementation. In relation to comparable countries, the Philippines had the highest level of wealth-based absolute inequality (the slope index of inequality) in births attended by skilled health personnel (Figure 5.3).

Figure 5.3 Benchmarking the latest status of wealth-based absolute inequality in births attended by skilled health personnel in the Philippines against 11 other low- and middle-income Asia-Pacific countries, DHS and MICS 2005–2010



In one of the indicators – early breastfeeding – the wealth-based absolute and relative inequality in the Philippines was such that the poor achieved better coverage than the wealthy. This was also the case in 5 of the other 11 nations against which the Philippines was benchmarked.

In wealth-based relative inequality, the Philippines was among the one third of countries with the lowest inequality for two health service indicators: antenatal care (at least one visit) and antenatal care (at least four visits). These two indicators were also some of the only ones that achieved comparably high levels of national coverage among countries assessed. Relative inequality in 8 of the 11 indicators fell in the middle one third of comparable countries: contraceptive prevalence (modern methods), contraceptive prevalence (modern and traditional methods), family planning needs satisfied, births attended by skilled health personnel, DTP3 immunization, full immunization, measles immunization and vitamin A supplementation.

5.5 Defining priority areas

Assessing the situation

Using a three-point scale, Table 5.4 shows an assessment of the latest status of inequality (absolute and relative) and national average of 11 reproductive, maternal and child health indicators in the Philippines. The assessment was carried out through a consensus-reaching process with key stakeholders that are knowledgeable in health statistics, taking into account the aim for universal health care in the Philippines and the reproductive, maternal and child health targets set for 2015. A value of 1 indicates that no action is needed, 2 indicates that action is needed and 3 indicates that urgent action is needed. Similar tables for time trend and benchmarking should also be incorporated.

Defining priorities

Once the status of each health indicator by each equity stratifier has been assessed, the process of priority setting can begin. As shown in Table 5.5, an average inequality score was calculated for each health indicator and an average score was calculated for each equity stratifier. Based on the average inequality scores and the national average scores, coverage of births attended by skilled health personnel emerged as an urgent priority, with an average score of 2.9 for inequality and a score of 3 for national average. This was followed by coverage of antenatal care (at least four visits), which scored 2.4 for inequality and 2 for national average. The best average score for inequality was for early initiation of breastfeeding, which scored 1 across the board for inequality; however, the national average of 2 for breastfeeding indicated that action is needed. Education- and region-based inequalities were identified as the equity stratifiers with highest priority.

Using priority setting to implement change

The priorities identified here provide a starting point for policy-makers in the Philippines, but other considerations weigh into the decision of where action and resources will be directed. For example, the coverage of births attended by skilled health personnel was identified as a high-priority indicator based on inequality across the equity stratifiers and national average, but this may be a relatively expensive indicator to influence. There is a need to train additional skilled providers, keep them working in the Philippines and develop a financing system that will bring skilled providers to underserved areas. While DTP3 immunization coverage was found to be a lower-priority indicator, it may make more sense to prioritize DTP3 in a national policy agenda, as the inequality in this indicator may be more easily – and cost-effectively – influenced. This is an important point to understand when presenting inequality monitoring results to the public and policy-makers, as acknowledging the need to address a variety of indicators (rather than concentrating on just one or two high-priority ones) may make the presentation of an inequality assessment more relevant.

Table 5.4 Assessing the latest status of inequality and national average in various reproductive, maternal and child health service indicators in the Philippines with a simple numerical scale

Health indicator	Inequality by equity stratifier										National average
	Wealth		Education		Sex		Area		Region		
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	
Contraceptive prevalence: modern methods	2	2	2	2			1	1	2	3	2
Contraceptive prevalence: modern and traditional methods	2	2	2	2			1	1	2	3	2
Family planning needs satisfied	2	1	2	2			1	1	3	2	2
Antenatal care: at least one visit	1	1	2	2			1	1	1	1	1
Antenatal care: at least four visits	2	3	3	3			2	1	3	2	2
Births attended by skilled health personnel	3	3	3	3			3	2	3	3	3
Early initiation of breastfeeding	1	1	1	1	1	1	1	1	1	1	2
DTP3 immunization among 1-year-olds	2	2	3	2	1	1	1	1	3	2	1
Full immunization coverage among 1-year-olds	2	2	3	3	1	1	1	1	3	2	2
Measles immunization among 1-year-olds	2	2	3	3	1	1	1	1	3	2	2
Vitamin A supplementation among children under five	2	1	2	2	1	1	1	1	2	2	2

Note: 1 indicates no action is needed (green cells), 2 indicates action is needed (yellow cells) and 3 indicates urgent action is needed (red cells); grey cells indicate non-applicability.

Table 5.5 Prioritizing the latest status of inequality and national average in various reproductive, maternal and child health service indicators in the Philippines, using average scores for health indicators and equity stratifiers

Health indicator	Inequality by equity stratifier										Average inequality score	National average
	Wealth		Education		Sex		Area		Region			
	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative	Absolute	Relative		
Contraceptive prevalence: modern methods	2	2	2	2			1	1	2	3	1.9	2
Contraceptive prevalence: modern and traditional methods	2	2	2	2			1	1	2	3	1.9	2
Family planning needs satisfied	2	1	2	2			1	1	3	2	1.8	2
Antenatal care: at least one visit	1	1	2	2			1	1	1	1	1.3	1
Antenatal care: at least four visits	2	3	3	3			2	1	3	2	2.4	2
Births attended by skilled health personnel	3	3	3	3			3	2	3	3	2.9	3
Early initiation of breastfeeding	1	1	1	1	1	1	1	1	1	1	1.0	2
DTP3 immunization among 1-year-olds	2	2	3	2	1	1	1	1	3	2	1.8	1
Measles immunization among 1-year-olds	2	2	3	3	1	1	1	1	3	2	1.9	2
Full immunization coverage among 1-year-olds	2	2	3	3	1	1	1	1	3	2	1.9	2
Vitamin A supplementation among children under five	2	1	2	2	1	1	1	1	2	2	1.5	2
Average inequality score	1.9		2.3		1.0		1.2		2.2			

Note: 1 indicates no action is needed (green cells), 2 indicates action is needed (yellow cells) and 3 indicates urgent action is needed (red cells); grey cells indicate non-applicability. Average scores represent the mean of relevant health indicator or equity stratifier values.

Conclusion

Monitoring health inequality is a practice that fosters accountability and continuous improvement within health systems. It helps to identify and track health differences between subgroups, providing evidence and feedback to strengthen equity-oriented policies, programmes and practices. Through inequality monitoring and the use of disaggregated data, countries gain insight into how health is distributed in the population, looking beyond what is indicated by national averages. Data about health inequalities underlie health interventions that aim to reach vulnerable populations. Furthermore, they constitute an evidence base to inform and promote equity-oriented health initiatives, including the movement towards universal health coverage.

This handbook has explained and illustrated the components of the cycle of health inequality monitoring, addressing the considerations, implementation and importance of each step. At the country level, it is important to sustain and promote improvements throughout the entire process. Data sources can be expanded and strengthened to supply high-quality, representative data about health indicators and equity stratifiers, ensuring that linkages exist. Countries are encouraged to develop the expertise needed not only to conduct health inequality analyses, but also to thoroughly understand the applicability and implications of various measures of inequality. Following this, it is important that those involved in health inequality monitoring develop the ability to draw conclusions from the analyses, effectively communicate the results of health inequality monitoring to policy-makers and support the integration of this new knowledge into health policies, programmes and practices. An understanding of each step in health inequality monitoring cultivates a better appreciation of the process in its entirety; this enhances the ability to apply health inequality monitoring and assists countries in building capacities for health inequality monitoring in their own health information systems.

Appendix: Health indicator definitions

Antenatal care: at least one visit	Proportion of women aged 15–49 years with a live birth in a given time period, attended at least once during pregnancy by skilled health personnel for reasons related to the pregnancy.
Antenatal care: at least four visits	Proportion of women aged 15–49 years with a live birth in a given time period, attended at least four times during pregnancy by any provider (skilled or unskilled) for reasons related to the pregnancy.
Births attended by skilled health personnel	Proportion of live births attended during delivery by skilled health personnel. Skilled health personnel include doctors, nurses, midwives and other medically trained personnel, as defined according to each country.
Contraceptive prevalence: modern methods	Percentage of women aged 15–49 years, married or in union, who are currently using, or whose sexual partner is using, at least one modern method of contraception. Modern methods of contraception include female and male sterilization, oral hormonal pills, intrauterine device (IUD), male condom, injectables, implant (including Norplant), vaginal barrier methods, female condom and emergency contraception.
Contraceptive prevalence: modern and traditional methods	Percentage of women aged 15–49 years, married or in union, who are currently using, or whose sexual partner is using, at least one method of contraception, regardless of the method used.
DTP3 immunization coverage among 1-year-olds	Percentage of 1-year-olds who have received three doses of the combined diphtheria–tetanus–pertussis (DTP3) vaccine in a given year.
Early initiation of breastfeeding	Proportion of children who were put to the breast within one hour of birth.
Family planning needs satisfied	Proportion of all women aged 15–49 years using contraception among those who are fecund, in union and in need of contraception. Women in need of contraception include those who do not want any more children or who want to wait two or more years before having another child.
Full immunization coverage among 1-year-olds	Percentage of 1-year-olds who have received one dose of bacille Calmette–Guérin (BCG) vaccine, three doses of polio vaccine, three doses of DTP3 vaccine and one dose of measles vaccine.
Infant mortality rate	Probability (expressed as a rate per 1000 live births) of a child born in a specific year or period dying before reaching the age of one, if subject to age-specific mortality rates of that period.
Measles immunization coverage among 1-year-olds	Percentage of children aged 12–23 months who have received at least one dose of measles-containing vaccine in a given year.
Stunting among children under five	Percentage of stunting (height-for-age less than minus two standard deviations of the World Health Organization Child Growth Standards median) among children aged five years or younger.
Under-five mortality rate	Probability (expressed as a rate per 1000 live births) of a child born in a specific year or period dying before reaching the age of five, if subject to age-specific mortality rates of that period.
Vitamin A supplementation among children under five	Proportion of children aged 6–59 months who received a high-dose vitamin A supplement within the six months prior to the survey. High-dose vitamin A, according to the International Vitamin A Consultative Group (IVACG) definition, refers to doses equal to or greater than 25 000 IU.

Note: For more-detailed definitions of health indicators, including the criteria used to calculate numerator and denominator values, see the World Health Organization Indicator and Measurement Registry: http://apps.who.int/gho/indicatorregistry/App_Main/indicator_registry.aspx.

Monitoring health inequality is a practice that fosters accountability and continuous improvement within health systems. It helps to identify and track health differences between subgroups, providing evidence and feedback to strengthen equity-oriented policies, programmes and practices. Through inequality monitoring and the use of disaggregated data countries gain insight into how health is distributed in the population, looking beyond what is indicated by national averages. Data about health inequalities underlie health interventions that aim to reach vulnerable populations. Furthermore, they constitute an evidence base to inform and promote equity-oriented health initiatives, including the movement towards universal health coverage.

The *Handbook on health inequality monitoring: with a special focus on low- and middle-income countries* is a user-friendly resource, developed to help countries establish and strengthen health inequality monitoring practices. The handbook elaborates on the steps of health inequality monitoring, including selecting relevant health indicators and equity stratifiers, obtaining data, analysing data, reporting results and implementing changes. Throughout the handbook, examples from low- and middle-income countries are presented to illustrate how concepts are relevant and applied in real-world situations; informative text boxes provide the context to better understand the complexities of the subject. The final section of the handbook presents an expanded example of national-level health inequality monitoring of reproductive, maternal and child health.

9 789241 548632

STOP DREAMING AND BECOME AN AUTHOR YOURSELF TODAY!

It's Free, Easy and Fun!

At our sister website, Foboko.com, we provide you with a free 'Social Publishing Wizard' which guides you every step of the eBook creation/writing process and let's your friends or the entire community help along the way!

LOGON ONTO FOBOKO.COM

and get your story told!

FOBOKO.COM