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## **Disparities in Medical Practices**

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### **Abstract**

Inequities in health associated with socioeconomic position including income, education, race/ethnicity, gender, and geography are found across societies internationally. Inequities/disparities in health system performance associated with socioeconomic position have also been widely documented. This chapter provides an overview of variations in health and health care associated with socioeconomic position. Methods of measuring health disparities and measurement challenges commonly encountered are discussed. Populations at risk for health inequities include any group consistently more likely to experience poor health than the general population as consequence of social or economic disadvantage. Studying disparities begins with reliable and valid measures and methods for tracking change over time. Important concepts to consider include how the use of relative and absolute disparities may result in different estimates of changes in disparity over time, how the choice of reference group can affect perceptions of disparities, when to use rate comparisons or summary measures, and whether to stratify or risk adjust measures. Objectives for the analysis should inform decisions about indicator choice and measurement. Then, results need to be interpreted in the context of the specific strengths and limitations of the measurement approach used. Health inequities result in enormous costs for individuals, health systems, communities, and governments. Much can be gained by interventions aimed at reducing and ultimately eliminating them. This chapter focuses primarily on measurement and reporting challenges. The same concepts are applicable to studies to better understand factors that lead to more or less equitable health outcomes or to evaluate interventions designed to reduce disparities.

# Introduction

Inequities in health associated with socioeconomic position including income, education, race/ethnicity, and gender appear across societies internationally. The size of the gap in health between the most and least advantaged members of society varies considerably across countries and over time (Marmot [2001](#)). Disparities in health-care quality have also been well documented in many health systems and settings of care (Smedley et al. [2002](#)). These disparities in health system performance, that is, the ability of health-care providers to achieve high measurable standards, contribute to health inequities in populations.

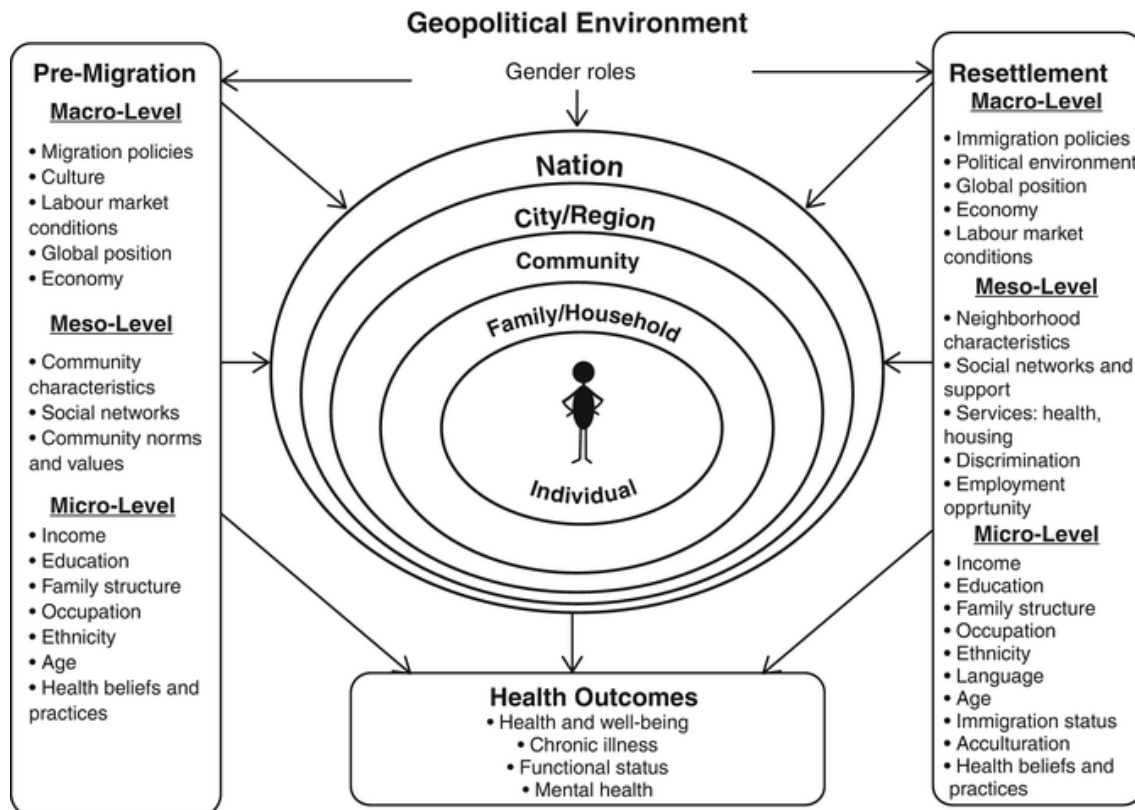
A growing number of countries have identified the need to reduce health inequities as a priority for both health and social policies and have developed strategies and implemented policies aimed at achieving health equity (Sabik and Lie [2008](#)). Economic, environmental, and societal factors all result in a higher burden of illness among socioeconomically disadvantaged populations. Social policies (Kawachi et al. [1999](#)), characteristics of primary care delivery (Starfield et al. [2005](#)), and type of political system (Navarro et al. [2006](#)) have all been associated with more or less equitable distribution of health in populations. Thus, there is broad consensus that health inequities are amenable to change. This chapter provides an overview of variations in health and health care associated with socioeconomic position. Methods of measuring health disparities and measurement challenges are discussed.

## Inequities or Disparities?

In the USA, the term health disparities is commonly used to refer to differences in health among population groups, while internationally the term health inequities is more often used and preferred because it encompasses the concept of fairness. In this chapter, both terms are used. Eliminating health inequities (disparities) requires systems to measure and monitor identified disparities, as well as research to understand their root causes and to test and evaluate interventions that address them.

## Medical and Nonmedical Determinants of Health

The determinants of health are complex and multifactorial and act through varied pathways and at multiple levels. Major determinants of health lie outside of the health system, including living in crime-ridden neighborhoods or places with poor transportation options, food deserts, undocumented immigrant status, and the stress associated with racial discrimination. Individual, family, community, health system, and societal factors all contribute to the development of health inequities. Figure [1](#) provides an example to illustrate the many levels that influence the health of immigrant women. Their health is the product of macro-level or national factors such as labor market conditions, the economy, health system characteristics, and immigration policy; meso- or community-level factors such as neighborhood characteristics, social networks, discrimination, and availability of health and community services; and microlevel factors such as those related to individuals and families, for example, income, education, and family structures in countries of origin (premigration) and in the host nation (post-migration) (Bierman et al. [2009a](#)).



**Fig. 1**

Gender, migration, and health outcomes – multiple levels of influence \*Central concentric circles (Adapted from Hertzman et al. (2001), Bierman et al. (2009a). Source: © All rights reserved. Social Determinants and Science Integration Directorate. Public Health Agency of Canada 2013. Reproduced with permission from the Minister of Health 2015)

Because the nonmedical determinants of health play such an important role, the potential contribution of health sector reform and transformation to health equity has been questioned. However, health care is an important determinant of health serving as a mediator of health outcomes. Health inequalities resulting from social conditions are manifested through preventable or treatable clinical conditions, such as heart disease, diabetes, or asthma, which are thus more prevalent among disadvantaged and marginalized groups. As a result, when socioeconomically disadvantaged populations experience barriers to accessing care or receive health care of lower quality, they experience suboptimal health outcomes. Access to quality health care can potentially improve the health of population groups of lower socioeconomic position, whereas poor access and quality of care can compound health inequities produced by the nonmedical determinants of health (Bierman and Dunn 2006).

## Equity, Health System Performance, and Population Health

Equity is recognized as a key attribute of high-performing health systems and an important dimension of health-care quality (Institute of Medicine 2001). Inequities in access, quality, and outcomes of care have all been well documented. Two landmark studies by the US Institute of Medicine (IOM), *Crossing the Quality Chasm*, released in 2001, and *Unequal Treatment*, released in the following year, focused attention on gaps in health-care quality as well as inequalities in quality of care

associated with race and ethnicity (Institute of Medicine [2001](#); Smedley et al. [2002](#)). Health systems can make important contributions to reduce inequities in health through health system redesign aimed at meeting the needs of populations at risk for poor health, as well as by engaging in cross-sectoral partnerships aimed at addressing the social determinants of health. At the same time, progress in achieving health equity can make important contributions to health system sustainability by reducing the incidence of costly and preventable illnesses such as late stage breast, colorectal, or cervical cancer that can be identified through screening or hospitalizations for uncontrolled diabetes or congestive heart failure through better chronic disease management. There is increasing focus on integrating public health and health system strategies to tackle health disparities (Institute of Medicine [2012](#)).

The relationship between socioeconomic position and health is manifested as a gradient across all levels of socioeconomic position such that the middle class are also less healthy than the more affluent. Therefore, policies aimed at reducing health inequities have the potential to benefit large segments of the population. Additionally, to maximize the effectiveness of efforts to improve overall population health or to improve health system performance, it is necessary to improve the health of those who are sickest and/or at risk for poor health outcomes.

Internationally, the focus has been primarily on eliminating socioeconomic inequities in health, whereas the USA has placed a greater emphasis in racial/ethnic inequities. In *Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care*, the IOM found a consistent body of research that demonstrated that US racial and ethnic minorities are less likely to receive indicated services and experience worse health outcomes. Disparities were found even when clinical factors, such as stage of disease presentation, comorbidities, age, and severity of disease, were taken into account across a wide range of clinical settings, including public and private hospitals and teaching and nonteaching hospitals. These disparities are believed to result from multiple factors including socioeconomic position, bias and discrimination, and differential access to care and its quality (Smedley et al. [2002](#)). This is not surprising. Health-care systems mirror the dynamics of the broader society. Thus, discrimination and bias associated with race, gender, and class operating within health-care institutions contribute identified inequities in health and health care (Geiger [2006](#)).

## What Is Health Equity?

In order to develop strategies to reduce inequities in health, it is important to have a clear definition of what constitutes a health inequity. While the term health disparities can be defined as “differences” in health and health-care quality, the disparities literature largely focuses on the same construct of remediable differences.

The International Society for Equity in Health (ISEqH) has developed a useful set of definitions for this purpose ( [International Society for Equity in Health](#)). Inequity in health is defined as “the systematic and potentially remediable differences in one or more aspects of health across populations or population groups defined socially, economically, demographically, or geographically” (Macinko and Starfield [2002](#)). By including “potentially remediable” as a key element of the definition, it focuses attention on identifying and addressing factors amenable to change.

Empiric data can be used to identify priorities and to target health inequities that are amenable to change among disadvantaged population subgroups (Bonney et al. [2007](#)). ISEqH goes on to define *equity policy and actions* as “active policy decisions and programmatic actions directed at improving equity in health or in reducing or eliminating inequalities in health.” Furthermore, such policies can be objectively studied and evaluated to further build the evidence base about what works to close gaps in

health and health care associated with socioeconomic disadvantage. *Equity research*, defined as “research to elucidate the genesis and characteristics of inequity in health for the purpose of identifying factors amenable to policy decisions and programmatic actions to reduce or eliminate inequities,” can inform strategy development as well as ongoing implementation and improvement of policies and interventions aimed at reducing identifies inequities.

## Equity Versus Equality

A distinction is made between “equity” and “equality”(Braveman and Gruskin [2003](#)). Implicit in the definition of equity is the notion of fairness. Achieving equity in health requires specifically addressing the root causes of health inequities and recognition of the different needs of disadvantaged and marginalized subgroups arising from social and historical factors. Thus, treating all individuals equally (the same) will not suffice and is not the objective. Rather, achieving health equity targets will require resource allocation and interventions to specifically address the unique needs of disadvantaged populations. For example, if women and low-income individuals experience a higher prevalence of arthritis and thus have greater need for hip replacement therapy and rates of hip replacement are equal among men and women and individuals with lower and high incomes, this is likely not to represent an equitable distribution of services but rather barriers to needed care among populations with greater need (Hawker et al. [2006](#)). In Ontario, Canada, rates of hip replacement surgery are lower among low-income residents and among women, although they are more likely to have arthritis (Hawker et al. [2000](#), [2002](#)). Similarly, disadvantaged and marginalized populations may experience barriers to accessing available services, and additionally, enabling services may be needed to assure equitable access (Aday and Andersen [1981](#); Andersen [1995](#)).

## Equity in Health and Health Care

Health equity has multiple dimensions. Populations at risk include any group consistently more likely to experience poor health than the general population as consequence of social or economic disadvantage. Within the health-care sector, populations at risk include any group more likely to encounter barriers to accessing health care, more likely to experience suboptimal quality of care, or more likely to experience poor health outcomes than their more advantaged counterparts.

Internationally, health inequities associated with income, education, race/ethnicity, gender, and place of residence have all been commonly observed. Other vulnerable groups suffer health disparities including the disabled, lesbian/gay/bisexual/transgender (LGBT) individuals, and linguistic minorities, among others. In this chapter, attention is focused on the aforementioned groups because that is where the bulk of research has occurred. In addition, these disparities have more often been measured, monitored, and/or targeted by public health and health system interventions. There is no intent to diminish the importance of the barriers faced by other groups, and work is underway to address the needs of these other important vulnerable populations.

While the nonmedical determinants of health are the primary determinants of health, community and health system characteristics as well as health system performance are important mediators of the contribution of the social determinants to health inequities (Bierman [2007](#); Wilper et al. [2009](#)).

Universal health insurance fosters access to needed health services. There are well-studied disparities in access to health insurance in the USA. It has been estimated that 45,000 excess deaths annually in the USA can be attributed to lack of health insurance (Wilper et al. [2009](#)). Expansion of health

insurance coverage through Medicaid in Massachusetts was associated with reductions in mortality (Sommers et al. [2012](#), [2014](#)). The impact on the expansion of health insurance coverage through the Affordable Care Act on mortality is not yet known. Nonetheless, access to health insurance and health-care services is necessary but not sufficient. In the USA, disparities in access, quality, and outcomes of care associated with race/ethnicity, socioeconomic status, and gender have all been found among individuals with the same health insurance and seen by the same providers.

A number of studies in Canada's single-payer system have found overall utilization of health services to be based upon the need and not of equitable access to care (Finkelstein [2001](#); Rotermann [2006](#)). Nevertheless, important access barriers to primary care have been identified, and cost remains a barrier for services not universally covered including prescription drugs. In a cross-national comparison of sicker adults, 20 % of Canadians reported not receiving a prescription because of cost. Lack of care coordination and access to office visits on short notice or after hours were reported as an access barrier for many (Schoen et al. [2005](#)). A national study found that individuals in fair or poor health or with activity restrictions, both more prevalent among disadvantaged populations, were more likely to report barriers to routine first-contact care (Sanmartin and Ross [2006](#)). Low-income Canadians have been found less likely to access specialty services than those with higher incomes (Blendon et al. [2002](#); van Doorslaer et al. [2006](#)). Socioeconomic disparities in quality and outcomes of care have been identified in multiple studies in Ontario including for referral to specialists; care for myocardial infarction, stroke, and diabetes (Alter et al. [1999](#); Booth and Hux [2003](#); Kapral et al. [2002](#)); screening for colorectal cancer (Honein-AbouHaidar et al. [2005](#)–2011; Singh et al. [2004](#)); and palliative radiotherapy (Huang et al. [2001](#)).

Barriers to health-care access may contribute to identified inequities in health and health care. Socioeconomically disadvantaged populations can encounter multiple financial and nonfinancial barriers to accessing effective care which in turn contribute to health inequities (Angus et al. [2012](#); Lombardo et al. [2014](#)). Improving access to and quality of care is therefore dependent upon understanding access barriers as experienced by populations at risk and developing effective interventions to address them. Access barriers can be categorized as primary, secondary, and tertiary barriers (Bierman et al. [1998](#)).

Primary access barriers discourage or diminish the ability to obtain first-contact care and include such factors as lack of health coverage including pharmacy benefits, poor proximity of providers, competing demands such as caregiving and those arising from the social determinants of health, and lack of transportation. Socioeconomically disadvantaged individuals and those with chronic illness or disability may be disproportionately affected by these barriers. Secondary barriers are structural barriers within the care delivery system such as difficulty getting appointments, specialty referrals, or advice after hours. Tertiary access refers to the link between access and quality and reflects the ability of providers and the health-care system to understand and address the patient's needs including the provider's communication skills, cultural competence, knowledge, and clinical skills. All of these barriers can lead to health disparities, and they often work in combination (Bierman and Clancy [2001](#); Bierman et al. [1998](#); Weinick et al. [2005](#)).

## Studying Disparities

While there is much known about patterns of health inequities and their causes, there is less evidence on how to most effectively and efficiently close existing gaps. Critically evaluating health equity policies, strategies, and interventions to determine what works and what doesn't work is required to

build the evidence base needed to support widespread adoption of best practices. Studying disparities begins with reliable and valid measures and methods for tracking change over time.

## Choosing Measures

Performance measurement and reporting can be used as a tool for achieving improvements in access, quality, and outcomes of care, as well as for reducing inequities in health and health care; however, a specific focus on equity (across sex, socioeconomic status, demographic characteristics, and geography) is needed to ensure that access to and quality of health care are being equitably delivered. In order to eliminate inequities, objectives must be selected, indicators measured, and progress monitored. Quality improvement activities can narrow, maintain, or widen health inequities depending on the relative improvement in advantaged compared to disadvantaged populations. For many reasons, it may be easier to improve performance among those who are advantaged. Overall improvement on health indicators can mask inequities. There are a number of important challenges related to measurement and monitoring disparities that are discussed in the following section.

Explicit criteria are needed and widely used to select reliable and valid quality indicators including relevance, scientific soundness, and feasibility. Including the dimension of equity to these criteria can support the selection of indicators that can be measured and monitored to reduce disparities. Figure 2 shows the indicator selection criteria developed for the Project for an Ontario Women's Health Evidence-Based Report (POWER Study) that includes equity as a criterion to be considered in indicator selection along with definitions of selection criteria ( [www.powerstudy.ca](http://www.powerstudy.ca)).



SELECTION CRITERION	DESCRIPTION
<b>Relevance</b>	
Importance/Usefulness	<ul style="list-style-type: none"> <li>The indicator reflects an important health issue or aspect of health system functioning that matters to the health of the population group in question</li> <li>The indicator assists in monitoring and measuring health system performance over an extended period of time and is meaningful to stakeholders</li> </ul>
Amenable to Action	<ul style="list-style-type: none"> <li>The information being collected can be used to inform and influence policy or funding, alter behaviour of health services providers, or increase general understanding in the community in order to improve quality of care and population health</li> </ul>
<b>Scientific Soundness</b>	
Validity	<ul style="list-style-type: none"> <li>There is sufficient scientific evidence to support a link between the performance of an indicator and overall positive outcomes to patients</li> <li>The indicator measures what is both intended and acceptable to the community (face validity), covers relevant content or domains (content validity), and has predictive power (criterion validity)</li> </ul>
Reliability	<ul style="list-style-type: none"> <li>The same result will be obtained if measurements are repeated under identical conditions</li> </ul>
Risk-Adjusted or Stratified	<ul style="list-style-type: none"> <li>The extent to which non-modifiable influences or factors that differ among groups being compared can be controlled or taken into account when necessary for interpretation</li> </ul>
Interpretability	<ul style="list-style-type: none"> <li>Changes in the indicator are commonly understood to be good or bad</li> </ul>
Comparability	<ul style="list-style-type: none"> <li>The indicator can be compared over time, to other geographic areas or to other standards/benchmarks</li> </ul>
<b>Feasibility</b>	
Precisely Defined and Specified	<ul style="list-style-type: none"> <li>The extent to which the measure is standardized with explicit predefined requirements for data collection and calculation of the measure value or score</li> </ul>
Data Feasibility	<ul style="list-style-type: none"> <li>Data required for the indicator are available and of sufficient quality for the areas and time periods indicated, such that no unreasonable obstacles or constraints exist either on access to information or restrictions on its use</li> </ul>
Reliability of Data Collection	<ul style="list-style-type: none"> <li>The data for the indicator are collected in a consistent manner by one or more agencies over time</li> </ul>
<b>Equity</b>	
Health Disparities	<ul style="list-style-type: none"> <li>Indicator selection considers where gender, socioeconomic and ethnic disparities in health and health care are greatest, and where there are significant gender differences in health determinants</li> </ul>
<b>Comprehensiveness</b>	
Continuum of Care	<ul style="list-style-type: none"> <li>The indicator selection process seeks to identify health status and health care performance across the continuum of care, from population health to primary and tertiary care</li> </ul>

POWER Study

\*Developed from a comprehensive review of indicator selection criteria used by other reporting bodies and projects, with specific acknowledgment to the indicator selection criteria developed by the National Committee for Quality Assurance (<http://www.ncqa.org/tabid/415/Default.aspx>) and those used by the Ontario MOHLTC Health System Score Card.

**Fig. 2**  
POWER Study selection criteria\* (Clark and Bierman [2009](#))

There are often interactions between sex and gender with other factors associated with disparities including race/ethnicity and income. Sex refers to the biological differences between men and women, while gender refers to the differences associated with societal roles and the context of women's lives. It is usually difficult to separate the effects of sex and gender when studying health care. For example, while sex (male vs. female) influences who will get lung cancer and who will survive it, social factors that vary by gender influence who is more likely to smoke and is therefore at greater risk. Thus,



applying a gender lens when considering equity criteria for indicator selection can be used to select indicators that address the needs of both women and men from disadvantaged groups. Comprehensiveness is also included as a criterion to assist in the selection of indicators that assess the needs of disadvantaged populations across the continuum of care.

## Measuring Disparities

The goal of eliminating health disparities can be achieved only if indicators of interest are monitored and disparities recorded and tracked. However, our ability to track improvement is hampered by disagreement around how to measure disparities and how to demonstrate progress or lack thereof. Progress toward reducing disparities means that indicators must be measured over time. This section will provide an in-depth discussion of methodological approaches to disparities measurement, including statistical and technical considerations of disparities measurement, highlighting strengths and weaknesses of the different approaches. After reading this section, the reader should be able to understand common issues in measuring health disparities, describing the strengths and weaknesses of each. Important concepts include how the use of relative and absolute disparities may result in different estimates of changes in disparity over time and how the choice of reference group can affect perceptions of disparities. While examples given focus primarily on race/ethnicity, the same principles are applicable to other groups who experience disparities in health and health care.

## Identifying Group Domains and Reference Points

Measuring disparities can be viewed as an exercise in arithmetic. Indicators of health status or quality of care (performance) are usually measured in terms of rates, percentages, proportions, means, or other quantitative measures such as life expectancy. Each measure can be compared among two or more groups of interest in a “domain.” A domain is defined as “a set of groups defined in terms of a specific characteristic of persons in a population” (Keppel et al. [2005a](#)). For example, in the USA, the race domain according to the Office of Management and Budget contains five race categories including Black or African-American, White, Asian, American Indian or Alaska Native, and Native Hawaiian or Other Pacific Islander (Office of Management and Budget [1997a, b](#)). There are also two separate categories for ethnicity: Hispanic or Latino and Not Hispanic or Latino. Individuals can indicate more than one race. Classifications may change over time. For example, currently, the census is exploring adding a category of Middle Eastern or North African. Domains including different ethnic groups can number in the hundreds, and the categories chosen may be chosen to reflect the demographics of the population or community studied. Disparities become evident when quantitative measures (rates, percentages, etc.) of health, utilization, or health quality differ among groups in a domain.

Disparities frequently are measured by comparing health indicators of one group with one or more of the other groups in the same domain. After selecting a domain, the next step in creating a disparities measure usually involves selecting a *reference point*. A reference point is defined as “the specific value of a rate, percent, proportion, mean, or other quantitative measure relative to which a disparity is measured.” Alternatively, disparities can be measured from a reference point that is not a group characteristic. For example, one could compare each group against the unweighted mean of all the groups in the domain or to an externally determined benchmark or a goal. In such a case, one could select the Healthy People 2020 access objective to increase the proportion of persons with a usual

primary care provider to 83.9 % ( <http://www.healthypeople.gov/2020/topicsobjectives2020/objectiveslist.aspx?topicId=1>). Goals have intuitive appeal because they imply that all groups could improve. This chapter focuses on differences among groups, because achieving health equity is dependent upon improving the health and health care of disadvantaged populations.

From a purely statistical point of view, any one of the groups in a domain could be chosen as a reference point, but certain considerations should be taken into account. For example, the largest group might be selected because its rate is usually the most stable statistically speaking. Thus, if in some localities a “minority-majority” exists, the minority population would be the reference group. One might instead select the group with the best rate or highest-quality performance because this represents a realistic attainment. In addition, choosing the group with the best performance ensures that all of the differences with the other groups will be positive and have ratios greater than 1. A disadvantage of using the largest group or the best performing group is that the reference point may change over time. The best performing group could also differ across indicators resulting in different reference categories making comparisons difficult. Furthermore, using a method that ignores a priori evidence of social disadvantage could lead to policies that redirect resources toward more privileged populations. This chapter draws on the position argued by Braveman, who defines disparities as “...potentially avoidable differences in health (or in health risks that policy can influence) between groups of people who are more and less advantaged socially” (Braveman [2006](#)). The National Partnership for Action (NPA) to End Healthcare Disparities took a similar position:

A health disparity is a particular type of health difference that is closely linked with social or economic disadvantage. Health disparities adversely affect groups of people who have systematically experienced greater social and/or economic obstacles to health and/or a clean environment based on their racial or ethnic group; religion; socioeconomic status; gender; age; mental health; cognitive, sensory, or physical disability; sexual orientation or gender identity; geographic location; or other characteristics historically linked to discrimination or exclusion. ( [http://minorityhealth.hhs.gov/npa/files/Plans/Toolkit/NPA\\_Toolkit.pdf](http://minorityhealth.hhs.gov/npa/files/Plans/Toolkit/NPA_Toolkit.pdf))

Applying this concept to the measurement of disparities would argue that, for purposes of achieving equity in health care that is fair and just, the chosen reference group should always be the historically *advantaged* group.

## Absolute Versus Relative Disparities and Favorable Versus Adverse Indicators

The first decision commonly encountered by a disparities researcher is whether to use absolute or relative disparity measures. The simplest measure of disparity is the absolute disparity, also referred to as a rate difference. This is calculated as the arithmetic difference between two rates, expressed in the same units as the rates themselves:

*Formula 1:* Absolute measure = rate of reference group – rate of group of interest.

Another straightforward approach is to calculate the relative measure of disparity. This can be expressed as the simple ratio of two rates (Formula 2) or as a percentage of the reference point (or group) (Formula 3):

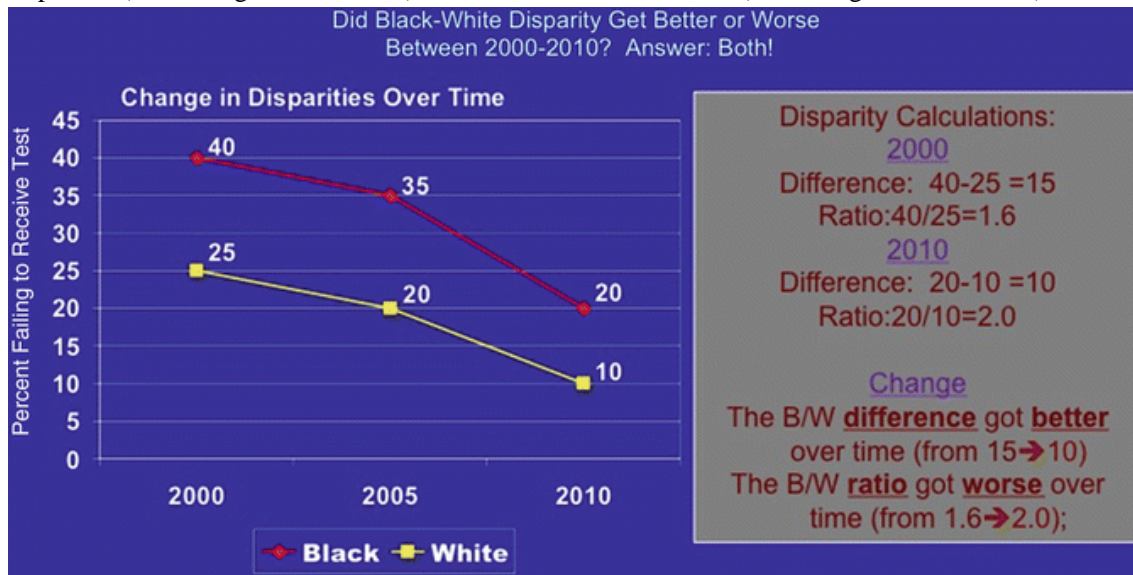
*Formula 2:* Relative ratio measure = *rate of group 1* / *rate of group 2*

*Formula 3:* Relative percentage measure = (*rate of reference group – rate of group of interest*) × 100 / *reference group rate*

For a desirable indicator (such as having a usual source of care), a difference greater than zero or a ratio greater than one would indicate a disparity as long as the researcher is using the advantaged

group as the referent. Many analysts focus on the relative rate because it has an intuitive connection with the idea of equality (Harper et al. 2010). However, at a given point in time for any given domain, the “direction” of the disparity will always be the same whether one chooses absolute or relative measures. In other words, if the absolute difference is greater than zero, then the relative ratio will always be greater than one (1).

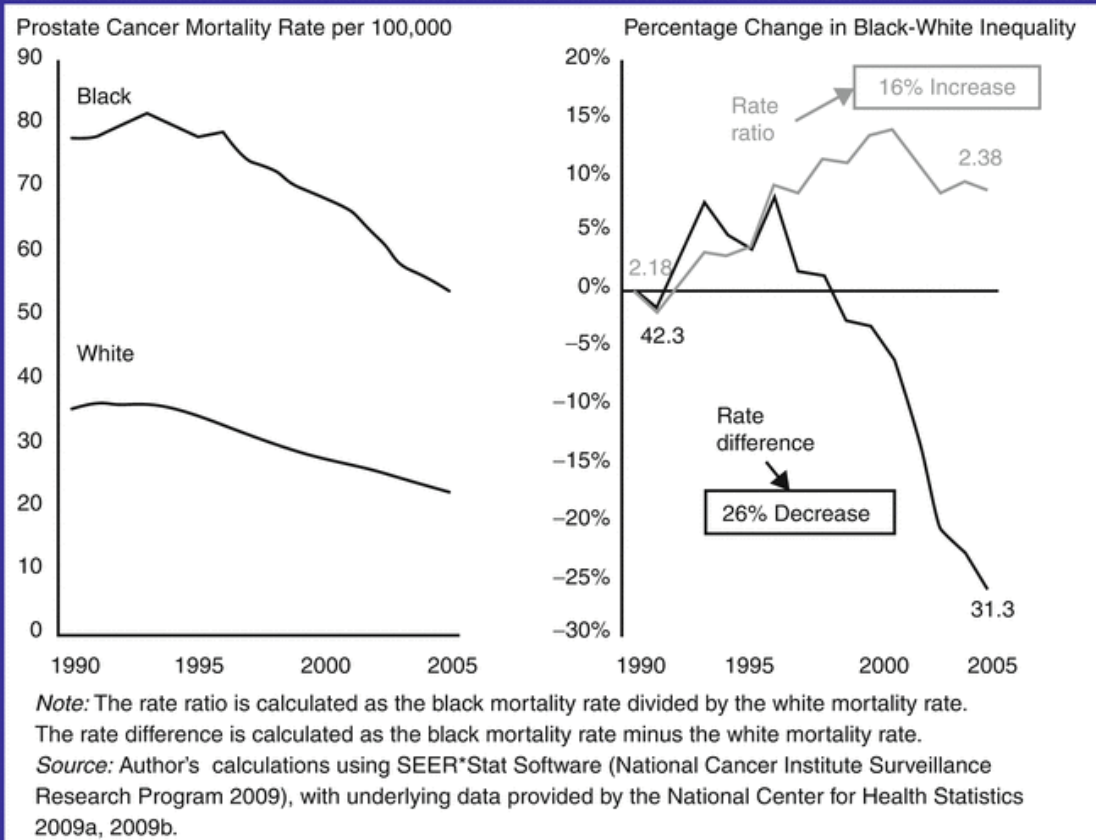
What may seem like a straightforward decision – how to calculate differences between two or more groups in health status or some other health statistic – becomes complicated when making comparisons across time or geography or other units of care. The choice of methods will affect the direction of results and the conclusions drawn from the analysis. The reason is partly because a change in disparities is a “difference in differences” problem. The calculations are complicated by the prevalence of the condition among groups and by the frequency or scarcity of a particular measure. For rare conditions, or for indicators with low baseline rates, small changes in absolute differences will result in larger proportionate changes. For common conditions or high rates, the opposite is true. A simple example illustrates this. In Fig. 3, the percentage of blacks and whites failing to receive the indicated test decreases over time from 40 to 20 and 25 to 10, respectively. The absolute disparity improved (decreasing from 15 to 10), while the relative worsened (increasing from 1.6 to 2.0).



**Fig. 3**  
Differences between absolute and relative differences over time

This is more than a theoretical exercise. Harper et al. examined differences in prostate cancer mortality and note that the relative disparity between whites and blacks increased over time, while the absolute disparity, or rate difference, declined (see Fig. 4) (Harper et al. 2010). This occurred because blacks had worse health at the beginning, and the rate of improvement for blacks was smaller than for whites. However, the authors note that the rate for blacks declined by 24 deaths per 100,000, while the rate for whites decreased by 13 deaths per 100,000; so on an absolute basis, blacks made more progress.

Trends in Prostate Cancer among Black and White Males and 933  
Percentage Change in Black-White Ratio and Rate Difference



Harper S, King NB, Meersman SC, et al., Implicit value judgments in the measurement of health inequalities, *Milbank Q*, 2010;88(1):4-29.

**Fig. 4**  
Absolute and relative differences in prostate cancer mortality over time

Another example is taken from a widely cited paper, by Werner et al., using the somewhat provocative title, "Racial profiling: the unintended consequences of coronary artery bypass graft report cards" (Werner et al. 2005). In this paper, the authors claimed "The release of CABG report cards in New York was associated with a widening of the disparity in CABG use between white versus black and Hispanic patients." While true using relative rates, a close inspection of the data shows that the rate for CABG more than tripled for blacks during the time period (rising from 0.9 to 3.0) while only doubling for whites. One could reasonably ask if access got better or worse for this population.

In addition to deciding on absolute versus relative measures, one must also consider how to characterize the event in terms of something to be achieved or avoided. In health care, performance indicators are often dichotomous indicators. Did the patient receive the indicated choice or not? Or did the patient survive or die? Here, the issue with reporting favorable or unfavorable (i.e., adverse) events is mostly one of "optics," that is, how something is perceived more than the substance of the comparison itself. Here is an example. Many health indicators are based on rare events, such as mortality rates. Say, the mortality rate for the dominant group is 1 % (for a given condition in a given period of time) and 1.25 % for the minority group. It is a relatively small difference –  $0.0125 - 0.01 = 0.0025$ , or 0.25 percentage points, but it could be represented as a 25 % relative

difference in mortality, i.e.,  $(0.0125-0.01) \times 100/0.01 = 25\%$ . Instead, assume now that survival is the indicator. The difference is the same:  $0.99-0.9875 = 0.0025$ . However, the relative disparity is  $(0.99-0.9875)/0.99 = 0.25\%$ , a 100-fold difference.

The choice of a disparity method can have important policy implications. An article by Trivedi et al. found a beneficial impact of public reporting on disparities when they reported that disparities between black and white Medicare enrollees who received preventive services *declined* for seven of nine HEDIS quality measures from 1997 to 2003 (Trivedi et al. [2005](#)). However, when the results are recalculated using *relative* instead of absolute disparities and *adverse events* of failing to receive indicated services instead of receiving the service, four of the reductions in absolute disparities became relative *increases* (Keppel et al. [2005b](#)). These discrepancies in interpretation – using the same underlying statistics – can become important when communicating disparities to policy makers or the media.

Given these effects on interpretation, in any calculation of disparities, it is recommended that both absolute and relative statistics should be calculated, using both favorable and adverse indicators. If in doing so, the analysts lead to conflicting conclusions, both should be presented, allowing readers to make their own interpretation by taking the context of the report into consideration. To be even more transparent, the researcher may wish to report the underlying rates, allowing the reader to make their own calculations.

In population health studies, measures such as the attributable risk, population attributable risk, attributable risk percent, and population impact number are used to estimate the contribution of a given factor (i.e., income, education, race/ethnicity) to observed health inequities. Table 1 provides information on some of these measures. **Table 1**

Measures of health inequality for comparing two rates

Measures	Explanation	Examples/calculation	Key advantages/disadvantages
<b>Compare two rates using relative measures</b>			
Relative statistics	Ratio of exposed rate to nonexposed rate	Relative risk/odds ratio	Show how many times higher/lower one risk is over the other
<b>Compare two rates with absolute measures</b>			
<b>Attributable risk</b>			
Attributable risk (AR)	1. Difference between rate (proportion) of outcome among exposed and nonexposed  2. Excess risk (rate) of outcome attributable to exposure	$AR = I_e - I_o$  $I_e$ = rate of outcome in exposed  $I_o$ = rate of outcome in nonexposed	Shows how much rate reduction could be achieved in exposed if effect of exposure is removed  Does not depend on the size of either population  Can be adjusted for confounding if data are available



Attributable risk percent	Percent of outcome in those exposed that could be prevented if effect of exposure is removed	$AR\% = AR/I_e \times 100\%$ $= (RR-1)/RR \times 100\%$	<p>Shows potential percent rate reduction which could be achieved in exposed if effect of exposure is removed</p> <p>Can be adjusted for confounding if data are available</p> <p>Potential to help identify the impact of addressing the inequalities</p>
No. of excess outcomes	No. of excess outcomes attributable to exposure	<p>Excess outcomes = <math>AR * N_e</math></p> <p><math>N_e</math> = number of people in exposed</p>	Can be adjusted for confounding if data are available
<b>Population attributable risk</b>			
Population attributable risk (PAR)	<p>1. Difference between rate (proportion) of an outcome in the total population and the nonexposed</p> <p>2. Excess risk (rate) of outcome in the total population attributable to exposure</p>	$PAR = I_T - I_o$ <p><math>I_T</math> = rate of outcome in total population</p> <p><math>I_o</math> = rate of outcome in nonexposed</p>	<p>Provides proportion of outcomes due to exposure in population</p> <p>No direct indication of difference between exposed and nonexposed</p> <p>Depends on the size of the population in the exposed (i.e., if this is a small population, then the PAR will be small)</p> <p>Can be adjusted for confounding if data are available</p>
Population attributable risk percent (PAR%)	Proportion of outcome in the population that could be prevented if effect of exposure is removed	$PAR\% = PAR/I_T \times 100\%$	<p>Provides percent reduction of outcomes in population if effect of exposure is removed</p> <p>Can be adjusted for confounding if data are available</p> <p>Potential to help evaluate which exposure has higher impact on outcomes in the population</p>
Population impact number (PIN)	<p>No. of outcomes in a population that are attributable to exposure</p> <p>Reduction of outcomes in the population if the effect of exposure is removed</p>	$PIN = PAR * P_e * N$ <p><math>P_e</math> = proportion exposed</p> <p><math>N</math> = number of people in population</p>	Can be adjusted for confounding if data are available

## How Many Groups to Compare at Once?

Most disparities measures tend to make comparisons between two (paired) groups in a single domain. While this may be applicable to a particular research project, reports covering entire populations must consider disparities among multiple groups. When this happens, a number of problems arise. First, making comparisons among multiple pairs of groups can be cumbersome, leading to large tables that are difficult to interpret. What should one conclude about disparities if Black-white disparities improve over time but Hispanic-White disparities worsen, while Asian-White disparities stay the same? Second, if the groups in an ordered domain are arbitrarily defined (e.g., persons below poverty, 100–200 % of poverty, and so on), then changing the group definition could arbitrarily change the results. Third, the sample size of one or more of the individual (paired) groups of interest may be too small to make stable estimates (see below for more detail). In these cases, it may be desirable to use a summary disparity statistic.

Breen et al. state in a recent paper, “no single measure exists that reflects the complexities of inequality. Instead, there is a range of measures for different aspects of the concept” (Breen et al. [2014](#)). Choice of measure depends on the purpose for the measurement, and the type of disparity being assessed. Two summary disparity measures used in the USA, one at the national and one at the state level, provide examples. Healthy People 2010 uses a summary measure, the index of disparity (ID) (Keppel et al. [2007](#); Percy and Keppel [2002](#)), defined as the average of the percentage rate differences across all groups divided by the reference rate, which is usually the overall population rate. The Massachusetts Office of Medicaid found that many of the hospitals participating in its statewide pay-for-performance program had very few minority patients in their fee-for-service Medicaid program and so decided to use a summary statistic similar to the index of disparity, called the between-group variance (BGV), to assess disparities in the quality of hospital care (Blustein et al. [2011](#)). The BGV provides a single measure of the consistency of care provided across all racial/ethnic groups treated in a hospital. It is derived by summing the variation from the average quality of care provided by the hospital that is received by members of different racial/ethnic groups, calculated as

$$\mathrm{Formula} \ 3: \ \mathrm{B} \ \mathrm{G} \ \mathrm{V} = \ \mathrm{var} \ \Sigma \ \left( \frac{\left( \frac{\mathrm{n}_i}{\mathrm{d}_i} \right) - \left( \frac{\mathrm{N}}{\mathrm{D}} \right)}{\left( \frac{\mathrm{d}_i}{\mathrm{D}} \right)} \right)^2$$

where  $n_i$  = the number of successfully achieved opportunities for a given racial/ethnic group

$d_i$  = the total number of eligible opportunities for a given racial/ethnic group

$N$  = the total number of successfully achieved opportunities (for all groups)

$D$  = the total number of eligible opportunities (for all groups)

Summary measures provide a single number representing the totality of disparities among and across all of the categories or groups in a domain. They are simple to report and easy to understand. Yet as appealing as it is to report a single overall disparity using summary measures, the approach has several disadvantages. First, summary measures do not indicate which groups are doing poorly and which are doing better. This may be important for public reporting and can be essential for identifying opportunities for improvement. Certainly, a minority group that feels that access has worsened will feel further underrepresented if a summary measure masks access problems. Second, summary statistics lack “directionality.” This means that they tend to identify disparities, regardless of whether the historically disadvantaged group is doing better or worse than the advantaged group. Third, some

summary measures are sensitive to the numbers of patients within each racial/ethnic group. For example, using the BGV above, a secondary analysis of the data showed that providers with few minority patients exhibited smaller disparities than other providers even if they offered the same level of care to each group offered by the other providers. In other words, hospitals with more diverse populations (more minorities) appeared to provide less equitable care (higher disparities) when assessed using the BGV (Blustein et al. [2011](#)). As a result of these limitations, great care must be taken before using summary measures to track disparities. To provide essential information needed for interpreting these results, it is recommended that appendix tables accompanying the reporting of summary measures track pairwise comparisons and furthermore that entities with very small numbers of groups of interest either be excluded or aggregated with other entities. In any case, the context of such a disparities report needs to be explicitly considered.

As mentioned above, a number of absolute and relative disparity methods exist, as well as summary indexes, which can also be absolute or relative. A complete review of these methods can be found in a monograph published by the National Cancer Institute (NCI) (Harper and Lynch [2005](#)). Other useful reviews of these measures are available (Harper and Lynch [2005](#); Mackenbach and Kunst [1997](#); Shaw et al. [2007](#); Spinakis et al. [2011](#); Wagstaff et al. [1991](#)). No consensus exists as to the best summary measure as all have different strengths and limitations. Choice of measure may influence results (Harper et al. [2008](#)). Commonly used summary measures of inequality used internationally include concentration indices (absolute concentration index (ACI), relative concentration index (RCI)) and regression measures (slope index of inequality (SII), relative index of inequality (RII)). [Table 2](#) provides information on selected summary measures. The advantage of these measures is that they can assess the effect of social gradients, i.e., across income or education. These measures require that groups can be hierarchically ordered. A limitation is that they do not assess specific between group differences (Harper and Lynch [2005](#); Shaw et al. [2007](#)). **Table 2**

Methods for analyzing all levels of ordinal disaggregators (i.e., income, education)

Measures	Explanation	Examples/calculation	Key advantages/disadvantages
<b>1. Concentration curve, concentration index, decomposition analysis</b>			
Concentration curve	<p>SES-related inequality for a health event</p> <p>Curve below diagonal: events concentrated in higher SES</p> <p>Curve above diagonal: events concentrated in low SES</p>	Plot cumulative rate of health event as a function of cumulative proportion of population across ordinal disaggregator	<p>Looks at all levels of SES, includes all people</p> <p>Allows visualization of the levels of inequality</p> <p>Applies to ordinal variables only</p> <p>Hard to compare area under curve (overall inequality) by visualizing</p>
Concentration index	<p>= ± 1: total inequality</p> <p>= 0: no inequality</p>	Index is the measured area between the curve and the straight diagonal equity line	<p>Provides summary measure of overall inequalities of SES for a health event</p> <p>Able to compare indices</p> <p>No info. about the levels of</p>

	<p>Positive value: events concentrated to high SES</p> <p>Negative value: events concentrated to low SES</p>		<p>inequality within a SES indicator</p> <p>No info. about contribution of inequality from other factors</p> <p>Can be normalized to compare across regions</p>
Decomposition analysis	<p>Decompose concentration index</p> <p>Evaluate contribution of individual factors to SES-related inequality</p>	<p>Separate income-related inequality in health outcome into each of its contributing factors (e.g., age, sex, rural/urban, physical activity, etc.)</p>	<p>Provides detailed information about degree to which each factor contributes to the inequality</p>
<b>2. Slope indices of inequality (SII), relative index of inequality (RII)</b>			
Slope indices of inequality (SII)	<p>Absolute change in health level (frequency) from lowest SES to highest SES</p>	<p>Use linear regression coefficient – predict rate difference between lowest SES to highest SES</p> <p>For example, change of mortality by educational levels</p>	<p>Looks at all levels of SES</p> <p>Able to predict/estimate the change in risk of the outcome associated with a change in SES</p> <p>Able to control confounding</p> <p>Assumptions <sup>b</sup> must be met, i.e., SES must be ordered hierarchically and linear relationship between ordered SES and outcome must exist</p>
Relative index of inequality (RII)	<p>Exponent of change in health level/frequency when one changes SES hierarchy</p> <p>Predict rate ratio for bottom compared with top SES</p>	<p>Divide SII by mean level of health/frequency</p>	<p>Overcomes the limitations of SII if assumptions can't be met</p> <p>Able to predict/estimate the change in risk of the outcome associated with a change in SES</p> <p>Able to control confounding</p>

The same superscript letter in the table indicates that they are the same method

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The NCI publishes a statistical software program, HD\*Calc, which imports data from population-based health registries (e.g., NCI's Surveillance, Epidemiology, and End Results Data [SEER], the National Health Interview Survey, National Health and Nutrition Examination Survey) developed to monitor and trend health disparities in cancer in the USA and can be used with other data sets.

HD\*Calc can calculate 11 different summary measures to allow comparisons. It can be downloaded from the NCI website at <http://seer.cancer.gov/hdcalc/>. The tables and graphs that the program generates can be exported.

## Subgroup Analyses and Sample Size Considerations

The most common disparity comparison is made within a single domain, such as differences among racial groups or ethnicities. However, disparities may in some cases exist only for subsets of a particular racial/ethnic group identified by two or more characteristics. For example, there may be a disparity for Black males but not Black females or for white persons living in rural settings but not in urban settings. This is known in statistical terms as an *interaction effect*, defined as the situation in which the size or direction of the effect (i.e., the disparity) differs depending on the subgroup characteristics (or level) of a group. This occurred in reporting the effects of a well-cited article by Schulman et al., which found racial and gender disparities in referral for cardiac catheterization (Schulman et al. [1999](#)). The findings reported by the media were that blacks and women were 40 % less likely to be referred. However, as described in a subsequent *NEJM* Sounding Board, the effect of race was modified depending on whether the patient was male or female and vice versa (Schwartz et al. [1999](#)). In fact, the rates were identical for white men, white women, and black men. Only black women were referred at lower rates. To avoid this problem, when clear differences in quality exist by racial/ethnic substrata, the researcher should test for interactions and when indicated perform further stratification of results to highlight areas of possible disparities.

The identification of disparities is further hampered by sample sizes because many racial/ethnic groups are in the minority, and subgroups are of course even smaller. Thus, disparities measurement and reduction programs face a major challenge when providers or institutions treat small numbers of minority patients because the estimates may not be statistically reliable. Reliability in this context means that a statistic should consistently identify the same providers as either high or low performers no matter how often their performance is measured. The smaller the underlying population sample, the more likely it is apparent disparities will reflect chance rather than true differences.

Fortunately, there are a number of strategies the researcher can undertake to counteract the problem presented by small sample sizes, many of them intuitively simple. For example, one common method is to “roll up” the race/ethnicity groups into broader categories containing more than one group, such as the OMB categories, or even a two-level grouping of minority and majority. Alternatively, one can over-sample minority patients or combine data from two or more years.

Another option, as noted above, is to use a summary statistic such as the BGV, which considers all of the racial/ethnic groups simultaneously. This is what the Massachusetts Office of Medicaid decided to do when confronted with small sample sizes for their Pay 4 Performance program (Blustein et al. [2011](#)). Finally, when some quality indicators apply only to certain “eligible” populations, one can use a composite quality measure. Composite scores provide a global comparison of the quality of care by combining across indicators to produce an aggregate score. Composite scores can be generated using much smaller sample sizes than those required for single indicators.

## Stratification and Risk Adjustment

Risk adjustment is a tool that is used when comparing the performance (e.g., cost or outcomes of care) among two or more groups to control for the confounding influence of variables such as



race/ethnicity, SES, primary language, and insurance status on health outcomes. Stratification, which simply means dividing the population into subpopulations and reporting the health indicators separately for each stratum, is a type of risk adjustment. Continuous variables such as income can be grouped into categories using cutoff points such as the percent of the Federal Poverty Level (FPL) or neighborhood income. Such variables can be dichotomous or multi-level. The relative risk of the outcome or variable of interest is then calculated for each substratum and can be compared among groups. The IOM Subcommittee notes in its 2009 report, “Common to virtually all successful [quality improvement] projects are some fundamental steps, including the acquisition of data on race and ethnicity, the stratification of quality-of-care data by race and ethnicity, the use of race and ethnicity to identify members of a target population to whom elements of an intervention would apply, and reanalysis of stratified quality data to evaluate the impact of the activities” (McFadden et al. [2009](#)). Risk adjustment uses regression analyses to account for the effect of confounders. It is basically a statistical way to “level the playing field” when reporting health indicators, especially those related to patient outcomes (National Quality Forum [2014](#)). For example, a 70-year-old woman with diabetes and heart failure would be expected to have a worse outcome after undergoing surgery than a younger woman with no comorbidities. Likewise, socioeconomic status is one of the most important determinants of health and health-care utilization. Low-income persons are exposed to more life stresses, live in less healthful environments, and may have less ability to follow up on their doctor’s recommendations. Thus, risk adjustment can make it possible to compare performance fairly across providers who care for populations of different risk. However, the use of risk adjustment is not without controversy, since controlling for these underlying factors can hide important differences that nevertheless need to be addressed (Fiscella et al. [2014](#)). In addition, if disadvantaged populations receive care of lower quality, this factor will be adjusted for. Therefore, it has been recommended that quality indicators used for reporting and payment be both risk adjusted for comparison and stratified to show differences between groups.

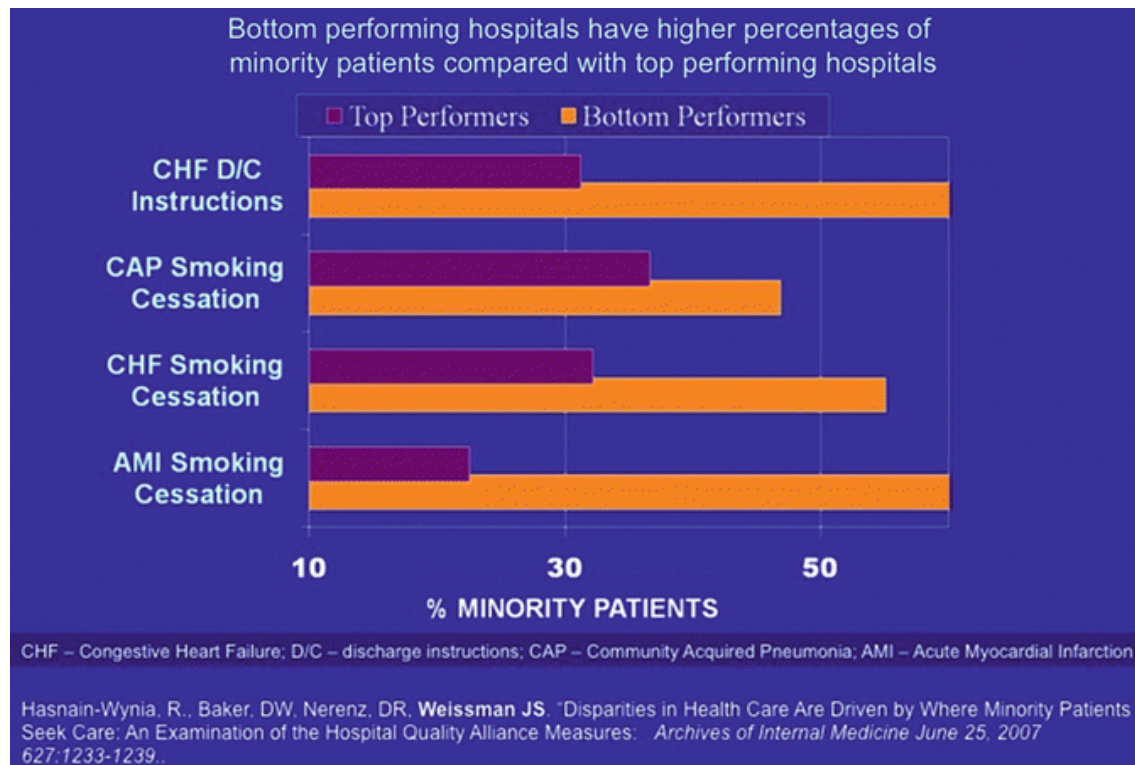
## Is It Who You Are or Where You Go? Geographical Disparities

Health care is local, and people obtain care in discrete units, whether those units are geographic regions or organizations or individual practitioners. Much of the disparities literature tends to report overall or aggregate data. When aggregate differences are reported, the suggestion is they are due to bias, racism, or lack of cultural competency. However, it is also known that minorities tend to be clustered within certain regions and receive their care from a limited number of providers (Bach et al. [2004](#)). This may occur due to the historical geographical concentration of race/ethnic groups at the national level, residential segregation within local areas, or the mission of certain providers to serve distinct local areas or ethnic populations.

Thus, rather than being treated in a discriminatory manner by individual caregivers, an alternative explanation to aggregate overall quality differences is that minorities may be receiving care from providers who treat everyone equitably but at an overall lower quality level because of where they receive care. For example, hospitals with high volumes of black patients tend to have lower quality care for acute myocardial infarction (AMI) (Gaskin et al. [2008](#); Jha et al. [2007](#)), and hospitals with high percentages of Medicaid patients (disproportionately minority) tend to exhibit lower performance using CMS’ Hospital Compare data (Jha et al. [2011](#)). In a study of hospital quality of care using the National Hospital Inpatient Quality Measures from the Hospital Quality Alliance, disparities were smaller and in some cases not significantly different from zero once site of care was taken into

consideration (Hasnain-Wynia et al. [2007](#)). This debate over “who you are versus where you are treated” has policy significance because the answer may determine whether resources are committed to efforts to reduce prejudicial treatment by practitioners, to improve the quality of care in organizations that serve high volumes of minorities, or to implement policies that equalize access to high-quality providers.

There are several ways to represent these unit-based phenomena. One method is to identify the units of care and characterize the proportion of minorities in the high and low performers. Hasnain-Wynia et al. examined individual indicators of the Hospital Quality Alliance by the race and ethnicity of the patients receiving the service (Hasnain-Wynia et al. [2007](#)). They then categorized hospitals into high and low performers according to the rate at which they provided each recommended service and found that the percentage of minority patients tended to be much higher among the lower performing hospitals (Fig. 5). Alternatively, researchers have used regression methods to control for individual confounders as well as the site of care.



**Fig. 5**

Disparities associated with hospitals where minorities seek care (Source: © All rights reserved. Social Determinants and Science Integration Directorate. Public Health Agency of Canada 2013. Reproduced with permission from the Minister of Health 2015)

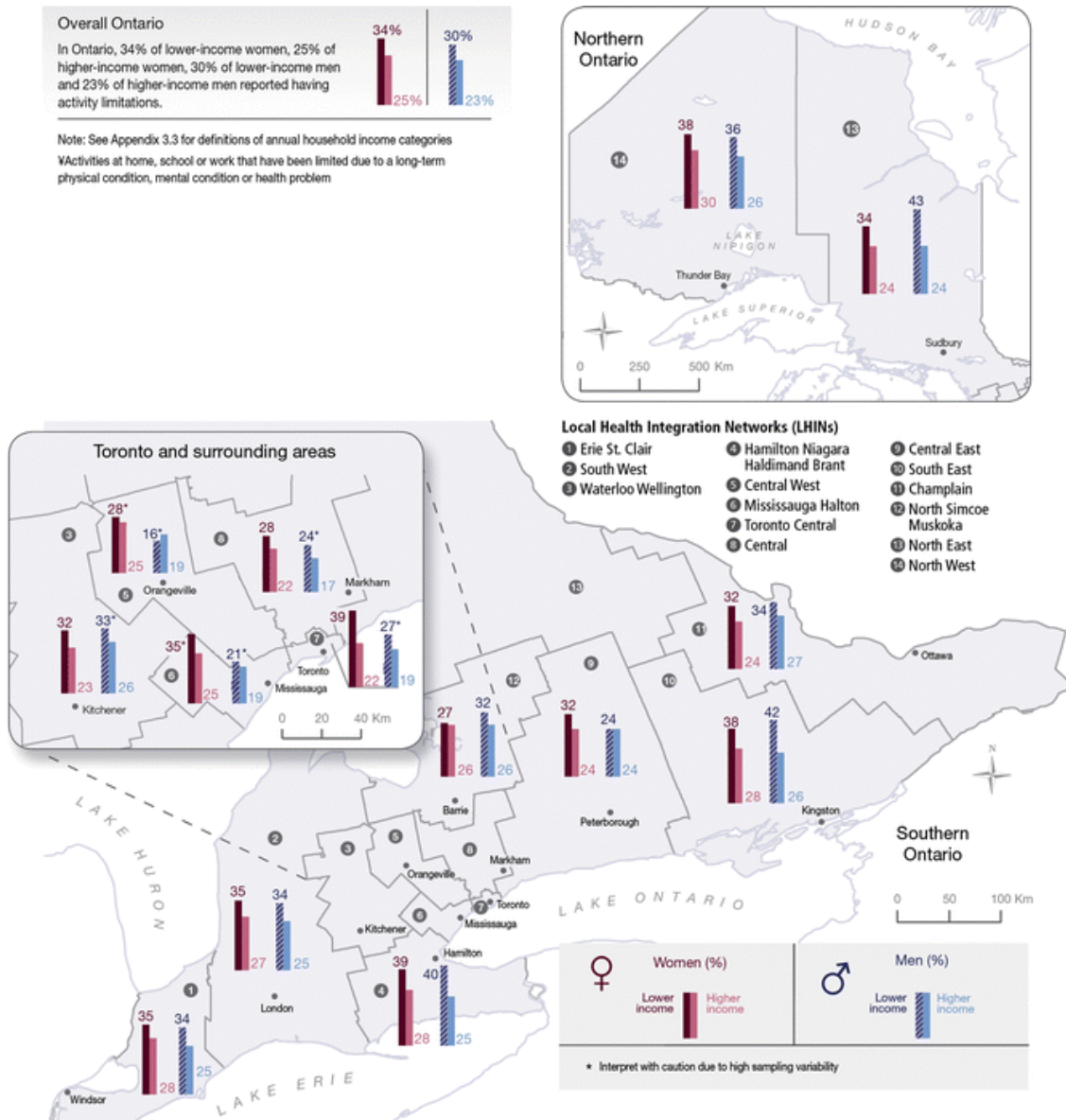
## Examining Variations in Health and Health Care: Some Examples

Measuring disparities in health and health care provides the critical information needed to inform policy and practice aimed at improving health-care quality and population health. Indicators to assess health-care quality and public health are routinely reported though not routinely disaggregated to assess disparities. In the USA, Healthy People 2020 <https://www.healthypeople.gov/> and the National

Health Quality and Health Disparities Reports <http://www.ahrq.gov/research/findings/nhqdr/nhqdr14/index.html> stratify indicators to allow assessment of performance for populations at risk for experiencing disparities. Regular reporting of these indicators allows assessment of change over time. Other national reporting efforts do not report differences in performance across disadvantaged populations. For example, several large reporting systems for Medicare on important health system sectors including Hospital Compare <http://www.medicare.gov/hospitalcompare/search.html>, Nursing Home Compare, and Home Care Compare do not assess disparities. Likewise, Healthcare Effectiveness Data and Information Set (HEDIS) which reports on the performance of more than 90 % of America's health plans also does not report disparities. More widely available data on disparities would support efforts to address them.

In Ontario, Canada, the POWER Study examined gender, socioeconomic, race/ethnic, and regional differences in access, quality, and outcomes of care across the continuum of care for the leading causes of morbidity and mortality in the province. Using a community-engaged research model, the study was designed to provide actionable data for policy makers, providers, and consumers in their efforts to improve health and reduce health inequities in Ontario. The POWER Study developed an approach to integrate clinical, public, and population health measures, emphasizing indicators that are modifiable and that can support efforts to link measurement to intervention and improvement. An overarching objective of the study was to use performance measurement and reporting as a mechanism for knowledge translation by actively engaging stakeholders in the process. The report provided evidence on health inequities at the provincial and health region levels and identified opportunities for improvement. Findings from the analyses also provided objective information used for priority setting.

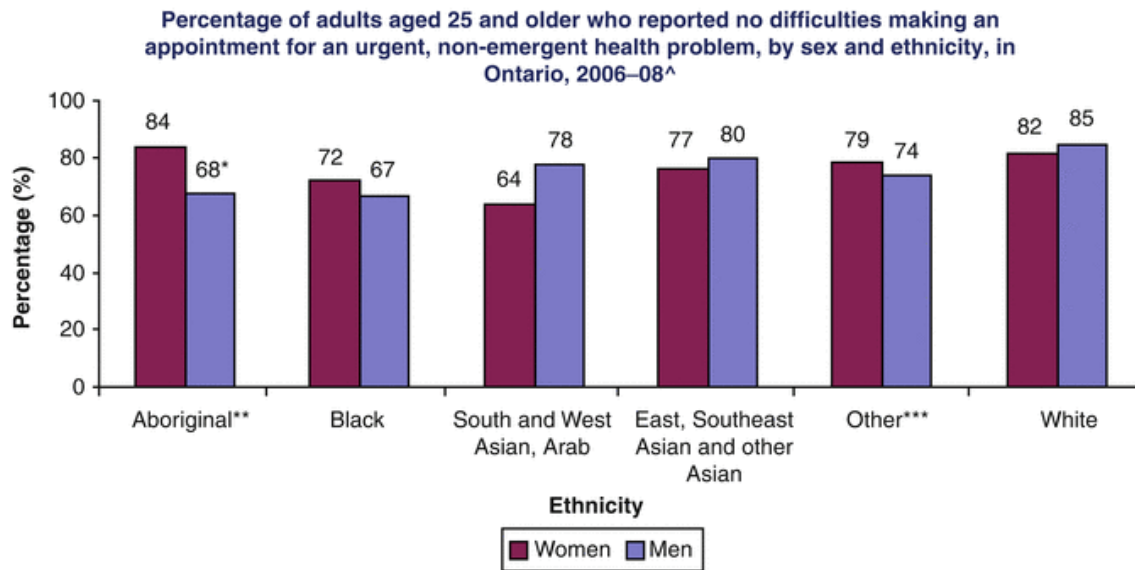
Despite universal health coverage, the POWER Study found sizable and modifiable inequities in health and health care associated with gender, race/ethnicity, income, education, and geography. For example, lower-income Ontarians had worse health and functional status, had more chronic disease risk factors, received less preventive care, and had worse health outcomes than those with higher incomes. Furthermore, the magnitude of disparities varied across the province (Bierman et al. [2012a](#)). Figure 6 shows variation in the percentage of the population reporting activity limitations (work, school, or home activities are limited by a long-term health condition) stratified by sex, income, and health region. In all regions, low-income women and men were more likely to report activity limitations than their counterparts with higher incomes. However, the proportion of low-income women reporting activity limitations ranged from 28 % to 39 % across regions. Racial and ethnic disparities in activity limitations were also observed with 45 % of aboriginal women reporting activity limitations.



**Fig. 6**  
 Age-standardized percentage of adults aged 25 years and older who reported having activity limitations, by sex, household income, and health region in Ontario, 2005 (Bierman et al. 2009b)

The study found disparities in access to primary care associated with sex, income, education, race/ethnicity, immigration status, language spoken, and geography. For example, recent immigrants were less likely to have a primary care physician, less likely to be satisfied with care, and more likely to report difficulties accessing care compared to those who had been in Canada longer. Compared to other racial/ethnic groups, South and West Asian and Arab women were most likely to report difficulties accessing needed services. Figure 7 shows differences in the ability to access urgent, non-emergent primary care in a timely manner. These findings illustrate the need to address cultural and linguistic barriers to care among diverse populations in order to reduce health disparities.





**Data source:** Primary Care Assessment Survey (PCAS), Waves 4–11

<sup>^</sup> The survey period was from October 2006–September 2008

\* Interpret with caution due to high sampling variability

\*\* Only includes off-reserve Aboriginal people (North American Indian, Metis, Inuit)

\*\*\* Includes El Salvador, Other European, Other Central American, Other South American, religion as ethnicity

**Fig. 7**

Racial and ethnic disparities in access to urgent primary care appointments (Bierman et al. [2010](#))

POWER Study analyses quantified the impact of health inequities in the Ontario population in a number of key domains. For example, if all Ontarians had the same health as Ontarians with higher income, an estimated 318,000 fewer people would be in fair or poor health, an estimated 231,000 fewer people would be disabled, and there would be an estimated 3,373 fewer deaths each year among Ontarians living in metropolitan areas. Additionally, an estimated 30 % of hospitalizations for four common ambulatory care sensitive conditions (ACSCs) (heart failure, chronic obstructive pulmonary disease, diabetes, and asthma) – or almost 16,000 hospitalizations a year – could potentially be avoided if the hospitalization rates observed among adults living in the highest-income neighborhoods could be achieved across all neighborhood income levels. The social determinants of health influenced women and men differently. Overall, inequities in health status were much greater than inequities in access to and quality of care, and inequities in screening and chronic disease management were greater than inequities in care for acute conditions.

## Reducing and Eliminating Disparities

The health system can play a critical role in fostering health equity. The three major roles for the health system to reduce disparities in health identified by the Ontario Health Quality Council provide a framework for addressing some major targets of opportunity (Ontario Health Quality Council [2007](#); Rachlis [2008](#)):

1.

Improving the *accessibility* of the health system through outreach, location, physical design, opening hours, and other policies

2.



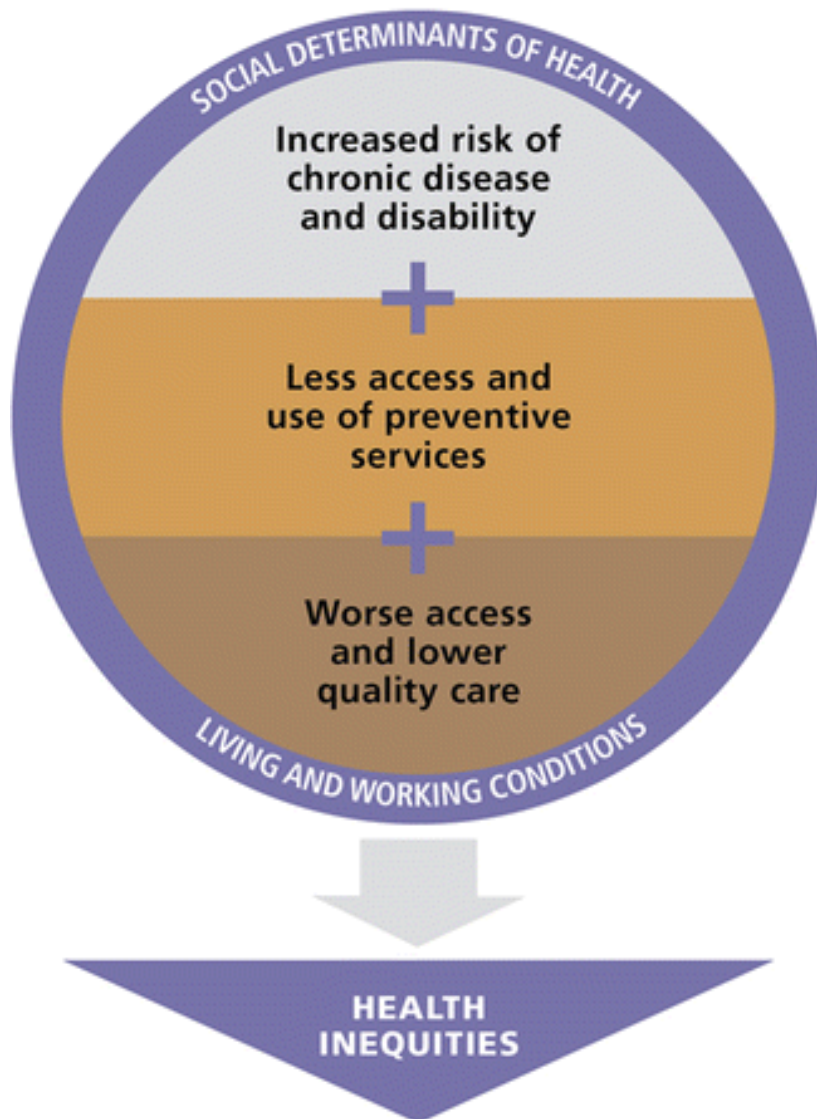
Improving the *patient-centeredness* of the system by providing culturally competent care, interpretation services, and assisting patients and families surmount social and economic barriers to care

3.

Cooperating with other sectors to improve *population health*

Braveman's conceptual framework for monitoring equity in health and health care details the steps needed in implementing a process for monitoring health inequities (Braveman [2003](#), [2006](#)). In this framework, once inequities have been assessed, and data sources and potential indicators identified, it is then necessary to "develop and set in motion a strategic plan for implementation, monitoring, and research, considering political and technical obstacles, and including the full range of appropriate stakeholders in the planning process." The process is then repeated incorporating knowledge learned from experience (Braveman [2003](#)).

The pathway to health inequity is illustrated in Fig. [8](#). The social determinants of health including living and working conditions increase the risk of chronic disease and disability which in combination with less access and use of preventive services along with worse access to and quality of health care result in observed health inequities. Each of these factors can be targeted for improvement.



**Fig. 8**  
 Pathway to health inequity (Bierman et al. [2012b](#))

The current health-care system evolved to meet the needs of acute illness and does a particularly poor job of serving individuals with chronic illness and disability. Because socioeconomically disadvantaged populations have a higher burden of chronic illness and disability, the current mismatch between the way health care is organized and the needs of people with chronic illness disproportionately impacts upon them. Health system redesign that supports chronic illness care and fosters patient empowerment and community partnership is an important strategy for driving health equity. Successful public health interventions also require community empowerment and participation (Syme [2008](#)).

Without health system transformation in the area of chronic disease prevention and management, it will not be possible to improve health outcomes and/or achieve equity. Chronic disease prevention and management may not only lead to improved health outcomes but also can support health system sustainability through potential cost savings. For example, guideline concordant care can reduce morbidity and mortality associated with diabetes. Complications such as heart attack, stroke, and amputation can often be prevented. A population study in Ontario found low-income persons with diabetes to be at increased risk for mortality and adverse cardiovascular outcomes (myocardial

infarction and stroke) than those with higher incomes. This disparity narrowed markedly after age 65 when universal drug coverage becomes available highlighting the contribution access to prescription drugs can make in reducing health inequities (Booth et al. [2012](#)). Likewise, low-income men who have diabetes are at much greater risk to have both minor and major amputations than their counterparts with higher incomes (Amin et al. [2014](#)). Thus, policy interventions, such as the provision of drug coverage to assure access to indicated treatments and health system interventions to improve diabetes management among populations at risk, could help reduce disparities.

## Conclusion

Health inequities result in enormous costs for individuals, health systems, communities, and governments. Much can be gained by interventions aimed at reducing and ultimately eliminating them. Measuring and monitoring inequities in health and health care is a first but critical step toward making progress in this regard. To do so effectively, a number of important measurement concepts and challenges described in this chapter need to be addressed, including the challenge of assessing change over time. Objectives for reporting should inform decisions about indicator choice and measurement. Then, results need to be interpreted in the context of the specific strengths and limitations of the measurement approach used. For these reasons, criteria for indicator measurement and selection need to be transparent. This chapter focuses primarily on measurement and reporting challenges. The same concepts are applicable to studies to better understand factors that lead to more or less equitable health outcomes or to evaluate interventions designed to reduce disparities.

## References

Aday LA, Andersen RM. Equity of access to medical care: a conceptual and empirical overview. *Med Care*. 1981;19 Suppl 12:4–27.

[CrossRef](#)

Alter DA, Naylor CD, Austin P, Tu JV. Effects of socioeconomic status on access to invasive cardiac procedures and on mortality after acute myocardial infarction. *N Engl J Med*. 1999;341(18):1359–67.

[CrossRef PubMed](#)

Amin L, Shah BR, Bierman AS, Lipscombe LL, Wu CF, Feig DS, Booth GL. Gender differences in the impact of poverty on health: disparities in risk of diabetes-related amputation. *Diabet Med*. 2014;31(11):1410–7. doi:10.1111/dme.12507.

[CrossRef PubMed](#)

Andersen RM. Revisiting the behavioral model and access to medical care: does it matter? *J Health Soc Behav*. 1995;36(1):1–10.

[CrossRef PubMed](#)

Angus JE, Lombardo AP, Lowndes RH, Cechetto N, Ahmad F, Bierman AS. Beyond barriers in studying disparities in women's access to health services in Ontario, Canada a qualitative metasynthesis. *Qual Health Res.* 2012. doi:10.1177/1049732312469464.

[PubMed](#)

Bach PB, Pham HH, Schrag D, Tate RC, Hargraves JL. Primary care physicians who treat blacks and whites. *N Engl J Med.* 2004;351(6):575–84.

[CrossRef PubMed](#)

Bierman AS. Equity and women's health, measuring health inequalities among Canadian women: developing a basket of indicators. Ottawa: Report to Health Canada; 2007.

Bierman AS, Clancy CM. Health disparities among older women: identifying opportunities to improve quality of care and functional health outcomes. *J Am Med Womens Assoc.* 2001;56(4):155–9, 188.

[PubMed](#)

Bierman AS, Dunn JR. Swimming upstream. Access, health outcomes, and the social determinants of health. *J Gen Intern Med.* 2006;21(1):99–100. doi:10.1111/j.1525-1497.2005.00317.x. [pii] JGI317.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Bierman AS, Magari ES, Jette AM, Splaine M, Wasson JH. Assessing access as a first step toward improving the quality of care for very old adults. *J Ambul Care Manage.* 1998;21(3):17–26.

[CrossRef PubMed](#)

Bierman AS, Ahmad F, Mawani FN. Gender, migration, and health. In: Agnew V, editor. *Racialized migrant women in Canada: essays in health, violence, and equity.* Toronto: University of Toronto Press; 2009a. p. 98–136.

Bierman AS, Ahmad F, Angus J, Glazier RH, Vahabi M, Damba C, Dusek J, Shiller SK, Li Y, Ross S, Shapiro G, Manuel D. Burden of illness. In: Bierman AS, editor. *Project for an Ontario women's health evidence-based report, vol. 1.* Toronto; 2009b. St. Michael's Hospital and the Institute for Clinical Evaluative Sciences ISBN: 978-0-9733871-1-7.

Bierman AS, Angus J, Ahmad F, Degani N, Vahabi M, Glazier RH, Li Y, Ross S, Manuel D. Access to health care services. In: Bierman AS, editor. *Project for an Ontario women's health evidence-based report, vol. 1.* Toronto; 2010. St. Michael's Hospital and the Institute for Clinical Evaluative Sciences ISBN: 978-0-9733871-1-7.

Bierman AS, Shack AR, Johns A. Achieving health equity in Ontario: opportunities for intervention and improvement. Toronto: St. Michael's Hospital and the Institute for Clinical Evaluative Sciences; 2012a.

Bierman AS, Shack AR, Johns A. Achieving health equity in Ontario: opportunities for interventions and improvement . In: Bierman AS, editor. Project for an Ontario women's health evidence-based report, vol. 2. Toronto; 2012b. St. Michael's Hospital and the Institute for Clinical Evaluative Sciences ISBN: 978-0-9733871-1-7.

Blendon RJ, Schoen C, DesRoches CM, Osborn R, Scoles KL, Zapert K. Inequities in health care: a five-country survey. *Health Aff.* 2002;21(3):182–91.

[CrossRef](#)

Blustein J, Weissman JS, Ryan AM, Doran T, Hasnain-Wynia R. Analysis raises questions on whether pay-for-performance in Medicaid can efficiently reduce racial and ethnic disparities. *Health Aff.* 2011;30(6):1165–75.

[CrossRef](#)

Bonnefoy J, Morgan A, Kelly MP, Butt J, Bergman V. Constructing the evidence base on the social determinants of health: a guide. A report to the WHO Commission on the Social Determinants of Health. London: WHO; 2007.

Booth GL, Hux JE. Relationship between avoidable hospitalizations for diabetes mellitus and income level. *Arch Intern Med.* 2003;163(1):101–6.

[CrossRef PubMed](#)

Booth GL, Bishara P, Lipscombe LL, Shah BR, Feig DS, Bhattacharyya O, Bierman AS. Universal drug coverage and socioeconomic disparities in major diabetes outcomes. *Diabetes Care.* 2012;35(11):2257–64. doi:10.2337/dc12-0364.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Braveman PA. Monitoring equity in health and healthcare: a conceptual framework. *J Health Popul Nutr.* 2003;21:181–92.

[PubMed](#)



Braveman P. Health disparities and health equity: concepts and measurement. *Annu Rev Public Health*. 2006;27:167–94.

[CrossRef PubMed](#)

Braveman P, Gruskin S. Defining equity in health. *J Epidemiol Community Health*. 2003;57(4):254–8.

[PubMedCentral CrossRef PubMed](#)

Breen N, Scott S, Percy-Laurry A, Lewis D, Glasgow R. Health disparities calculator: a methodologically rigorous tool for analyzing inequalities in population health. *Am J Public Health*. 2014;104(9):1589–91.

[CrossRef PubMed](#)

Clark JP, Bierman AS. The POWER study framework. In: Bierman AS, editor. *Project for an Ontario women’s health evidence-based report, vol. 1*. Toronto; 2009. St. Michael’s Hospital and the Institute for Clinical Evaluative Sciences ISBN: 978-0-9733871-1-7.

Finkelstein MM. Do factors other than need determine utilization of physicians’ services in Ontario? *CMAJ*. 2001;165(5):565–70.

[PubMedCentral PubMed](#)

Fiscella K, Burstin HR, Nerenz DR. Quality measures and sociodemographic risk factors: to adjust or not to adjust. *JAMA*. 2014;312(24):2615–6. doi:10.1001/jama.2014.15372.

[CrossRef PubMed](#)

Gaskin DJ, Spencer CS, Richard P, Anderson GF, Powe NR, LaVeist TA. Do hospitals provide lower-quality care to minorities than to whites? *Health Aff*. 2008;27(2):518–27.

[CrossRef](#)

Geiger HJ. Health disparities: what do we know? What do we need to know? What should we do? In: Schulz AJ, Mullings L, editors. *Gender, race, class and health: intersectional approaches*. San Francisco: Jossey-Bass; 2006. p. 261–88.

Harper S, Lynch J. Methods for measuring cancer disparities: using data relevant to healthy people 2010 cancer-related objectives, vol. 6. Bethesda: National Cancer Institute; 2005.

Harper S, Lynch J, Meersman SC, Breen N, Davis WW, Reichman ME. An overview of methods for monitoring social disparities in cancer with an example using trends in lung cancer incidence by area-socioeconomic position and race-ethnicity, 1992–2004. *Am J Epidemiol.* 2008;167(8):889–99.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Harper S, King NB, Meersman SC, Reichman ME, Breen N, Lynch J. Implicit value judgments in the measurement of health inequalities. *Milbank Q.* 2010;88(1):4–29. doi:10.1111/j.1468-0009.2010.00587.x.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Hasnain-Wynia R, Baker DW, Nerenz D, Feinglass J, Beal AC, Landrum MB, . . . Weissman JS. Disparities in health care are driven by where minority patients seek care: examination of the hospital quality alliance measures. *Arch Intern Med.* 2007;167(12):1233–9.

Hawker GA, Wright JG, Coyte PC, Williams JI, Harvey B, Glazier R, . . . Badley EM. Differences between men and women in the rate of use of hip and knee arthroplasty. *N Engl J Med.* 2000;342(14):1016–22.

Hawker GA, Wright JG, Glazier RH, Coyte PC, Harvey B, Williams JI, Badley EM. The effect of education and income on need and willingness to undergo total joint arthroplasty. *Arthritis Rheum.* 2002;46(12):3331–9. doi:10.1002/art.10682.

[CrossRef](#) [PubMed](#)

Hawker GA, Guan J, Croxford R, Coyte PC, Glazier RH, Harvey BJ, Badley EM. A prospective population-based study of the predictors of undergoing total joint arthroplasty. *Arthritis Rheum.* 2006;54(10):3212–20. doi:10.1002/art.22146.

[CrossRef](#) [PubMed](#)

Hertzman C, Power C, Matthews S, Manor O. Using an interactive framework of society and life course to explain self-rated health in early adulthood. *Soc Sci Med.* 2001;53:1575–85.

[CrossRef](#) [PubMed](#)

Honein-AbouHaidar GN, Baxter NN, Moineddin R, Urbach DR, Rabeneck L, Bierman AS. Trends and inequities in colorectal cancer screening participation in Ontario, Canada, 2005–2011. *Cancer Epidemiol.* 2005–2011;37(6):946–56. doi:10.1016/j.canep.2013.04.007.

Huang J, Zhou S, Groome P, Tyldesley S, Zhang-Solomans J, Mackillop WJ. Factors affecting the use of palliative radiotherapy in Ontario. *J Clin Oncol.* 2001;19(1):137–44.

## PubMed

Institute of Medicine. Crossing the quality chasm. Washington, DC: National Academy Press; 2001.

Institute of Medicine. Primary care and public health: exploring integration to improve population health. Washington, DC: National Academy Press; 2012.

International Society for Equity in Health. Definitions. [http://www.iseqh.org/workdef\\_en.htm](http://www.iseqh.org/workdef_en.htm). Retrieved 14 May 2007.

Jha AK, Orav EJ, Li Z, Epstein AM. Concentration and quality of hospitals that care for elderly black patients. Arch Intern Med. 2007;167(11):1177–82.

[CrossRef PubMed](#)

Jha AK, Orav EJ, Epstein AM. Low-quality, high-cost hospitals, mainly in South, care for sharply higher shares of elderly black, Hispanic, and Medicaid patients. Health Aff. 2011;30(10):1904–11.

[CrossRef](#)

Kapral MK, Wang H, Mamdani M, Tu JV. Effect of socioeconomic status on treatment and mortality after stroke. Stroke. 2002;33(1):268–73.

[CrossRef PubMed](#)

Kawachi I, Kennedy BP, Gupta V, Prothrow-Stith D. Women's status and the health of women and men: a view from the States. Soc Sci Med. 1999;48(1):21–32.

[CrossRef PubMed](#)

Keppel K, Pamuk , Lynch J, et al. Methodological issues in measuring Health Disparities. National Center for Health Statistics, Vital Health Stat 2(241). 2005a. [http://www.cdc.gov/nchs/data/series/sr\\_02/sr02\\_141.pdf](http://www.cdc.gov/nchs/data/series/sr_02/sr02_141.pdf)

Keppel KG, Percy JN, Weissman JS. Trends in racial disparities in care. N Engl J Med. 2005b;353(19):2081–5; author reply 2081–2085.

[CrossRef PubMed](#)

Keppel K, Bilheimer L, Gurley L. Improving population health and reducing health care disparities. Health Aff. 2007;26(5):1281–92.

## [CrossRef](#)

Lombardo AP, Angus JE, Lowndes R, Cechetto N, Khattak S, Ahmad F, Bierman AS. Women's strategies to achieve access to healthcare in Ontario, Canada: a meta-synthesis. *Health Soc Care Community*. 2014;22(6):575–87.

[CrossRef PubMed](#)

Macinko JA, Starfield B. Annotated bibliography on equity in health, 1980–2001. *Int J Equity Health*. 2002;1(1):1.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Mackenbach JP, Kunst AE. Measuring the magnitude of socio-economic inequalities in health: an overview of available measures illustrated with two examples from Europe. *Soc Sci Med*. 1997;44(6):757–71.

[CrossRef PubMed](#)

Marmot M. Inequalities in health. *N Engl J Med*. 2001;345(2):134–6.

[CrossRef PubMed](#)

McFadden B, Nerenz DR, Ulmer C. Race, ethnicity, and language data: standardization for health care quality improvement. Washington, DC: National Academies Press; 2009.

Navarro V, Muntaner C, Borrell C, Benach J, Quiroga A, Rodriguez-Sanz M, . . . Pasarin MI. Politics and health outcomes. *Lancet*. 2006;368(9540):1033–7.

National Quality Forum. Risk adjustment for socioeconomic status or other sociodemographic factors. Technical report. National Quality Forum. [http://www.qualityforum.org/Publications/2014/08/Risk\\_Adjustment\\_for\\_Socioeconomic\\_Status\\_or\\_Other\\_Sociodemographic\\_Factors.aspx](http://www.qualityforum.org/Publications/2014/08/Risk_Adjustment_for_Socioeconomic_Status_or_Other_Sociodemographic_Factors.aspx) (2014).

Office of Management and Budget. Recommendations from the Interagency Committee for the Review of the Racial and Ethnic Standards to the Office of Management and Budget concerning changes to the standards for the classification of federal data on race and ethnicity. *Fed Regist*. 1997a;3110–01:36873–946.

Office of Management and Budget. Revisions to the standards for the classification of federal data on race and ethnicity. *Fed Regist*. 1997b;62:58781–90.

Ontario Health Quality Council. 2007 report on Ontario's health system. Toronto: Ontario Health Quality Council; 2007. p. 96.

Pearcy JN, Keppel KG. A summary measure of health disparity. *Public Health Rep.* 2002;117(3):273–80.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Rachlis MM. Delivering equity: community-based models for access and integration in Ontario's health system Toronto. Toronto: Wellesley Institute; 2008.

Rotermann M. Seniors' health care use. *Health Rep.* 2006;16(Suppl):33–45.

[PubMed](#)

Sabik L, Lie R. Priority setting in health care: lessons from the experiences of eight countries. *Int J Equity Health.* 2008;7(1):4.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Sanmartin C, Ross N. Experiencing difficulties accessing first-contact health services in Canada. *Health Policy.* 2006;1(2):103–19.

Schoen C, Osborn R, Huynh PT, Doty M, Zapert K, Peugh J, Davis K. Taking the pulse of health care systems: experiences of patients with health problems in six countries. *Health Aff (Millwood).* 2005 Jul-Dec;Suppl Web Exclusives:W5-509-25. <http://www.ncbi.nlm.nih.gov/pubmed/16269444>

Schulman KA, Berlin JA, Harless W, Kerner JF, Sistrunk S, Gersh BJ, . . . Escarce JJ. The effect of race and sex on physicians' recommendations for cardiac catheterization. *N Engl J Med.* 1999;340(8):618–26.

Schwartz LM, Woloshin S, Welch HG. Misunderstandings about the effects of race and sex on physicians' referrals for cardiac catheterization. *N Engl J Med.* 1999;341(4):279–83. doi:10.1056/NEJM199907223410411; discussion 286–277.

[CrossRef](#) [PubMed](#)

Shaw M, Galobardes B, Lawlor D, Lynch J, Wheeler B, Davey-Smith G. The handbook of inequality and socioeconomic position: concepts and measures. Bristol, England: The Policy Press; 2007.



Singh SM, Paszat LF, Li C, He J, Vinden C, Rabeneck L. Association of socioeconomic status and receipt of colorectal cancer investigations: a population-based retrospective cohort study. *CMAJ*. 2004;171(5):461–5.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Smedley BD, Stith AY, Nelson AR. *Unequal treatment: confronting racial and ethnic disparities in health care*. Washington, DC: National Academy Press; 2002.

Sommers BD, Baicker K, Epstein AM. Mortality and access to care among adults after state medicaid expansions. *N Engl J Med*. 2012;367(11):1025–34. doi:10.1056/NEJMsa1202099.

[CrossRef](#) [PubMed](#)

Sommers BD, Long SK, Baicker K. Changes in mortality after Massachusetts health care reform. A quasi-experimental study. *Ann Intern Med*. 2014;160(9):585–93. doi:10.7326/M13-2275.

[CrossRef](#) [PubMed](#)

Spinakis A, Anastasiou G, Panousis V, Spiliopoulos K, Palaiologou S, Yfantopoulos J. Expert review and proposals for measurement of health inequalities in the European Union - Full Report. European Commission Directorate General for Health and Consumers. Luxembourg. (2011) ISBN 978-92-79-18528-1.

Starfield B, Shi L, Macinko J. Contribution of primary care to health systems and health. *Milbank Q*. 2005;83(3):457–502.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Syme SL. Reducing racial and social-class inequalities in health: the need for a new approach. *Health Aff*. 2008;27(2):456–9. doi:10.1377/hlthaff.27.2.456.

[CrossRef](#)

Trivedi AN, Zaslavsky AM, Schneider EC, Ayanian JZ. Trends in the quality of care and racial disparities in Medicare managed care. *N Engl J Med*. 2005;353(7):692–700.

[CrossRef](#) [PubMed](#)

van Doorslaer E, Masseria C, Koolman X. Inequalities in access to medical care by income in developed countries. *CMAJ*. 2006;174(2):177–83.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Wagstaff A, Paci P, Van Doorslaer E. On the measurement of inequalities in health. *Soc Sci Med*. 1991;33(5):545–57.

[CrossRef PubMed](#)

Weinick RM, Byron SC, Bierman AS. Who can't pay for health care? *J Gen Intern Med*. 2005;20(6):504–9.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)

Werner RM, Asch DA, Polsky D. Racial profiling the unintended consequences of coronary artery bypass graft report cards. *Circulation*. 2005;111(10):1257–63.

[CrossRef PubMed](#)

Wilper AP, Woolhandler S, Lasser KE, McCormick D, Bor DH, Himmelstein DU. Health insurance and mortality in US adults. *Am J Public Health*. 2009;99(12):2289.

[PubMedCentral](#) [CrossRef](#) [PubMed](#)