STATISTICALLY Speaking

Health Disparities Calculator: A Methodologically Rigorous Tool for Analyzing Inequalities in Population Health

Historically, researchers and policy planners have selected a single indicator to measure trends in social inequalities. A more rigorous approach is to review the literature and data, select appropriate inequality measures to address the research question, compute results from various indices, and graphically compare resulting trends. The Health Disparities Calculator (HD*Calc, version 1.2.4; National Cancer Institute, Bethesda, MD) computes results from different indices and graphically displays them, making an arduous task easier, more transparent, and more accessible.

Health disparities are complex social phenomena. Economists and other social scientists have developed many indices to measure trends in inequality. As noted by Sen and Foster, "If a concept has some basic ambiguity, then a *precise* representation of that ambiguous concept must *preserve* that ambiguity . . . for *descriptive accuracy* in inequality measurement. . . ."[1(p121)] No single measure exists that reflects the complexities of inequality. Instead, there is a range of measures for different aspects of the concept. World Bank Chief Economist Martin Ravaillion noted, "There is no economic theory that tells us that inequality is relative, not absolute. Rather, they are two different concepts."[2(p27)] HD*Calc facilitates the exploration of a variety of disparity indices.

BACKGROUND AND DEVELOPMENT OF THE HEALTH DISPARITIES CALCULATOR

A *Healthy People 2010* goal was to eliminate health disparities.[3] This goal, which was expanded in *Healthy People 2020*[4] to "achieve health equity, eliminate disparities, and improve the health of all groups," raised the dilemma: how can we define and measure disparities? The National Center for Health Statistics developed the Index of Disparity as the official disparities measure for *Healthy People 2000*.[5] Scientists have developed many indices, each with different measurement characteristics, to capture the complexity of disparities.

In a parallel effort, the National Cancer Institute established a contract to produce 2 monographs. The first reviewed and compared the various indices, and concluded that a suite of measures is needed to yield a scientifically rigorous representation of health disparities.[6] The second monograph compared multiple indices, employing cancer control data and interpreting the results.[7] HD*Calc was designed so that public health practitioners and researchers can examine and compare different disparities indices using their own data.

After reviewing the literature and identifying a wide range of summary indices used to measure trends in disparities, the National Cancer Institute–led team selected the most commonly used indices in public health and added others with special features to include in the first monograph. For example, the concentration indices calculate not only changes in trends, but also which group is favored by change. A key recommendation of the first monograph is to compare different summary measures on a single data set; this approach would help researchers better capture the nuances of their data. Examples of this were presented in the second monograph. However, computing multiple summary measures is arduous and it seemed unlikely that researchers would perform this series of tasks. To make the process more manageable, 11 summary measures were programmed into a new online tool, HD*Calc. HD*Calc summary measures are not unique to HD*Calc. Other than using a consistent approach to computing standard errors (Taylor Series), the HD*Calc tool presents and calculates all 11 indices as originally published. HD*Calc can be used with Joinpoint, version 4.1.0 (http://surveillance.cancer.gov/joinpoint; National Cancer Institute, Bethesda, MD) to test for statistical significance in change over time.

WHAT IS THE HEALTH DISPARITIES CALCULATOR?

HD*Calc is statistical software that was created as an extension of the 2 National Cancer

TABLE 1—Summary Table of Advantages and Disadvantages of the Health Disparities Calculator Health Disparity Measures

Disparity Measure	Absolute or Relative	Reference Group	All Social Groups	Reflect SES Gradient	Social Group Weighting	Inequality Aversion Parameter	Graphical Analog
Absolute difference	Absolute	Best	No	Yes	No	No	Yes
Relative difference	Relative	Best	No	Yes	No	No	Yes
Slope index of inequality	Absolute	Average	Yes	Yes	Yes	No	Yes
Relative index of inequality	Relative	Average	Yes	Yes	Yes	No	Yes
Index of disparity	Relative	Best	Yes	No	No	No	No
Relative concentration index	Relative	Average	Yes	Yes	Yes	Yes	Yes
Absolute concentration index	Absolute	Average	Yes	Yes	Yes	Yes	Yes
Between group variance	Absolute	Average	Yes	No	Yes	Yes	No
Theil index	Relative	Average	Yes	No	Yes	Yes	No
Mean log deviation	Relative	Average	Yes	No	Yes	Yes	No
Kunst–Mackenbach index	Relative	Best	Yes	Yes	Yes	Yes	Yes

Note. SES = socioeconomic status.

Institute monographs. It can be used with any population-based data. HD*Calc generates multiple indices to evaluate and monitor health disparities (http://seer.cancer.gov/hdcalc), enabling users to examine trends in disparity among multiple groups. The tool calculates results for 11 existing summary measures for any inequality factor included in a data set, such as race, ethnicity, income, education, or geographic region. As shown in Table 1, these existing measures vary in their characteristics. HD*Calc allows researchers to compare the 11 measures to select the set of measures that best capture the nuances of their data.

HD*Calc has been used to explore cancer control outcomes including screening incidence, survival, and mortality,[8–10] but HD*Calc is not limited to use with cancer data. A hyperlink to the tool is posted on numerous Web sites and social media platforms. The US Environmental Protection Agency and the King County Public Health Department in Seattle, Washington, are both using HD*Calc to examine and compare trends in

TABLE 2—Barriers to Disparity Measurement and How the Health Disparities Calculator Helps Overcome Them

Barrier	How HD*Calc Helps Overcome the Barrier
How can I compute inequality indices?	HD*Calc easily computes 11 indices on any data.
How can I compare inequality indices?	HD*Calc graphically displays results of 11 indices.
How do I interpret the different indices?	The case study monograph provides examples.[7]
Should I measure absolute or relative disparity?	Both monographs[6,7] address this and other questions. HD*Calc generates 4 absolute and 7 relative summary measures of disparity so you can visually compare the results of different absolute and relative measures.
How can I find out more about HD*Calc?	An HD*Calc Webinar and several HD*Calc Tutorials summarize the rationale behind the tool and help you get started.
What if I want something shorter than the Webinar and tutorials to begin with?	Download the fact sheet, Health Disparities Calculator (PDF).
How can I obtain HD*Calc?	It is freeware: Download HD*Calc version 1.2.3.
How do I get technical support in using HD*Calc?	Please send questions or comments to hdcalculator@imsweb.com.

Note. HD*Calc = Health Disparities Calculator (http://seer.cancer.gov/hdcalc); PDF = portable document format.

disparities indices with their own data.[11]

HD*Calc has many cancer applications. For example, disparity trends in cervical cancer incidence by race and ethnicity are difficult to interpret without specifying whether absolute or relative disparities are more important. Cervical cancer incidence has been generally declining, but it has been declining faster among those with lower rates. In this case, relative disparities are increasing, but absolute disparities are decreasing. HD*Calc can be used to graphically present how these relative and absolute disparities vary. HD*Calc helps overcome barriers to computing and graphing inequality indices, as summarized in Table 2.

CONCLUSIONS AND RECOMMENDATIONS

HD*Calc is a powerful tool for public health research, policy, planning, program development, and evaluation. It is being used for monitoring and planning in public health departments and federal agencies and is available for use in research and public health practice settings free of charge. HD*Calc is also a teaching tool for use in schools of public health, departments of health policy and health services research, and in training. Plans are under way to translate HD*Calc into Spanish and Portuguese. HD*Calc will advance the understanding of and ultimately support the Healthy People goal to eliminate health disparities. ■

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