Monitoring social disparities in health is not a straightforward project. Defining what constitutes a disparity is challenging, and multiple measures have been proposed to track changes in disparity over time. In this issue, Harper et al. (Am J Epidemiol 2008;167:889–899) present seven health disparity measures and apply them to US lung cancer incidence rates (1992–2004). They find that different summary measures provide different answers to the question “Has disparity increased or decreased?” Their findings leave us uncertain how to use and interpret these measures to track changes in social disparities in health. In this invited commentary, the author proposes that increased attention to the scale at which disparities are measured, the interpretations attached to the various measures used, and the way in which these measures are assembled on the basis of conceptual models would benefit the field. Specifically, attention to these three areas would increase the capacity to communicate research findings to the public and policy-making consumers of disparity-related research.

When asked a question to which I do not know the answer, I’ve been advised to simply reframe the query into one that I can answer. This reframing technique, popular among political candidates and public health graduates alike, comes to mind when thinking about the broad question “Has disparity increased or decreased?” as posed by Harper et al. (1) in their paper’s introduction. I may not know the answer to this question, but thanks to their article, I am well armed with a variety of methods for measuring social disparities in health. Now, what was the question again?

Harper et al. (1) do an impressive job of distilling the research devoted to disparity measurement and identifying important issues to consider when choosing from among disparity measures. They clearly present seven health disparity measures and apply them to US lung cancer incidence rates (1992–2004). Measuring change in health disparities over time sounds like a straightforward activity and the various measures agree—in the absence of any meaningful health disparity. Harper et al. demonstrate, however, that when social disparities are present, the choice of measure practically “creates” the message and profoundly affects the conclusions one would draw regarding the relation among area-socioeconomic position, race/ethnicity, and lung cancer incidence. Their findings leave us uncertain how to use and interpret these measures to track changes in social disparities in health.

Defining what constitutes a “disparity” is challenging (1, 2), because the term “disparity” is laden with implicit assumptions (e.g., programs designed to reduce disparities are effective at doing so); value judgments (e.g., health equity is a worthy goal); and the weight of usual practice (e.g., health outcome assessment should be stratified by race or ethnicity). It is hard to answer the question “Has disparity increased or decreased?” when we are challenged by defining disparity. Relatedly, measuring disparity is complicated—a task to which a range of measures can be applied. However, disparity measurement is more than just an interesting academic exercise. It has important policy implications with practical consequences. The way disparities are defined, documented, and tracked over time largely determines those
activities to receive support from the resources allocated to health disparity elimination (2, 3). In light of the financial incentives and public health importance, monitoring health disparities and communicating our findings need to be done well. In this invited commentary, I suggest that the work of addressing social disparities in health would benefit from further consideration of the following areas: 1) scale of measurement (the intuitive appeal of absolute measures); 2) interpreting the measures (the need for clearer explanations of health disparity measures); and 3) assembling the pieces (the value of conceptual models for explicating our implicit assumptions).

## SCALE OF MEASUREMENT

The field of public health, and of epidemiology in particular, has fetishized the ratio measure, such that it is the most commonly calculated disparity measure (1, 2, 4). Although useful for multiple epidemiologic purposes, it may be habitually employed even when a different metric would be more advantageous. Harper et al. (1) present both difference and ratio measures of disparity in a balanced fashion and raise the importance of scale considerations when choosing from among the measures. They find consistency in the direction of lung cancer disparity change among the absolute measures but not among the ratio measures (1). Although absolute and relative measures are complementary, it is not clear that they are of comparable utility for measuring and communicating about the nature of social disparities in health.

Absolute measures of health disparities may be preferable to ratio measures, because they indicate how large a proportion of the disadvantaged group is affected by its susceptibility to an adverse outcome. Also, absolute measures are the same regardless of the adverse or favorable framing of the outcome (5, 6). Additionally, whereas large rate ratios could arise from a small absolute difference in rates, large absolute differences are based in meaningful units and represent the real numbers of people affected. As a result, absolute measures make for a simpler public health story, which is critical for policy action on public health (7). For instance, the excess numbers of a particular racial/ethnic group who have developed lung cancer over some period of time, compared with the healthiest or other referent group, are a simple story; the proportion of a group affected by an outcome, relative to the average of some other group, is a less intuitive message to convey.

For elimination of the social disparities in health among population subgroups, the determinants of disparities must be identified and avoidable determinants modified. Specific risk factors can be associated with measures at different scales (8). Everything hinges on the choice of measure. Absolute and relative measures provide different types of information that are important for researchers to understand. Yet, if the goal of disparity work in public health is to address lung cancer or some other health disparity in hopes of ultimately reducing the inequality, there is much to recommend absolute measures as the preferred measure of effect, especially for the purposes of health communication with policy-makers. Many answers to the question “Has disparity increased or decreased?” may be equally valid, but they may not all be equally useful.

## INTERPRETING THE MEASURES

Racial residential segregation and health disparity are highly related concepts. A social disparity in health can be defined as the unequal distribution of health across some social (or temporal or geographic) space, while racial residential segregation represents the unequal distribution of social (or ethnic or racial) groups across geography. Both concepts straddle multiple disciplines (sociology, economics, epidemiology), and both simultaneously result from and in complex social processes.

One feature of the segregation literature that the health disparity literature lacks is clear and concrete meanings for its measures. For instance, we understand that the broad concept “segregation” comprises five distinct components (9, 10). It takes all five measures to represent the full nature of segregation in a specific area, but each measure is clearly defined so its contribution to the larger concept is apparent (table 1). Further, investigators can make judgment calls about what aspects of segregation are most relevant for their specific geographic or research area. If segregation

### TABLE 1. Segregation measures, interpretations, and specific question each measure may be used to answer

<table>
<thead>
<tr>
<th>Measures</th>
<th>Meanings</th>
<th>Potential questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dissimilarity</td>
<td>Degree to which neighborhoods incorporate the same proportion of minority and majority residents as the urban area overall</td>
<td>What proportion of Whites living in a specific census tract would need to move out of that tract and into another to match the proportion of the urban area overall?</td>
</tr>
<tr>
<td>Isolation</td>
<td>Average probability of contact between minority and majority residents in a neighborhood</td>
<td>What is the average probability of a Black person’s coming in contact with a White person in a specific geographic area?</td>
</tr>
<tr>
<td>Clustering</td>
<td>Degree to which minority neighborhoods are contiguous, not dispersed across the urban area</td>
<td>Are predominantly Asian neighborhoods more likely to be adjacent to each other than to predominantly White neighborhoods?</td>
</tr>
<tr>
<td>Centralization</td>
<td>Degree to which minority neighborhoods are near urban city centers, not in suburbs</td>
<td>Are majority Hispanic neighborhoods more likely to be located in suburbs than in urban city areas?</td>
</tr>
<tr>
<td>Concentration</td>
<td>Average population density of minority and majority neighborhoods</td>
<td>Do Blacks tend to live in more highly concentrated neighborhoods than Whites?</td>
</tr>
</tbody>
</table>

Am J Epidemiol 2008;167:900–904
TABLE 3. Descriptions, formulas, meanings, and proposed disparity-related questions for the absolute measures described by Harper et al. (1)

<table>
<thead>
<tr>
<th>Measures</th>
<th>Formulas</th>
<th>Meanings (in English)</th>
<th>Potential questions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rate ratio</td>
<td>RR = y1/y2*</td>
<td>Lung cancer rate in least healthy group as a proportion of lung cancer rate in the most healthy group</td>
<td>How much more lung cancer occurs in the least healthy group relative to the most healthy group?</td>
</tr>
<tr>
<td>Index of disparity (20)</td>
<td>IDisp = ( \sum (</td>
<td>y_j - y_{rat}</td>
<td>/ J - 1) / y_{rat} ) \times 100(\dagger)</td>
</tr>
<tr>
<td>Relative concentration index (21)</td>
<td>RCI = ( (2/\mu) \times [\sum p_j y_j X_j] - 1 ) (\ddagger)</td>
<td>Summation of social group population share, social group lung cancer rate, and social group relative rank, relative to the population average lung cancer rate (derived from a health concentration curve = bivariate distribution of social group lung cancer rate and cumulative percent of the population)</td>
<td>How proportionate is lung cancer across social groups (e.g., education strata), given the social group’s size?</td>
</tr>
<tr>
<td>Theil index (22)</td>
<td>TI = ( \sum p_j r_j \ln r_j ) (\S)</td>
<td>Summation of the product of each group’s lung cancer share of the total lung cancer rate and the natural log of each group’s lung cancer share</td>
<td>What proportion of the total lung cancer rate does a particular social group represent, and how does it contribute to the total lung cancer rate?</td>
</tr>
</tbody>
</table>

* RR, rate ratio; \( y_1 \), health status in least healthy group; \( y_2 \), health status in most healthy group.

\( \dagger \) IDisp, index of disparity; \( y_j \), health status in \( j \)th group; \( y_{rat} \), health status in referent population; \( J \), total number of groups.

\( \ddagger \) RCI, relative concentration index; \( \mu \), population average rate of health; \( p_j \), group’s population share; \( y_j \), group’s mean health; \( X_j \), relative rank of \( j \)th socioeconomic group.

\( \S \) TI, Theil index; \( p_j \), proportion of population in group \( j \); \( r_j \), ratio of the rate (or prevalence) of health in group \( j \) relative to the total rate.

Research is being conducted outside metropolitan areas, for example, centralization may not be appropriate to assess. Each segregation measure is designed to answer a specific question, with a clear sense of how to combine the measures to create a meaningful picture of segregation over time and geography.

By use of segregation literature as a model, the same approach could (and probably should) be taken with disparity measures. Multiple disparity measures exist, each based on its own assumptions and requiring a specific interpretation. Unlike the segregation measures, the existing suite of disparity measures was not developed for the purposes of combination, but the authors note that their combination is both possible and important (1). Unfortunately, no readily understandable or interpretable meaning for each of these measures has been provided in the epidemiologic literature. Many investigators, including Harper et al., have worked extensively with these measures and may be well situated to provide much needed interpretive work for epidemiologists.

In an attempt to begin a dialogue in this area, I suggest a simple approach that, if undertaken by those more experienced with the measures, could facilitate their interpretation. The first two columns of tables 2 and 3 come directly from the material provided in the paper by Harper et al. (1). Some may take issue with the inconsistent notation used across the formulas, but these are the measures as presented by their respective developers. Column three of each table endeavors to translate into simple English what the formulas portray in symbols. The fourth column in each table

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* RR, rate ratio; \( y_1 \), health status in least healthy group; \( y_2 \), health status in most healthy group.

\( \dagger \) BGV, between-group variance; \( p_j \), \( j \)th population size; \( y_j \), average health status of group \( j \); \( \mu \), average population health status.

\( \ddagger \) ACI, absolute concentration index; \( \mu \), population average rate of health; \( RCI \), relative concentration index.

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contains an attempt at producing a specific question each measure could be used to answer. Although preliminary, table 2 attempts to simplify the interpretation of relative measures, while table 3 addresses the absolute measures. Consider these tables a request to Harper et al. to modify and develop further; I offer them solely as a starting point from which more nuanced, but lucid, meanings for these measures can emerge.

The authors note, in their discussion, that their findings “… provide a cautionary note about the importance of carefully thinking through the implications of specific measures of disparity before using them to monitor health disparity trends” (1, p. 898), and they mention that a suite of indicators is needed to provide a clear picture of health disparity. One major critique of their article, given that the authors have published extensively on these measures (1, 11, 12) and are recognized authorities on the material, is that they offered no guidance as to how to combine these measures in any meaningful way. From this article, it is not clear how the measures complement each other and on what basis one would choose any one measure over another. Hopefully, future work will provide additional explanation to these measures and suggestions for their useful combination.

ASSEMBLING THE PIECES

The message about race or area-socioeconomic position and lung cancer disparity that one takes away from this work depends entirely on the measure used to assess the relation (1). When research findings are measure dependent, they are more vulnerable to claims of manipulation and data mining for publishable results than are findings robust to the choice of measure. Multiple, broad conceptual models for social epidemiology (13) or general health disparities research exist (14) but do not appear to be modified or utilized when answering specific health disparities research questions. Macintyre et al. (15) have suggested that, in choosing measures of socioeconomic position, one must get as close as possible to the hypothesized causal links. Assembling the hypothesized causal links into a conceptual model would make choosing the appropriate measures for monitoring a particular disparity considerably more straightforward.

Creating a conceptual model for how social disparities in health are created and exacerbated is not a modest task; it requires wrestling with all the issues raised by Harper et al. (1) and more. Importantly, it demands moral and ethical judgments about what to measure, in what groups, and with what tools (16, 17). Making choices like these is a daunting activity, particularly in light of conflicting results (1), but is critical for conducting defensible health disparities research. Further, according to those who study the intersection of policy and research, the research matters. Research is important to building the health disparities agenda (18), and policy makers use research results to infer causal relations, whether intended by the authors or not (19). If consumers of epidemiologic literature, including those creating health disparity-related policy, are going to try to divine the causal story behind a particular research activity, it would seem in everyone’s best interest to make the underlying conceptual model and value judgments contained therein explicit (2). Certainly, economists will make judgments when assigning dollar values to different disparity-reduction approaches, as will politicians, too, when deciding which programs appear effective and which projects’ funding will be renewed. Epidemiologists’ unique perspective regarding which disparities require public health action should be included in the conversation.

Harper et al. (1) described seven measures one could use to monitor health disparities. Are any among them the “right” measure to answer the question “Are disparities increasing or decreasing?” Who knows? Yet, perhaps by continuing to consider the measures’ scale, meaning, and assembly, we will simultaneously be moving toward agreement on the important questions.

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