

A Glossary of Community-Level Social Determinants of Health

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A Glossary of Community-Level Social Determinants of Health

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Introduction

The idea that community characteristics are root causes of poor health has gained a lot of support in the past twenty years (Krieger, 2011; Marmot & Wilkinson, 2006). Arguably this has been based on developments in theory, with a growing set of hypotheses examining community-level social determinants of health, as well as developments in analytical approaches which have facilitated multilevel regression analysis (Bingenheimer, 2005; Subramanian, 2004).¹ The importance of community characteristics reflects what Ana Diez-Roux identifies as the “systemic nature of neighborhood health effects” (Diez Roux, 2016: 431), increasingly recognized as the root causes of health inequities. Diez-Roux argues that “the most impactful and sustainable interventions are those that alter the functioning of the systems that create spatial inequities to begin with”, emphasizing the importance of a community’s tangible and physical qualities as well as its level of segregation as the “critical levers that can trigger multiple changes” (Diez Roux, 2016: 431). The importance of community-level social determinants of health is now widely acknowledged, and a large number of measures have been developed to quantify their effects.

Disagreement exists, however, about how to best conceptualize and measure community-level characteristics (Dunn et al., 2015). A common approach has been to aggregate individual responses, for example by taking responses to an individual- or household-level survey and aggregating results to the level of the community. In this way, household measures of poverty can be aggregated to determine the proportion of a community that is below the poverty line, and individual responses to race/ethnic classification questions can be aggregated to determine community-level race/ethnic composition.

There is also an important tradition of developing community-level indices which combine a variety of

¹ Multilevel modelling allows for the separation of contextual factors (i.e., factors related to the place in which individuals live) from compositional factors (i.e., factors related to individuals themselves).

concepts and data sources, thus going beyond the simple aggregation of individual-level data. This glossary examines some of the most promising measures of community-level social determinants of health. Each approach is introduced and defined, with examples from recent health equity studies.²

Child Opportunity Index

The Child Opportunity Index (COI) was developed by Acevedo-Garcia et al to serve as a population-level measure of “conditions and resources conducive to healthy child development” (2014: 1948). The COI assumes that there are multiple neighborhood factors that work together to influence the health of children, that these factors can be measured with some degree of precision, and that the combination of different factors into a composite index creates more explanatory power than any single factor by itself. Its nineteen component indicators are listed in table 1.

Recently, the COI has been used by researchers looking to test neighborhood-level interventions to improve child opportunity (Sandel et al., 2016). A modified ten-item COI was used by O’Hare to examine the well-being of Black children relative to White children across the states (2016). At the same time, the need for local data to reveal spatial patterns of inequalities affecting children has been highlighted in the literature (Iton & Shrimali, 2016; Osypuk, 2015). The COI is also featured in Chicago’s new public health plan, *Healthy Chicago 2.0*, which targets investments and calls for public health interventions in communities with very low COI scores (Dirksen & Prachand, 2016). The plan highlights that 48% of children in Chicago live in low child opportunity areas, and that there is a profound effect of discrimination and segregation at play, with 1 in 2 African American and Hispanic children versus 1 in 50 White children living in low child opportunity areas in the city. The city has used the COI to make explicit

² This review is not intended to be fully comprehensive, and there are additional indexes that could be considered – e.g., measures of food insecurity, livability, and social vulnerability to environmental hazards.

equity-based targets. For example, its efforts to decrease the percentage of children less than 3 years of age with elevated blood lead levels target communities of very low child opportunity – with a target to decrease this prevalence from 5.7% to 3.7% by 2020.

Table 1: Components of the Child Opportunity Index

Educational Opportunities	Health & Environmental Opportunities	Social & Economic Opportunities
School Poverty rate	Proximity to health care facilities	Foreclosure rate
Student Math proficiency level	Retail healthy food environment index	Poverty rate
Student Reading proficiency level	Proximity to toxic waste release sites	Unemployment rate
Proximity to licensed early childhood education centers	Volume of the nearby toxic waste release	Public assistance rate
Proximity to high-quality childhood education centers	Proximity to parks and open Spaces	Proximity to employment
Early childhood education participation	Housing vacancy rate	
High school graduation rate		
Adult educational attainment		

Source: www.diversitydatakids.org. See also Acedevo-Gracia et al (2014; 2013).

Collective Efficacy

Collective efficacy is a sociological concept which Sampson defines as “social cohesion combined with shared expectations for social control” (2012: 27). It is a social process which hinges on the willingness for neighbors to work together. Using data from the Project on Human Development in Chicago Neighborhoods (PHDCN), Sampson et al showed that collective efficacy “mediated a substantial portion of the association between residential stability and disadvantage with multiple measures of violence” (1997: 923). Sampson et al used three factors to measure collective efficacy: social control, social cohesion and trust. In the survey component of the PHDCN, respondents were asked to use a five-item

Likert scale for the measurement of informal social control which looked at the likelihood that they could trust a neighbor to intervene in various situations. Social cohesion and trust were measured on a Likert scale that asked how strongly they agreed with the closeness of the neighborhood, whether people could be trusted and if people in the neighborhood did not share the same values, among other things (Browning & Cagney, 2002). Collective efficacy continues to be widely used in community-level studies, though there is considerable debate about the causal factors associated with social capital (Moore et al., 2006; Moore et al., 2005). New studies in this field have developed age-specific measures of collective efficacy, looking at older adults (Galinsky et al., 2012) and children (Smith et al., 2013).

Community Vitality Index

The Community Vitality Index (CVI) is a measure used to analyze the social and environmental characteristics of a community; it examines “the quality of our social connections and relationships” and is often associated with the level of productivity, well-being, and health of a community (Scott, 2009). Indicators used to quantify the CVI include social capital, economic potential, community amenities, housing, community safety, education, and healthcare. There are different approaches to measuring community vitality. For example, Gupta et al (2009) used the Metro Chicago Information Center’s CVI, which measured social capital, economic potential and community amenities to test its protective effect on childhood asthma. Gupta et al found that Chicago neighborhoods with higher CVI scores had lower childhood asthma prevalence. The communities with a lower asthma prevalence had more civic engagement, were more diverse, and had greater potential for economic development. Indiana University Public Policy Institute’s *Thriving Communities, Thriving State* initiative developed a CVI with indicators that included median household income, housing costs as % of median income, education,

unemployment rate, disability, life expectancy, and obesity (Marron & Kaur, 2015).³ Their study found that areas centered around large institutions and urban environments were well off, whereas rural areas experienced higher rates of unemployment, obesity, and greater educational degree challenges.

Concentrated Disadvantage

Concentrated disadvantage is an indicator that attempts to illustrate the relative poverty of neighborhoods. It encompasses many factors that could isolate a neighborhood from resources, fracture its social networks and cohesion and expose community members to negative social conditions. Sampson, in *Great American City*, reports on a composite measure of concentrated disadvantage taking into account census-tract level data: welfare receipt, poverty, unemployment, female-headed households, racial composition (percentage black), and density of children. Concentrated disadvantage was also an important concept in the *Moving to Opportunity* study (Graif et al., 2016; Leventhal & Brooks-Gunn, 2003). In a recent study in Cook County, concentrated disadvantage was shown to be associated with ovarian cancer-specific survival (Peterson et al., 2015).

Hardship Index

The hardship index is a composite measure that measures the economic and social conditions of cities and communities. It was originally developed by the Rockefeller Institute, and consists of six indicators: crowded housing, poverty, unemployment, education, dependency and income. Crowded housing measures the percentage occupied by housing units with more than one person per room. Poverty is the percentage of persons living below the federal poverty line. Unemployment is defined as the percentage of person over the age of 16 years who are unemployed, and education is defined as the percentage of

³ In this case, Marron and Kaur constructed a CVI which included health outcomes as component variables, which may be useful as a descriptive measure but weakens the measure's usefulness as an independent variable that affects a health outcome.

persons over the age of 25 years without a high school education. Dependency is the percentage of the population under 18 or over 64 years of age. Income is measured per capita for each community. Scores on the index can range from 0 (low hardship) to 100 (high hardship), with the scale being relative within a jurisdiction (i.e., cannot be directly compared across cities). The hardship index features in *Healthy Chicago 2.0*, illustrating the stark contrasts between communities within Chicago. The city has used the hardship index to focus efforts to reduce infant mortality, designating high hardship communities as the priority population, and calling for a reduction in infant mortality from 9.7 (per 1,000 live births in 2013) to 8.7 (per 1,000 live births) in 2020.

Index of Concentration at the Extremes

The Index of Concentration at the Extremes (ICE) quantifies the extent to which a community's residents are concentrated in the extremes of distributions, typically conceptualized as poverty and affluence.

The measure can take a value of -1 to +1; a value of -1 indicates that all of that community's population is concentrated in the 'most deprived' group, while a value of +1 indicates that all of that community's population is concentrated in the most privileged group.

An important methodological strength of the ICE is that it can be used at the small-area level. Unlike the Gini coefficient,⁴ it is not biased because of spatial social polarization at the small-area level (Krieger et al., 2016). Researchers have observed that when making observations across communities, there is a very high correlation between proportions of affluent and marginalized residents, raising problems of multicollinearity in statistical models. The ICE overcomes this problem by defining a spectrum of

⁴ The Gini coefficient is the most popular measure of income inequality (see De Maio, 2007). However, its usefulness is limited in small areas with relatively little variance like poor or wealthy communities. It is more appropriately used in larger geographies – the city, the state, or the country – where a wider range of income levels may be measured.

concentrated disadvantage and affluence, “ranging from a negative extreme (where all families are disadvantaged) to a neutral point (where affluent and disadvantaged families are equally balanced) to a positive extreme (where all families are affluent)” (Carpiano et al., 2009: 423).

A growing number of studies has employed the ICE to quantify community conditions and test its association with health outcomes. Carpiano et al (2009) examined the relationship between the ICE and child well-being in British Columbia. Finch et al (2010) modelled the effects of the ICE on allostatic load score using the Third National Health and Nutrition Examination Survey (NHANES III). Most recently, Krieger et al (2016) examined the use of the ICE and a novel ICE that jointly measured concentration of income as well as race/ethnicity as a public health monitoring tool in New York City.

Index of Dissimilarity

The most commonly used measure of race / ethnic segregation is the index of dissimilarity, which quantifies the proportion of minority residents that would need to move to achieve an equal pattern of settlement (Massey, 1990). This index is part of a long-standing tradition in demography which has attempted to quantify segregation (Duncan & Duncan, 1955). It has been used widely in health equity research (Acevedo-Garcia et al., 2003; Collins & Williams, 1999; Laveist, 1993; Polednak, 1996). Most recently, Maguire et al (2016) using the Index of Dissimilarity to model community predictors of poor mental health.

The work of Massey and Denton (1989) suggests that the index of dissimilarity may actually underestimate the degree of Black segregation in the United States. They put forward the idea segregation is comprised of five distinct dimensions, not all of which are addressed in the index of

dissimilarity. According to Massey and Denton, segregation can be seen through evenness, exposure, clustering, centralization, and concentration (see table 2).

Table 2: Massey and Denton’s Five Dimensions of Segregation

Dimension	Definition
Dissimilarity or Evenness	The degree to which the percentage of minority members within a community equals the city-wide minority proportion
Exposure	The degree of potential contact between minority and majority community members
Clustering	The extent to which minority areas adjoin one another in space
Centralization	The degree to which minority members are settled in and around the center of an urban area
Concentration	The relative amount of physical space occupied by a minority group

Source: Massey and Denton (1989)

Acevedo-Garcia et al (2003), in a systematic review of studies examining residential segregation as a social determinant of health, concluded the vast majority of this literature has focused on dissimilarity, or evenness, at the expense of the other 4 dimensions of segregation. Acevedo-Garcia et al argue: “...health research has largely overlooked the complexity of residential segregation. ...[most] studies included only dissimilarity indexes and lacked a conceptual justification for focusing on this segregation dimension” (2003: 217). Given the high levels of race/ethnic segregation in Chicago, researchers should consider utilizing the dissimilarity index in conjunction with measures of other dimensions of segregation.

Singh Area Deprivation Index

The Singh index combines 17 component indicators to create a measure of area deprivation (Singh, 2003). These components are listed in table 3.

Table 3: Components of the Singh Area Deprivation Index

<ul style="list-style-type: none">• Population aged ≥ 25 years with < 9 years of education, %• Population aged ≥ 25 with at least a high school diploma, %• Employed persons aged ≥ 16 years in white-collar occupations, %• Median family income, \$	<ul style="list-style-type: none">• Civilian labor force population aged ≥ 16 years unemployed, % (unemployment rate)• Families below poverty level, %
<ul style="list-style-type: none">• Income disparity• Median home value, \$• Median gross rent, \$	<ul style="list-style-type: none">• Population below 150% of the poverty threshold, %• Single-parent households with children aged < 18 years, %
<ul style="list-style-type: none">• Owner-occupied housing units, % (home ownership rate)	<ul style="list-style-type: none">• Households without a motor vehicle, %• Households without a telephone, %• Occupied housing units without complete plumbing, %• Households with more than 1 person per room, % (crowding)

Source: Singh (2003).

Kind et al (2014) used the Singh index in an analysis of 30-day rehospitalization of a random 5% sample of national Medicare patients. The objective of the study was to identify whether an understanding of neighborhood socioeconomic disadvantage would be useful in the clinical planning of activities to reduce readmission rate of patients with congestive heart failure, pneumonia, or acute myocardial infraction. They found that rehospitalization rates could be predicted by the Singh index, concluding that “measures of neighborhood disadvantage, such as the ADI [Singh Area Deprivation Index], could potentially be used to inform policy and care after hospital discharge” (Kind et al., 2014: 765). Another study used the Singh area deprivation index to analyze the socioeconomic and rural-urban disparities in all-cause mortality and mortality for leading causes of death in youth aged 15-24 (Singh et al., 2013). The study determined that youth in more deprived group areas had a higher mortality rate than those in least deprived areas.

Townsend Deprivation Index

The Townsend Deprivation Index, created by the noted sociologist Peter Townsend, measures deprivation in the needs of individuals through indicators that represent a community's norms. It is one of the earliest examples of a community-level composite measure of the social determinants of health.⁵ This index is composed of four variables of material and social deprivation: unemployment, car ownership, overcrowding, and home ownership, and while it has not featured in US-based health equity research, it has been widely used in the United Kingdom (Stafford et al., 2008) and globally (Eroglu, 2007; Townsend & Gordon, 2002). The Townsend Index was recently used to examine cancer risk inequities using census-tract data from Charleston, South Carolina (Rice et al., 2014).

Discussion

The notion that community characteristics matter as social determinants of health is certainly not new. Yet there is a perhaps a renewed momentum in this area, with more and more attention now given to

⁵ There is a large sociological literature – particularly a British tradition going back to Booth and Rowntree – that examines the construction of poverty measures. Townsend's work on *relative deprivation* demonstrates that even basic attempts to develop thresholds of absolute poverty are highly subjective – that is, they are influenced by social norms and convention:

Poverty can be defined objectively and applied consistently only in terms of the concept of relative deprivation... The term is understood objectively rather than subjectively. *Individuals, families and groups in the population can be said to be in poverty when they lack the resources to obtain the types of diet, participate in the activities and have the living conditions and amenities which are customary, or are at least widely encouraged or approved, in the societies to which they belong.* Their resources are so seriously below those commanded by the average individual or family that they are, in effect, excluded from ordinary living patterns, customs and activities. (Townsend, 1979: 31, emphasis added)

Townsend's perspective on poverty suggests that the creation of poverty lines is a highly subjective act – poverty is necessarily relative, and is dependent on social expectations and norms. However, once threshold has been defined, it can be studied objectively.

community-level factors and the structural determinants of health. The methodological approaches explored in this glossary offer examples of how researchers have explored community characteristics. Each index may offer a different perspective, and in some cases some indexes may be more useful than others. They may also be used in conjunction with one another, providing a sort of triangulation that builds confidence in an analysis. However, these indexes continue to have important blindspots. None of the indexes in this glossary incorporate explicit measures of racism/discrimination or sexism, for example, and only the Singh Index attempts to incorporate data on income inequality. Much more work is needed, as well, to compare the relative predictive capacity of these measures for a range of health outcomes across cities.

At the same time, we find it helpful to echo a warning issued by Jarman et al in a brief letter to the *BMJ* 25 years ago on the subject of deprivation indices:

As statisticians are never likely to agree among themselves on the structure and derivation of the perfect index endless discussion of the differences among the indices is unlikely to be productive. These measures may be refined further when additional data become available on a uniform basis. In the meantime more effort should be put into using the indices for the purposes for which they were developed... to help concentrate limited resources for health (and other) services (Jarman et al., 1991: 523)

As Jarman et al point out, the real value in this work lies in priority-setting. If measures of community-level social determinants of health serve a purpose, it is first and foremost through information they provide about where resources may be most equitably distributed. Community-level measures of community characteristics also open up two important research agendas: (1) the separation of compositional and contextual causes of poor health and (2) comparative analysis that examine the relationships between community characteristics and poor health (i.e., is the association between community-level social determinants of health universal and generalizable, or does it vary from place to place?).

Moving forward, we suggest that there are an additional two concerns that this area of work needs to explore. First, can we develop community-level measures that incorporate racism and discrimination as socio-political processes? This would help us move from analyses that model the effect of “% Black” or “% Latino” to more sophisticated analyses that see racism, not “race”, as the underlying social determinant of health. Second, can we develop community-level measures that measure what Farmer and others have labelled *structural violence*: “... social arrangements that put individuals and populations in harm's way ... The arrangements are structural because they are embedded in the political and economic organization of our social world; they are violent because they cause injury to people” (Farmer et al., 2006: 1686). It is ultimately structural violence that we are trying to measure. The various indexes reviewed in this glossary each emphasize a different aspect of this larger and more fundamental causes of health inequities.

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