Multi-Dimensional Poverty Index: An Application to the United States

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Abstract

In this paper we estimate a multi-dimensional poverty index (US-MPI) in the United States. Measuring poverty using multiple dimensions of deprivation provides a more complete picture of poverty. The US-MPI measures simultaneous deprivations experienced in multiple dimensions of well-being: health, education, income and housing. We use data on eight different indicators from the American Community Survey, and estimate the US-MPI across different regions, age, gender and race. Our estimates indicate that in 2011, one in five adult American's were multidimensional poor. Lack of health insurance and severe housing burden were two significant indicators of deprivation.

"Poverty" is an inherently vague concept, and developing a poverty measure requires a number of relatively arbitrary assumptions.--Blank, (2008).

Introduction

This paper measures multidimensional poverty in the United States (U.S.). Measuring and characterizing poverty using multiple dimensions of deprivation provides a more complete picture of poverty since the poor are not only those who lack income but also those who do not possess minimally acceptable standards in a number of dimensions of economics wellbeing.

The official poverty measure provided by the U.S. Census Bureau (the Office of Management and Budget's Statistical Policy Directive, 1978) is measured in terms of income deprivation. However, as is recognized, cash income and hence the income poverty measure fails to capture a number of aspects of economic well-being. Amartya Sen (2006) has long argued that while income is one of the sources of adequate living, a variety of other aspects of life quality are also relevant. In Sen's view, an individual's well-being comes from her "capability" of adequately functioning in one's society. Hence, in defining and measuring this capability, it is necessary to make judgments regarding what aspects of life are relevant for adequate functioning and a minimally acceptable standard for each of these aspects. The capabilities approach treats poverty as lack of a set of endowments (e.g. education or health) rather than a lack of money income that these endowments might have generated (Grusky and Kanbur, 2006). Although this capabilities approach to individual well-being and poverty measurement is appealing, it is difficult to implement in practice.

In this paper, we provide estimates of a U.S. based multidimensional poverty index (US-MPI). The US-MPI is based on a methodology developed by Alkire and Foster (2011, AF

methodology henceforth). An important property of a multidimensional poverty index (MPI) based on the AF methodology is that it identifies multiple deprivations experienced by an individual in different realms of well-being. Thus the MPI takes into account the joint distribution of deprivations; it tracks the same individual across multiple dimensions and counts the number of deprivations simultaneously experienced by an individual. The AF method gained prominence among other methodologies due to its adoption by the United Nations Development Program (UNDP) in 2010 to estimate a global multi-dimensional poverty index (UNDP-MPI), which is now published annually in the Human Development Report. The UNDP-MPI is estimated largely for developing countries; less is known about multidimensional poverty in *developed* countries such as the U.S. The deprivation dimensions and thresholds for the US-MPI are chosen with reference to the standard of living in the U.S. For instance, we choose indicators such as employment status, health insurance coverage, which better reflect the standard of living in a developed country than those more rudimentary indicators used in the UNDP-MPI (See Table 1). Construction of the UNDP-MPI is severely restricted by compatibility of cross-country data. Few countries have personal data, so the UNDP-MPI estimates rely on household data to assign individual values. Moreover, the UNDP-MPI relies on aggregate national income data rather than information on individual personal income. We are able to overcome both of these drawbacks.

Our estimate of the US-MPI uses micro level data from the 2011 wave of the American Community Survey (ACS). The extent of multidimensional poverty is estimated for population subgroups based on age, gender, race/ethnicity and region. We also conduct a sensitivity analysis of our US-MPI estimate. Estimating the US-MPI following the AF method involved

several choices including selecting well-being indicators, threshold values within indicators, choice of minimum number of indicators, weights attached to the indicators and so on. Hence we treat our baseline US-MPI as a "benchmark" value. Keeping all other choices intact, we change one value at a time, and calculate the sensitivity of the US-MPI value to that particular choice. We thus provide readers a range of likely MPI values for the U.S.

The remainder of the paper is structured as follows. Section 2 contains a brief review of the different poverty measures estimated in the U.S; Section 3 contains a review of different multidimensional measures. In Section 4, we discuss the AF methodology and formulate the MPI. Section 5 lists step-by-step, the choices we make in order to estimate a benchmark US-MPI. Estimate of the US-MPI are discussed in Section 6. Section 7 contains discussion on the decomposition of the US-MPI in different ways. The sensitivity of the US-MPI to the different choices is tested in Section 8. And a summary of results is provided in Section 9.

2. U.S Poverty Measures

2.1. Official Poverty Measure

The official poverty measure dates back to Orshansky (1965) who constructed poverty thresholds by calculating the cost of food budgets; the poverty threshold was taken to be three times the family food budget. For a household to be 'poor', annual cash income (earnings, pensions, interest, rent, assets and cash welfare) must be less than the poverty threshold. The thresholds vary by family size and composition, and are updated for inflation using the Consumer Price Index (CPI).

The drawbacks of the official poverty measure have been well documented (Iceland, 2012). The definition of money income does not capture a family's purchasing power, and

excludes non-cash income transfers such as food stamps, housing subsidies, and the Earned

Income Tax Credit which form a large share of the government's antipoverty efforts (Smeeding,

1982 and Ruggles, 1990). The income definition also fails to reflect taxes paid, work-related

transportation costs, and the cost of child care, all of which reduce the discretionary income of

a family. The poverty thresholds are outdated. With rising costs of non-food items, expenditure

on food comprises far less than one-third of the total families' expense. Thresholds do not vary

spatially though costs of living differ drastically across states and within states among rural and

urban cities.

2.2. Alternative Poverty Measures

In the early 1990s, the National Academy of Sciences (NAS) formed a panel on Poverty and

Family Assistance in order to address the shortcomings of the official poverty measure.

Following the recommendations of the 1995 report (Citro and Michael, 1995), the Census

Bureau published a series of experimental poverty measures (Short et al. 1999). In 2010, an

Interagency Technical Working Group recommended a Supplemental Poverty Measure. The

supplemental measure differs from the official poverty measure by taking into account

household expenses such as taxes, housing, utilities, health care and child support costs and

including government in-kind support, such as school lunch programs, housing subsidies, and

food stamps. The poverty thresholds in the supplemental measure vary by geography, family

size and whether a family pays a mortgage, rents or owns their home.

In addition to income, absolute poverty in the U.S. has also been measured in terms of

consumption expenditure (Meyer and Sullivan, 2012), earnings capacity (Haveman and

Bershadker, 2001), wealth (Azpitarte, 2011) and assets (Haveman and Wolff, 2004). The official

measure and other alternatives suggested differ in their definition of thresholds and measurement of economic resources. Yet these measures have one thing in common; they rely solely on income, or expenditure, or wealth, all of which are indirect and inadequate indicators of an individual's capabilities. The capabilities approach argues that poverty is a lack of an individual's ability to lead a fully functioning life. In addition to income, it takes into account individual's deprivation in other indicators of well-being.

Finally, there is a related set of studies that directly observe deprivation in various aspects of material well-being in the U.S. and constructs a poverty measure based on these. This material hardship literature typically uses data from the Survey of Income and Program Participation (SIPP), a longitudinal survey conducted by the Census Bureau to collect information on several aspects of material well-being, including ownership of consumer durables, housing quality, neighborhood quality, diet adequacy, perceived access to medical care, expenditures for current consumption and the existence of informal support networks (e.g. Beverly 2001, Carle et al. 2009). Some set of these factors are taken into account in measuring poverty based on material hardship. Like the official and other proposed measures, observed material deprivation poverty only captures some of the factors that reflect individual and household capability. The MPI is distinct from poverty measures based on material hardship. Whereas material hardship measures are able to capture deprivation in material possessions such as basic consumer durables (e.g., refrigerators, telephones, washing machines and a number of housing conditions), these measures fail to reflect a variety of non-material capabilities such as health outcomes, employment status and level of education. The US-MPI takes into account such non-material capabilities as well. Moreover, while there is no

commonly accepted definition of material hardship on which material hardship poverty measures rest (Ouellette et. al. 2004), our estimate of US-MPI rests on an axiomatic approach described in Section 4.[1]

3. Measures of Multidimensional Deprivation

3.1. International Measures

An early attempt at measuring well-being on a global scale was undertaken by the UNDP in the form of the Human Development Index (UNDP-HDI). Begun in 1990, the annual Human Development Report (HDR) ranks countries by the UNDP-HDI which measures a country's achievement in social and economic development; in particular, the UNDP-HDI is a weighted (geometric) average of national estimates of life expectancy, educational attainment and income. Between 1997 and 2009, the UNDP also published a deprivation index called the Human Poverty Index (UNDP-HPI). The UNDP-HPI aggregated deprivations in health, education, and standards of living and was estimated separately for developing (UNDP-HPI-1) and developed countries (UNDP-HPI-2).

In 2010, the UNDP-HPI was replaced by estimates of a multi-dimensional poverty index (UNDP-MPI). The UNDP-MPI, also referred to as an index of acute poverty, measures an individual's inability to meet simultaneously minimum international standards in indicators related to the Millennium Development Goals (Alkire and Santos, 2013). It identifies deprivations in ten indicators spanning the health, education and standard of living dimensions, and estimates the number of people who are multi-dimensionally poor. The UNDP-HDI and HPI

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[1] In addition to the axiomatic approach, other prominent methodologies in the literature including latent variables analysis, factor analysis, fuzzy set and information theory have also been used to formulate multidimensional deprivation measures (see Kakwani and Silber, 2008, for a summary).

calculate the percent of individuals deprived in each dimension and then aggregate these proportions; the MPI instead rests on the joint distribution of deprivations. It is calculated by first aggregating the deprivations experienced by each individual and then aggregating individuals. Table 1 provides a summary of the indicators used to measure the UNDP-HDI, UNDP-HPI-2 and the UNDP-MPI.

3.2. Measures in Developed Countries

Whelan et. al. (2012) estimate a MPI for 28 European countries making use of the European Union Statistics on Income and Living Standards data for 2009.[2] They measure deprivation in four dimensions (namely, basic deprivation, consumption deprivation, neighborhood deprivation and health deprivation) using 20 non-monetary indicators (see Table 1). Within the European Union, they find that basic and consumption deprivation are more prominent in the less affluent European countries whereas relative income poverty and health are the key dimensions of poverty in the more affluent countries.

Wagale (2009) estimates capability deprivation by using approaches different than the AF method--namely, the fuzzy set and the (relative and absolute) factor analysis. He uses data on educational attainment and degree, health condition, and occupational prestige as capability indicators from the general social survey (GSS). He finds that the magnitude of capability deprivation differed depending on the method used, but in all cases, it was lower than that of income poverty. Moreover he finds that capability deprivation in the U.S. decreased between 1994 and 2004. Alkire and Foster (2011) illustrate the AF methodology by using data in Indonesia and the U.S. They use data from the 2004 National Health Interview Survey

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[2] 26 countries in the European Union; Sweden is excluded and Norway and Iceland are included.

conducted by the U.S. National Center for Health Statistics on four indicators, namely, income measured in poverty line increments, self-reported health, health insurance, and years of schooling. However their estimates solely serve the purpose of providing an empirical application of their methodology.

A recent working paper by Mitra and Brucker (2014) uses the AF method to measure multidimensional poverty in the U.S. Though the authors also apply the AF methodology to U.S. data, there are important differences in the focus of the two papers. We empirically explore the properties of the MPI as well as conduct a step-by-step sensitivity analysis of the numerous methodological assumptions made. Mitra and Brucker (2014) test the feasibility of measuring the MPI by using the Current Population Survey (CPS) and the ACS data separately. They characterize and compare population groups by the number of deprivations experienced in income and other indicators. They choose five indicators to measure multidimensional deprivation. We include these five indicators and three additional indicators, including severe housing burden to estimate the MPI.

4. Formulation of the MPI based on the AF Method

The AF method generalizes standard income poverty measures—namely, the headcount ratio, the poverty gap and the squared poverty gap (Foster et al. 1984)—and proposes their analogs in a multidimensional setting. The headcount ratio for instance, is referred to as the adjusted headcount ratio in a multi-dimensional context. The MPI is a special case of the adjusted headcount ratio.

Let $i = 1, 2, \ldots n$ be the number of individuals, $l = 1, 2, \ldots L, L \geq 2$, be the multiple dimensions and $j = 1, 2, \ldots d, d \geq L$, be the indicators representing these dimensions. We

assume that L and d are fixed and given, n can vary depending on the population size. Let

y_{ij} denote the achievement of individual i in indicator j; y is an (nxd) achievement matrix. Let

$w_j, (w_j > 0)$ denote the weight signifying the relative importance of indictor j, such

that $(\sum_{j=1}^{d} w_j = d)$; w is a $(1xd)$ weighting vector. Let z_j denote the pre-determined poverty

threshold for indicator j; z is a $(1xd)$ vector of poverty thresholds. Specifying a poverty

threshold for each indicator denotes the first of the two-step identification process. If an

individual is deprived in an indicator j, i.e. $(y_{ij} < z_j)$ then her weighted deprivation score is

$g_{ij}^0 = w_j$; else $g_{ij}^0 = 0$; g^0 denotes the (nxd) deprivation matrix. Let $c_i^0, (0 \le c_i^0 \le d)$ denote

the sum of weights for the indicators in which individual i is deprived i.e., c_i^0 is the sum of all

entries in the ith row of g^0; c^0 is a $(nx1)$ vector of deprivation counts.

An individual is identified as "multidimensional" poor if $c_i^0 \ge k$ where $k, (0 < k \le d)$

specifies the second cutoff. For instance, the UNDP-MPI identifies an individual as

multidimensional poor if the individual is deprived in some combination of indicators whose

weighted sum is 33 percent or more. Using the second cutoff, the weighted deprivation matrix

(g^0) and the weighted deprivation score vector (c^0) are censored; if an individual is not

identified as multidimensional poor then her weighted deprivation score is replaced by zero.

Thus a censored deprivation matrix $g^0(k)$ consists of $g_i^0(k)$ where $g_i^0(k) = w_j$ if $c_i^0 \ge k$ else

$g_i^0(k) = 0$. Similarly $c^0(k)$ is a censored vector of deprivation counts and consists of

$c_i^0(k)$ where $c_i^0(k) = c_i^0$ if $c_i^0 \ge k$ else $c_i^0(k) = 0$. The multidimensional poverty index, MPI

(M^0) gives the weighted average deprivations experienced by the multidimensional poor. It is

defined as the mean (μ) of the censored deprivation matrix:

$$M^0 = \mu\big(g^0(k)\big) \tag{1}$$

The MPI can be estimated using categorical, ordinal and cardinal data on continuous variables whereas most of the prevailing deprivation indices use only ordinal, discrete data. It satisfies desirable axiomatic properties, for example: i) deprivation monotonicity: if a poor person becomes deprived in an additional indicator, the MPI will increase, ii) subgroup decomposability: the MPI can be expressed as the population-weighted sum of subgroup indices, say for different races, thus making possible deprivation comparisons across groups, and iii) decomposition by indicators: it can be broken down to measure the contribution of a specific indicator in overall deprivation. Like any other measure, the MPI has drawbacks. For instance, it ignores information about individuals who are not deprived in a dimension (Thorbecke, 2011), it uses arbitrary weights and thresholds, and disregards price information while aggregating across dimensions (Ravallion, 2011).[3]

5. Choices made to define a Benchmark US-MPI

5.1. Data

We estimate the MPI by using micro data from the 2011 wave of the American Community Survey (ACS). The ACS is currently the largest U.S. household survey and provides reliable data on numerous socio-economic characteristics of households. The ACS selects samples in *all* counties across the nation, and all municipios in Puerto Rico. We use one-year estimates from Public Use Microdata Sample (PUMS) files which provide data from areas with population of

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[3] See the special issue of *Journal of Economic Inequality* (Lustig, 2011), for details on the debate over the MPI.

65,000 or more.[4] Data on individual records is matched with data on individual's household characteristics; we have more than 3 million observations. From these, we remove individuals living in group quarters (5 percent of the sample) and exclude individuals below the age of 18 (another 22 percent of the sample).[5] Compared with the ACS, the CPS has a smaller annual sample size of 100,000 every year. The CPS collects detailed information on more than 50 income types. The ACS, on the other hand, collects fewer details on income but is more focused on collecting information on demographic, social, economic, and housing characteristics of the sample population. Table 2 provides a list of the dimensions, indicators, their thresholds and weights chosen to measure the benchmark US-MPI. Next we discuss each of these choices.

5.2. Dimensions

We measure deprivation in four dimensions: health, education, standard of living and housing. The HDR clearly defines human development as a process of 'enlarging people's choices', though the precise articulation of the concept varies in each report. However every HDR from 1990 to 2009 mentions health, education and living standards when discussing quality of life (Alkire, 2010). These three dimensions have been used to reflect an individual's capabilities in most multidimensional measures such as the UNDP-MPI, the UNDP-HPI and the UNDP-HDI. In addition to these three dimensions, we also include housing as an additional dimension since it is an important measure of the quality of life in a developed country.

5.3. Indicators

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[4] PUMS 2011 URL: http://www2.census.gov/acs2011_1yr/pums/ PUMS is a sample of population and housing unit records from the ACS; the 1-year ACS PUMS file represents about 1-percent of the total U.S. population or approximately 1.3 million housing unit records and about 3 million person records.
[5] Group quarters (GQ) include such places as college residence halls, residential treatment centers, skilled nursing facilities, group homes, military barracks, correctional facilities, and workers' dormitories. People living in GQ are usually not related to each other and survey values for GQs are often imputed. Hence we exclude all records on individuals from GQ.

Each dimension is measured by multiple indicators.[6] Given the constraints imposed by the ACS data, we chose indicators and their thresholds to reflect the quality of life in the U.S. Detailed definitions of each indicator are provided in an Appendix to the paper.

Health Indicators:

We use two indicators to measure deprivation in this dimension, namely, health insurance coverage and disability status. Health insurance coverage includes programs that provide comprehensive health coverage. A deprived individual lacks any health insurance coverage, private or public. Disability in the ACS is identified as serious difficulty with four basic areas of functioning – hearing, vision, cognition, and ambulation—supplemented by questions about difficulties with self-care such as difficulty in bathing and dressing, and difficulty performing independent errands such as shopping. We count an individual as deprived if she experiences two or more disabilities.

Education Indicators:

Deprivation in education is measured by indicators on schooling and the ability of the individual or her household members to speak English. Individuals who are 18 years old and over and who have not completed high school (12th grade) are treated as deprived. Households in which no individual, 14 and over, speaks English only or speaks a language other than English at home and speaks English very well are considered deprived.

Standard of living Indicators:

We measure an individual's standard of living by two indicators, namely, a person's poverty status, and her employment status. The poverty status is measured by the ratio of income to

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[6] While estimating the MPI, Alkire and Santos (2010) distinguish between dimensions and indicators whereas Alkire and Foster (2011) make no such distinction and use indicators without classifying them in dimensions.

the poverty threshold. The income-poverty ratio is estimated by comparing a person's total family income in the last 12 months with the poverty threshold appropriate for that person's family size and composition as defined by the Census Bureau. Those individuals with income to poverty threshold ratio less than 100 percent are counted as deprived. Employment status was previously used as a measure of social exclusion in the UNDP-HPI; we use it as an indicator of individual's standard of living. The deprived individuals are those who are in the labor force but are "unemployed", i.e. individuals who (1) were neither "at work" nor "with a job but not at work" and (2) were actively looking for work during the last 4 weeks, and (3) were available to start a job.[7]

Housing Indicators:

The ACS has detailed information on housing indicators. It reports data on occupants per room by dividing the number of people in each occupied housing unit by the number of rooms in the unit. The ACS categorizes a crowded unit as one which has more than one occupant per room. We use the same threshold to count the deprived. The ACS provides information on the monthly housing expenses for residents. It reports selected monthly owner costs such as mortgage payments, taxes, insurance, utilities, fuel costs and gross rent as a percentage of household income. "Severe housing burden" is typically defined as housing costs in excess of 50 percent of income. An individual is deprived if the owner costs or gross rent in a year is greater than 50 percent of the household income.[8]

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[7] Instead of unemployment, we would have liked to include "joblessness" as a deprivation indicator. The unemployed are individuals in the labor market, who are looking for a job; the jobless would have included individuals who dropped out of the labor market after failing to find a job. However estimates of joblessness status are not available from ACS questions.

[8] The housing burden categories are: No housing burden (under 30% of income spent on housing costs), moderate burden (between 30% to 49.9%), and severe burden (over 50%), (Schwartz and Wilson, 2007). ACS also reports data on housing facilities such as plumbing (e.g., hot and cold running water, a flush toilet, a bathtub or shower) and kitchen facilities (e.g., a sink with a faucet, a stove, range, or a refrigerator).

5.4. Weights

The weight attached to each indicator signifies the relative importance of the indicator in determining deprivation. Weights can be assigned by using different methods: value judgment, expert advice, survey based, statistical techniques and so on. In the benchmark case, for the ease of interpretation, we follow the UNDP-MPI and attach equal weights to all indicators $(w_j = 1, j = 1, \ldots, d)$.

5.5. Thresholds

The AF methodology uses a dual cut-off approach when identifying the multi-dimensionally poor. The first cut-off noted above for each indicator is used to determine whether a person is deprived in that particular indicator. The second cut-off is applied to the weighted sum of indicators which are counted towards identifying the multidimensional poor. Assuming all indicators are equally weighted, the union criterion identifies a person as poor if there is at least one indicator in which the person is deprived. This criterion does not distinguish between the poor deprived in one indicator from the poor deprived in multiple indicators. It is meaningful if achievement in each and every indicator is essential to be above poverty; otherwise it tends to overestimate poverty. The intersection criterion identifies an individual as poor only if she is deprived in *all* indicators. This criterion is appropriate when achievement in any one indicator is sufficient to belong to the non-poor class. It does not identify persons deprived in most but not all indicators and tends to underestimate poverty. The AF method allows the researcher the flexibility to choose the number for the second cutoff. We estimate

However less than 1 percent of our sample lived in households without kitchen or plumbing facilities and hence we did not include housing facilities as an indicator.

the benchmark US-MPI by defining an individual as multidimensional poor if she is deprived in two or more indicators ($k \geq 2$).

6. Estimates of the US-MPI

6.1. Deprivation in Different Indicators

Figure 1 shows the distribution of deprivation in each indicator separately. The proportion of deprived was more than 10 percent in four of the eight indicators. About 15 percent of individuals were without any health insurance, 13 percent incurred severe housing costs, 12.5 percent were income poor and 12 percent did not complete high school. The proportion of deprived individuals was smaller in the remaining four indicators, namely, disabilities (8 percent), unemployed (6 percent), crowded house living (4.5 percent) and lacking English fluency (4 percent). [9] An estimated 12.5 percent individuals being income poor in our sample is very close to the Census estimate of 12.8 percent adults (18 and above) being income poor. The unemployment rate estimated at 6 percent in our sample is less than the 8.9 percent rate released by the Bureau of Labor Statistics (BLS), largely because of differences in which employment data is collected by the CPS and the ACS (see Kromer and Howard, 2011).

In Table 3, we show pairwise the percent of individuals who are deprived in indicators simultaneously. The diagonal shows the proportion of population deprived in each indicator, so that the values are exactly the same as shown in Figure 1. The off-diagonal values were rather low, varying between 0.2 to 6 percent. These values show the percent of individuals who were deprived in two indicators. Of particular interest is the overlap of income poverty with other

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[9] Disability/difficulty distribution was: 9 percent-ambulatory, 6 percent-difficulty in independent living, 5 percent-hearing or cognitive, and 3 percent-vision or difficulty in self-care.

types of deprivations. If this overlap is high, the case for estimating a multidimensional poverty

index is weakened—those who have low incomes are also poor in terms of housing, health,

education and so on. About 6 percent of the income poor experienced severe housing costs and

about 4 percent of the income poor did not have health insurance. This suggests that

individuals deprived in other indicators were not always income poor. [10]

6.2. A Benchmark US-MPI

The MPI takes into account multiple deprivations simultaneously experienced by each

individual, instead of calculating separately the percentage of the deprived in each indicator as

in Figure 1. In order to estimate a benchmark US-MPI, we assign equal weights to all indicators

$(w_j = 1, j = 1, ..., d)$; hence the MPI (M^0), in Equation (1) can be simplified:

$$M^0 = \frac{1}{nd} \sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^0(k) \qquad (2)$$

The MPI gives the actual number of deprivations among the poor $\left(\sum_{i=1}^{n} \sum_{j=1}^{d} g_{ij}^0(k) \right)$ as a share

of the maximum deprivations (nd) the society could potentially experience. The benchmark

US-MPI was equal to 6.6 percent. Thus the multidimensional poor (i.e. those deprived in more

than one indicator) experienced 6.6 percent of all total deprivations that the society could

potentially experience. The MPI is not very intuitive to interpret; hence in the section below, we

express the MPI as a product of two indices, one of which simply gives headcount ratio of the

multidimensional poor.

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[10] The literature on material deprivation too finds that the correlation between measures of material hardship and income poverty is not very
strong in the U.S. (e.g. Bradshaw and Finch, 2003).

6.3. Proportion of Multidimensional Poor

In Equation (2), since $\sum_{j=1}^{d} g_{ij}^{0}(k) = c_i^0(k)$, we can rewrite Equation (2) as:

$$M_0 = \frac{1}{nd}\sum_{i=1}^{n} c_i^0(k) = \left(\frac{q}{n}\right) x \left(\frac{1}{q}\sum_{i=1}^{n} \frac{c_i^0(k)}{d}\right) \qquad (3)$$

Equation (3) shows that the MPI is equal to the product of two indices: the headcount ratio $\left(H = \frac{q}{n}\right)$ which gives the proportion of people who are poor, where q is the number of multidimensional poor and an average intensity index $\left(A = \frac{1}{q}\sum_{i=1}^{n} \frac{c_i^0(k)}{d}\right)$ which gives the average deprivation share $\left(\frac{c_i^0(k)}{d}\right)$ among poor individuals (q). Thus the MPI equals the headcount ratio (H) adjusted to the intensity of deprivation (A) and is referred to as the *adjusted headcount ratio*. It combines information on the prevalence of poverty and the average extent of a poor person's deprivation and satisfies dimensional monotonicity: if a multidimensional poor becomes deprived in an additional indicator, then H remains the same, but A rises, and so does M_0.

In the benchmark case, the headcount ratio (H) was equal to 20.1 percent, implying that 20.1 percent adults were identified as multidimensional poor.[11] In Table 4, we compare the proportion of the multidimensional poor with those identified using alternative income definitions. Setting aside the differences in datasets, methodology, sample size etc. used to estimate different poverty measures, it is seen that in general, poverty measures solely based on income, estimate between 13 to 15 percent of the adult population as poor. The proportion of adult population who was multidimensional poor is higher; we find that one in five individuals was deprived in more than one indicators of well-being.

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[11] The intensity index (A) which gives the fraction of possible indicators in which the average poor person endured deprivation was equal to 0.3. Thus on average, a multidimensional poor was deprived in 2.4 out of a total of 8 indicators.

6.4. Deprivations of the Multidimensional Poor

Out of the 20 percent of the total population who were multidimensional poor, we compute

how many were deprived in each indicator (see Figure 2). The expression $\left(\frac{1}{q}\sum_{i=1}^{n} g_{ij}^{0}(k)\right)$

counts the multidimensional poor who are deprived in indicator *j* as a proportion of all

multidimensional poor. About 53 percent of all the multidimensional poor were deprived in

income, 46 percent did not have health insurance/faced severe housing cost burden, 40

percent had not completed high school, 20 percent were unemployed/ had disabilities and 16

percent lived in a crowded house / had no household members fluent in English. Compared to

12.5 percent income poor within the total population, more than 50 percent individuals were

income poor within the multidimensional poor population. Thus among those who

experienced multiple deprivations, a majority were deprived in income and some other

indicator(s). However this also implies that the remaining 47 percent who were deprived in

multiple non-income indicators would not be identified as poor if we had used the standard

income poverty definition.

7. Decomposition of the Benchmark US-MPI

7.1. Decomposition by Indicators

A desirable property of the MPI is that it can be broken down to show how much each indicator

contributes to poverty.[12] The MPI in equation (2) can be expressed as:

$$M^0 = \frac{1}{d}\sum_{j=1}^{d}\left(\frac{1}{n}\sum_{i=1}^{n} g_{ij}^{0}(k)\right) \tag{4}$$

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[12] The headcount ratio (*H*) cannot be broken down to show how much each dimension contributes to poverty.

In Equation (4), $\left(\frac{1}{n}\sum_{i=1}^{n}g_{ij}^{0}(k)\right)$ gives the multidimensional poor who are deprived in indicator j as a proportion of the *total* population (as opposed to the proportion of *multidimensional poor* as in Section 6.4); thus the MPI is a weighted average of the indicator-wise proportions. The contribution of indicator j in the MPI is calculated as $\left(\frac{\frac{1}{d}\left(\frac{1}{n}\sum_{i=1}^{n}g_{ij}^{0}(k)\right)}{M^{0}}\right)$. Figure 2 shows the breakdown of the benchmark US-MPI by dimensions and indicators. The breakdown shows that three indicators had significant contributions in the overall US-MPI: income poverty (20 percent), lack of health insurance and severe housing burden (both 18 percent). The share of education in overall deprivation was about 15 percent; lack of English fluency in the household, living in a crowded house and having disabilities were less significant contributors. If we combine the indicators as dimensions, we find that overall the contribution of each of the four dimensions was equal and close to a quarter.

7.2. Decomposition by Population Subgroups

Another key property of the MPI is that it can be decomposed by population subgroups. The property implies that the MPI is equal to the weighted average of MPI values in population subgroups, where weights are subgroup population shares. The MPI in equation (2) can be expressed as:

$$M^{0} = \frac{1}{n}\sum_{i=1}^{n}\left(\frac{1}{d}\sum_{j=1}^{d}g_{ij}^{0}(k)\right) \qquad (5)$$

In Equation (5), $\left(\frac{1}{d}\sum_{j=1}^{d}g_{ij}^{0}(k)\right)$ is the deprivation score of individual i and MPI is the average of the individual deprivation scores. Treating each individual as a subgroup, the case of a singleton subgroup can be extended to subgroups with more than one individual. In Table 5, we

decompose the US-MPI by population groups by gender, age, race/ethnicity and region. There was not much variation in the proportion of multidimensional poor by gender and age. Women and adults (18 to 64 years) had greater percent of multidimensional poor than men and elderly (65 and above).

Dividing the population along race, "Whites alone" had less than average proportion of multidimensional poor. Asians, who typically fare well with income thresholds, had greater proportion (27 percent) of multidimensional poor, primarily due to higher than average deprivation in two indicators: crowded house and lack of English fluency. A large proportion (46 percent) of Hispanics was identified as multidimensional poor primarily because high percent of Hispanics were deprived not only in income, but also in other dimensions such as health, education and housing.[13] Similarly high percent (42 percent) of foreign born individuals were multidimensional poor. The decomposition by nativity and racial groups reveals that although deprivation in indicators such as English fluency, and crowded housing were not significant in the entire population, higher percent of the immigrant population was deprived in these indicators.

We compare how the distribution of the multidimensional poor differs from that of the income poor among different population groups, by calculating a relative risk ratio; a ratio of the proportion of poor in the subgroup over the proportion of poor in the population. Among regions, we find that the ratio was almost the same for multidimensional poor and official income poor. Northeast and Midwest had less than average whereas the South and West had a

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[13] Percent of Hispanics (and percent of total population) deprived in each indicator: No health insurance: 35 % Hispanics (15% total population), High school incomplete: 31% (12%), Lack of English fluency: 20% (4%), Income poverty: 21% (13%), Severe housing burden: 19% (13%), Crowded house: 18% (5%), Unemployment: 8% (6%), Disabilities: 6% (8%).

greater than average proportion of multidimensional poor. The proportion of multidimensional poor was lower in the Midwest than the Northeast and in the South than the West largely because of the severe housing burden in the Northeast and the West.[14]

8. Sensitivity of the US-MPI to Different Choices

Poverty is a vague notion and every poverty measure is based on some arbitrary choices made by the researcher (Blank, 2008). The researcher can justify the assumptions made on certain evidence in the literature, using some axiomatic framework and/or using empirical evidence, but ultimately the estimate is arbitrary. Hence, it is important to test the sensitivity of the poverty measure to a variety of alternative choices.[15] In this section we review the sensitivity of the benchmark MPI to the dual cut-offs used by the AF method, as well as to the weights applied to each indicator.

8.1. Sensitivity to the first cut-off: Indicator-Specific Thresholds

The first cut-off is employed for each indicator within a dimension in order to determine whether a person is deprived or not in terms of that indicator. There is a legitimate diversity of judgments regarding what would or would not count as a deprivation in a number of indicators used. If small changes in any cutoff would lead to a considerable change in the MPI value, this should be made explicit and the accuracy of that cutoff closely examined (Alkire and Santos, 2013). In this section, we review threshold values of a majority of indicators.[16] We change the

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[14] A recent paper by Islam et al. (2014) finds that human capital explains over half of the overall income gap between the persistently poor and other counties. It will be interesting to see how multidimensional poverty varies across counties.

[15] In testing the sensitivity of the MPI, we follow the general framework laid down in Dhongde and Minoiu (2013) who test the sensitivity of global poverty estimates to underlying assumptions by using a benchmark measure and the effect of changing one assumption at a time.

[16] Three of the eight indicators, namely health insurance, English fluency, and employment status, have yes or no type of information, so there is no scope to change the threshold values. For occupants per room, we change the threshold from "one or more" to "two or more". For the remaining four indicators, we choose a higher and lower threshold value.

threshold value for one indicator at a time and keep all other thresholds for the benchmark US-MPI intact; in this way, we can isolate the effect of changing a single indicator's threshold value on the benchmark US-MPI. For instance, in the benchmark measure, we regard not completing grade 12 as a threshold for schooling. Keeping everything else constant, a lower threshold of not completing grade 9, resulted in the headcount ratio decreasing from 20 to 18 percent and a higher threshold of not receiving any post-secondary degree (associate, bachelors and higher) led the proportion to increase to 33 percent.

Table 6 summarizes the results of sensitivity to indicator thresholds. If we change the threshold of income to poverty ratio from less than 100 percent to less than 50 percent and consider only the "acute poor", then the proportion of multidimensional poor decreased from 20.1 to 17.5 percent. On the other hand, if we raise the threshold to 200 percent to include the "near poor", i.e. people who have income above poverty but less than two times their poverty threshold, then the percent deprived increased from 20.1 to 27 percent. This implies that among the multidimensional poor, there were relatively few individuals just-below the poverty line and many more individuals just-above the poverty line. Similarly, if we change the housing costs threshold from severe housing burden (more than 50 percent of household income) to moderate housing burden (more than 30 percent) the proportion of multidimensional poor increased to 25 percent. On the other hand if the threshold is changed to include fewer people (more than 75 percent), the headcount ratio decreased to 18 percent. Overall we find that the proportion of the multidimensional poor was less sensitive to downward as opposed to upward revision of the indicator threshold.

8.2. Sensitivity to the second cut-off: Number of Indicators

The second cut-off is used to identify those individuals as multidimensional poor if their weighted deprivation score is at least equal to k. Since in the benchmark case, each indicator carries equal weight, the second cut-off $(k = 2)$ implies that individuals who are deprived in two or more of the eight indicators are identified as poor. In Table 7, we estimate the US-MPI values by varying the number of indicators specified as the threshold $(k = 1, 2, …, 8)$. As expected, the proportion of the multidimensional poor decreased as the threshold increased. If we use the union approach, the poor are those who are deprived in at least one indicator. We found that about 42 percent of individuals are identified as poor. In the benchmark case, 20.1 percent individuals were deprived in two or more indicators. The headcount ratio declined to 8.4 percent individuals if the threshold was increased to three or more indicators. There was not much overlap of deprivations beyond three indicators; less than 3 percent individuals were deprived in four or more indicators and less than 1 percent individuals were deprived in five or more indicators; only one individual in our sample was deprived in *all* eight indicators. Thus very few adults were deprived in four or more indicators.

8.3. Sensitivity to Relative Weights

Recall from Section 4 that $w_j, (w_j > 0)$ denotes the weight signifying the relative importance of indictor j, such that $\left(\sum_{j=1}^{d} w_j = d\right)$. In the benchmark US-MPI, all indicators within a dimension are equally weighed $(w_1 = 1, …, w_8 = 1)$. In this section we compare alternative weighting structures (see Table 8). First, we assign zero weight to income to poverty ratio. Even without income as a deprivation indicator, we found that 15.6 percent of individuals were

multidimensional poor. Next, we use a nested weighting structure to designate income as the dominant indicator (Alkire and Foster 2011). The dominant indicator is assigned a weight $w_j = d/2$, and all other indicators are weighed equally $w_{k \neq j} = \frac{d}{2(d-1)}$. The weights are assigned such that, a multidimensional poor is identified as an individual who is income poor and is deprived in one or more other indicators. We found that the proportion of multidimensional poor decreased from 20.1 to 10.7 percent. Thus 20.1 percent of the population was deprived in at least two or more indicators (benchmark case), 12.5 percent were income poor and 10.7 percent of individuals were income poor and were deprived in another indicator.

Another alternative used in Whelan et al (2012) is based on the notion of prevalence weighting. The underlying idea of this weighting structure is that deprivation in a widely attainable indicator is treated more seriously than a corresponding deprivation whose absence is more prevalent. Referring back to figure 1, we know that least percent of individuals (about 4) were deprived of language fluency or were living in a crowded house. So attainment in these indicators was more prevalent; hence deprivation in these indicators carries the highest weight $(w_1 = w_2 = 2)$. Following these indicators, fewer (between 6 to 8 percent) individuals were unemployment or had two or more disabilities; these indicators are assigned a lower weight $(w_3 = w_4 = 1)$. Finally, the remaining four indicators with most prevalent deprivation are assigned the least weights $(w_5 = \ldots = w_8 = 0.5)$. Based on this weighting scheme, the proportion of multidimensional poor (about 7 percent) is much lower than other weighting schemes. Thus the multidimensional poverty index is very sensitive to the weights attached to indicators.

9. Summary

In this paper, we have developed a multidimensional poverty index for the U.S. Unlike the official poverty measure or the alternate supplemental poverty measure which are largely based on some concept of income, the multidimensional poverty index accounted for an individual's simultaneous deprivation in multiple dimensions such as housing, education and health.

We defined a benchmark US-MPI based on eight indicators of quality of life: health insurance, disabilities, high school education, fluency in English, income, employment, housing costs and living space. In the benchmark case, any individual deprived in two or more of indicators was identified as multidimensional poor. In 2011, one in five (adult) American's were multidimensional poor; thus a greater proportion of individuals were poor in a non-traditional way compared to the official poverty estimate (12.5 percent). The multidimensional poor experienced about 7 percent of all deprivations that the society could potentially experience. Even when we removed income as an indicator of well-being, we found that almost 16 percent of adults were multidimensional poor. Lack of health insurance and severe housing burden were two indicators, in which a significant proportion of individuals were deprived.

There was variation in the proportion of multidimensional poor by race, nativity, and region, less so by gender and age. Among the different races, Asians had greater proportion (27 percent) of multidimensional poor, because of higher than average deprivation in two indicators: a crowded house and lack of English fluency. Similarly a large proportion of Hispanics (46 percent) were identified as multidimensional poor. The proportion of Hispanics deprived of health insurance, high school education, English fluency and living in crowded

house was more than double the average proportion of deprivation. Overall, in the U.S., a large proportion of individuals (42 percent) was deprived in at least one indicator of well-being which was not necessarily income, a sizeable proportion was deprived in at least two (20.1 percent) or three (8.4 percent) indicators and very low proportion (3 percent) of individuals was deprived in four or more indicators.

The benchmark MPI identified an individual as multidimensional poor if the individual was deprived in two or more indicators. The multidimensional poor, for instance, might include i) the elderly (65 and above) who experienced two or more disabilities and had not completed high-school, ii) Hispanics who lived in a crowded house and were not fluent in English (nor had a household member who could speak English very well), iii) young adults (above 18) who did not have health insurance and were unemployed and so on. Not all would agree that these caricatures of individuals should be treated as "poor". Poverty after all is a vague concept and is open to interpretation. The multidimensional poverty measure, like any other poverty measure is based on relatively arbitrary assumptions which can be questioned and changed. Using the ACS as our data source, we extracted as many as eight different quality of life indicators (the choice is restricted by the availability of data), and provided a range of possible values of the multidimensional poverty index by changing the thresholds on each indicator, changing the relatively weights attached to each indicator and by changing the minimum number of deprivations needed, in order to qualify as a multidimensional poor. We made certain choices to define the benchmark US-MPI; others may choose differently and find another estimate as more plausible. The purpose of this paper is to emphasize the need of an alternate measure of poverty in the U.S. based on the notion of multiple deprivations.

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Table 1 Variables used in Selected Multidimensional Measures

Index	Dimensions	Indicators *(deprived if)*
Human Development Index (HDI)	Health	Life expectancy at birth (*a minimum of 20 years and maximum of 83.4 years*)
	Education	Average years of schooling for adults aged 25 years Expected years of schooling for children of school entering age (*maximum of 18 years*)
	Standard of Living	GNI per capita (PPP$) (*minimum income is $100 and the maximum is $107,721*)
Human Poverty Index (HPI-2):developed countries	Health	Mortality rate (*probability of not surviving to age 60*)
	Education	Percent of adults who are illiterate
	Standard of Living	Percent of the population below the income poverty line (*50% of median household disposable income*)
	Social Exclusion	Rate of long term unemployment (*12 months or more*)
UNDP-MPI: developing countries	Health	Child Mortality (*any child has died in the family*) Nutrition (*any adult or child who is malnourished*)
	Education	Years of school (*if no household member has completed 5 years of schooling*) Children enrolled (*any school-aged child is not attending school up to class 8*)
	Standard of Living	Cooking fuel (*cooks with dung, wood or charcoal*) Sanitation (*sanitation facility is not improved according to MDG guidelines*) Water (*no access/more than a 30-minute walk to safe drinking water*) Electricity (*no electricity*) Floor (*has a dirt, sand or dung floor*) Assets (*no more than one radio, TV, telephone, bike, motorbike or refrigerator and does not own a car or truck*)
MPI: EU	Basic	Absence of a meal, clothes, a leisure activity, a holiday, a meal with meat or a vegetarian alternative, adequate home heating, shoes
	Consumption	Absence of a PC, a car and an internet connection
	Health	Self-assessed health status, restrictions on current activity and the presence of a chronic illness
	Neighborhood Environment	Reported levels of litter, damaged public amenities, pollution, crime/violence/vandalism and noise in the neighborhood
	Income Poverty	Relative poverty (*income less than 60% of median disposable income*)

Table 2 Benchmark US Multidimensional Poverty Index

Dimensions	Indicators *(deprived if)*
Health	**Health insurance** (*no public or private insurance*) **Disability** (*difficulty in more than one functions: Hearing, Vision, Cognitive, Ambulatory, Self-care, Independent Living*)
Education	**Years of schooling** (*grade 12 not completed*) **English Fluency** (*no one in the household 14 and over speaks English only or speaks English 'very well'*)
Standard of Living	**Income poverty** (*income to poverty threshold ratio less than 100%*) **Employment status** (*in labor force and unemployed*)
Housing	**Housing costs** (*monthly owner costs or gross rent is more than **50%** of household income*) **Crowded house** (*more than 1 occupant per room*)

Table 3 Deprivation Overlap in Different Indicators

	No Health Ins.	Disabilities	No High School	Lack English Flu.	Income Poor	Unemployed	Housing Costs	Crowded House
No Health Ins.	14.7							
Disabilities	0.6	8.1						
No High School	3.2	2.2	11.8					
Lack English Flu.	1.6	0.4	1.7	4.0				
Income Poor	4.2	1.8	3.3	1.2	12.5			
Unemployed	2.5	0.3	0.9	0.3	1.9	6.0		
Housing Costs	3.3	1.6	2.3	1.0	6.4	1.5	12.8	
Crowded House	1.8	0.2	1.5	0.7	1.4	0.5	0.8	4.5

Values show the percent of individuals in the population who were deprived in respective indicators

Table 4 Proportion of Poor by Different Measures 2011

Measures	Indicator[1]	Data Source	% population[2]
Official Poverty Measure	Income	CPS-ASES	12.8
Supplemental Poverty Measure	Income	CPS-ASES	15.5
Income Poor	Income	ACS	12.5
Multidimensional Poor	**2 or more**	**ACS**	**20.1**

1. Income definitions and time covered differ for each dataset; http://www.census.gov/hhes/www/poverty/about/datasources/factsheet.html.
2. Percent of population given for adults 18 years and above

Table 5 Decomposition by Population Subgroups

Subgroups	Categories	Our Sample			Official Statistics		
		Proportion of Population (%)	Multi-dimensional Poor (%)	Relative Risk Ratio[1]	Proportion of Population (%)	Official Income Poor[2] (%)	Relative Risk Ratio
Sex	Female	52.7	20.6	1.0	51.7	14.6	1.2
	Male	47.3	19.7	1.0	48.3	10.9	0.9
Age	18 to 64	78.5	21.2	1.1	82.3	13.7	1.1
	65 and above	21.5	16.4	0.8	17.7	8.7	0.7
All			**20.1**			**12.5**	
Race	White Alone	79.2	16.5	0.8	78.2	12.8	0.9
	Black Alone	10.1	31.7	1.6	12.8	27.6	1.8
	Asian Alone	4.6	27.0	1.3	5.2	12.3	0.8
Ethnicity	Hispanic[3]	11.9	45.9	2.3	16.9	25.3	1.7
Nativity	Native Born	86.2	16.7	0.8	87	14.4	1.0
	Foreign Born[4]	13.8	42.0	2.1	13	19.0	1.3
Region	Northeast	18.2	17.0	0.9	17.8	13.1	0.9
	Midwest	21.9	16.0	0.8	21.4	14.0	0.9
	South	36.9	21.9	1.1	37.3	16.0	1.1
	West	23.0	24.0	1.2	23.5	15.8	1.1
All			**20.1**			**15**[5]	

1. Ratio of proportion of poor in a subgroup over proportion of poor in the total population.
2. All figures taken from: http://www.census.gov/hhes/www/poverty/data/historical/index.html
3. Includes Hispanic, Spanish and Latinos; 4. Includes naturalized citizens and non-citizens
5. Official income poor for race, ethnicity, nativity and region include all age groups and is equal to 15 percent. Hence the relative risk ratio for these subgroups is calculated with 15 as the denominator.

Table 6 Sensitivity to the first cut-off: Indicator-Specific Thresholds

Indicators	Benchmark Threshold	Lower Threshold	Multi-dimensional Poor (%)	Higher Threshold	Multi-dimensional Poor (%)
	Benchmark US-MPI		**20.1**		**20.1**
Disability	*difficulty 2 or more functions*	*3 or more functions*	19.1	*at least 1 function*	22.1
Years of schooling	*grade 12 not completed*	*grade 9 not comp.*	18.1	*One or more years of college but no degree*	33.2
Income poverty	*income to poverty threshold ratio less than 100%*	*less than 50%*	17.5	*less than 200%*	26.9
Housing costs	*monthly owner costs or gross rent is more than 50% of household income*	*more than 75%*	18.1	*more than 30%*	24.6
Crowded house	*more than 1 occupant per room*	*more than 2*	19.0	-	-

Table 7 Sensitivity to the second cut-off: Number of Indicators

| Deprivation Cutoffs	Deprived in at least as many indicators	Multidimensional Poor (%)
Union	1	42.1
Benchmark MPI	**2**	**20.1**
	3	8.4
	4	2.8
	5	0.7
	6	0.1
	7	0.009
Intersection	8	0.00004

As in the benchmark case, all indicators have equal weight

Table 8 Sensitivity to Relative Weights

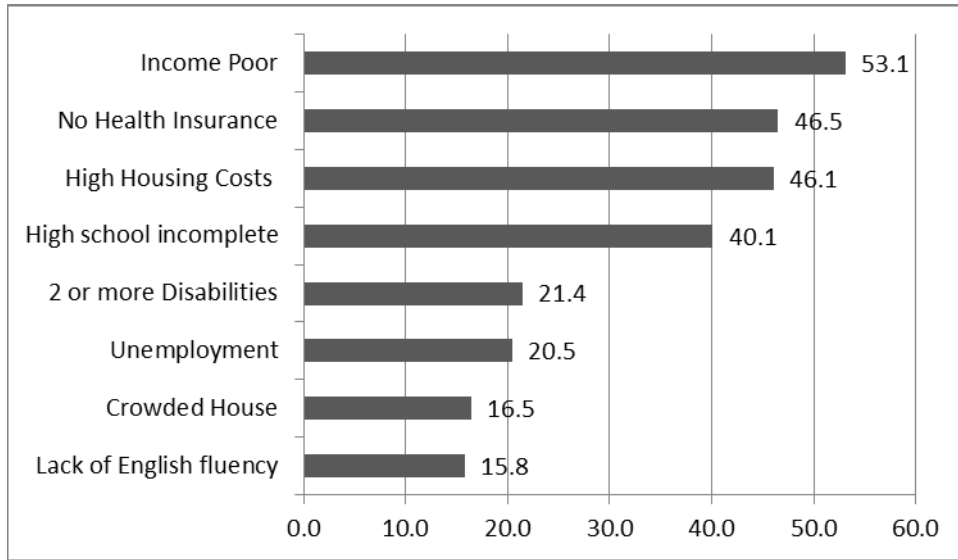| Dimensions	Indicators	Weights			
		Equal (benchmark)	Equal (w/o income)	Nested	Prevalence
Health	No Health Ins.	1	1	4/7	1/2
	Disabilities	1	1	4/7	1
Livelihood	No High School	1	1	4/7	1/2
	Lack English Flu.	1	1	4/7	2
Standard of Living	Income Poor	1	0	4	1/2
	Unemployed	1	1	4/7	1
Housing	Housing Costs	1	1	4/7	1/2
	Crowded House	1	1	4/7	2
Multidim. Poor (%)		20.1	15.6	10.7	6.8

As in the benchmark case, the second cutoff k is such that an individual is identified as "multidimensional" poor if she is deprived in two or more indicators; for nested weighting structure k > 4, and for prevalence weighting structure k > 2.

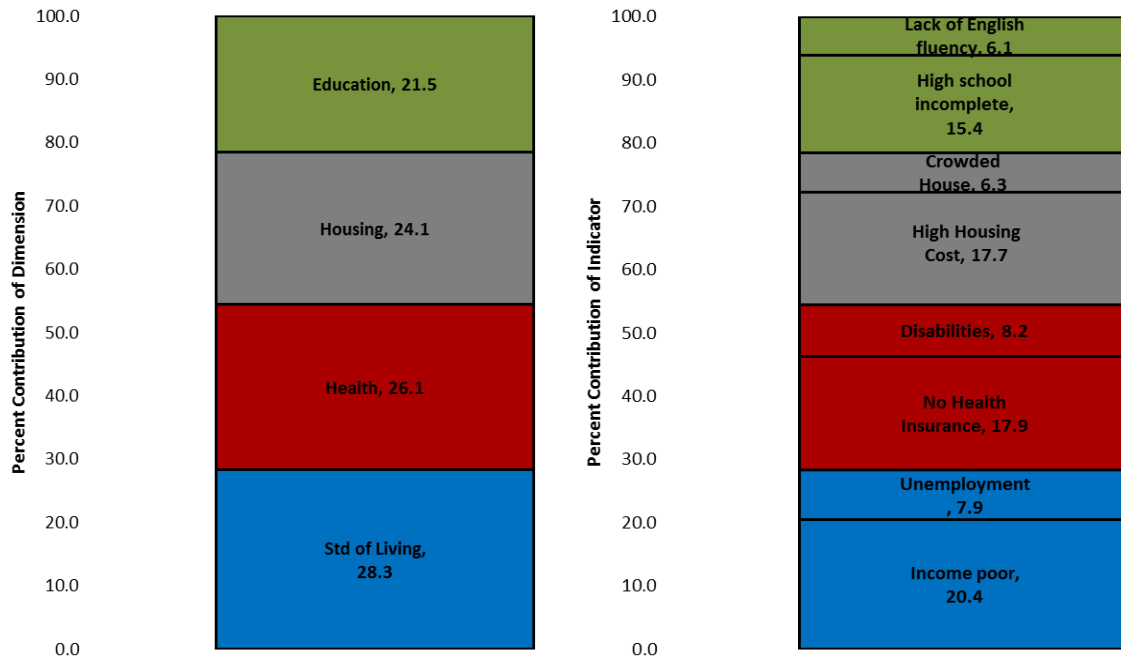## Figure 1 Indicator wise Deprivation in the Population
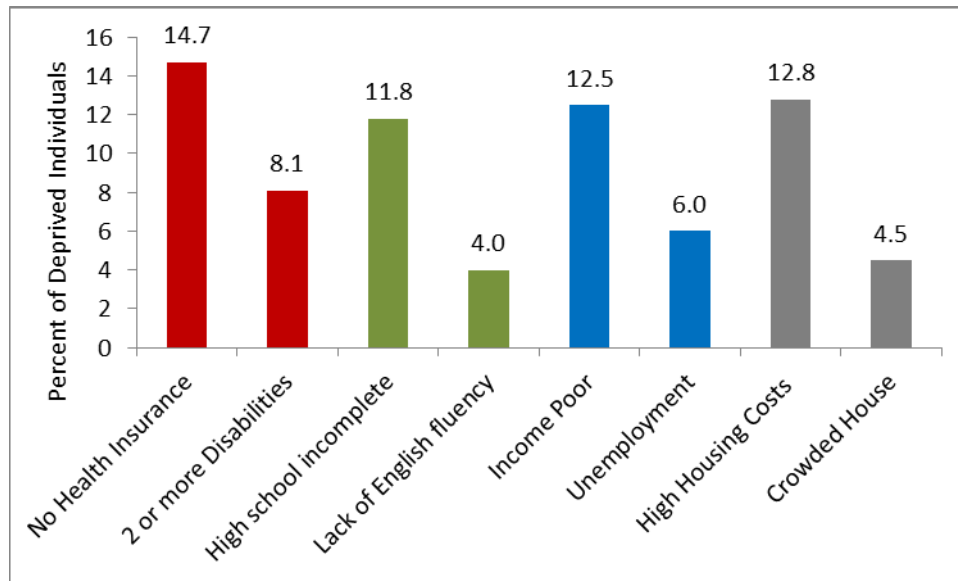
Values show individuals deprived in an indicator as a percent of the entire population

Figure 2 Indicator wise Deprivation in the Multidimensional Poor

Income Poor — 53.1
No Health Insurance — 46.5
High Housing Costs — 46.1
High school incomplete — 40.1
2 or more Disabilities — 21.4
Unemployment — 20.5
Crowded House — 16.5
Lack of English fluency — 15.8

Values show multidimensional poor deprived in an indicator as a percent of the multidimensional poor population

Figure 3 Decomposition of the Benchmark US-MPI by Dimensions and Indicators

Percent Contribution of Dimension

Education, 21.5
Housing, 24.1
Health, 26.1
Std of Living, 28.3

Percent Contribution of Indicator

Lack of English fluency, 6.1
High school incomplete, 15.4
Crowded House, 6.3
High Housing Cost, 17.7
Disabilities, 8.2
No Health Insurance, 17.9
Unemployment, 7.9
Income poor, 20.4

Appendix

Health Insurance Coverage

Health insurance coverage in the ACS define coverage to include plans and programs that provide comprehensive health coverage. Plans that provide insurance for specific conditions or situations such as cancer and long-term care policies are not considered coverage. Likewise, other types of insurance like dental, vision, life, and disability insurance are not considered health insurance coverage. The Census Bureau broadly classifies health insurance coverage as private health insurance or public coverage. Private health insurance is a plan provided through an employer or union, a plan purchased by an individual from a private company, or TRICARE or other military health care. Public health coverage includes the federal programs Medicare, Medicaid, and VA Health Care (provided through the Department of Veterans Affairs); the Children's Health Insurance Program (CHIP); and individual state health plans. The types of health insurance are not mutually exclusive; people may be covered by more than one at the same time.

Disability Status

In an attempt to capture a variety of characteristics that encompass the definition of disability, the ACS identifies serious difficulty with four basic areas of functioning – hearing, vision, cognition, and ambulation--supplemented by difficulty in self-care and independent living. Hearing difficulty was estimated by asking respondents if they were "deaf or … [had] serious difficulty hearing." Similarly, vision difficulty was derived by asking respondents if they were "blind or … [had] serious difficulty seeing even when wearing glasses." Cognitive difficulty question asked respondents if due to physical, mental, or emotional condition, they had "serious difficulty concentrating, remembering, or making decisions." Ambulatory difficulty was derived from question which asked respondents if they had "serious difficulty walking or climbing stairs." Self-care difficulty was estimated by asking respondents if they had "difficulty dressing or bathing." Difficulty with these activities are two of six specific Activities of Daily Living (ADLs) often used by health care providers to assess patients' self-care needs. Independent living difficulty question asked respondents if due to a physical, mental, or emotional condition, they had difficulty "doing errands alone such as visiting a doctor's office or shopping." Difficulty with this activity is one of several Instrumental Activities of Daily Living (IADL) used by health care providers in making care decisions.

Educational Attainment

Educational attainment data is collected by the ACS for people 18 years old and over. Respondents are classified according to the highest degree or the highest level of school completed. The question included instructions for persons currently enrolled in school to report the level of the previous grade attended or the highest degree received. The educational attainment question included a response category that allowed people to report completing the 12th grade without receiving a high school diploma. Respondents who received a regular high school diploma and did not attend college were instructed to report "Regular high school diploma." Respondents who received the equivalent of a high

school diploma (for example, passed the test of General Educational Development (G.E.D.)), and did not attend college, were instructed to report "GED or alternative credential."

Ability to Speak English

Respondents who reported speaking a language other than English were asked to indicate their English-speaking ability based on one of the following categories: "Very well," "Well," "Not well," or "Not at all." Those who answered "Well," "Not well," or "Not at all" are sometimes referred as "Less than 'very well.'" Respondents were not instructed on how to interpret the response categories in this question. Households in which no one 14 and over speaks English only or speaks a language other than English at home and speaks English "very well"- This variable identifies households that may need English language assistance. This arises when no one 14 and over meets either of two conditions (1) they speak English at home or (2) even though they speak another language, they also report that they speak English "very well." After data are collected for each person in the household, this variable checks if all people 14 and over speak a language other than English. If so, the variable checks the English-speaking ability responses to see if all people 14 and over speak English "Less than 'very well.'" If all household members 14 and over speak a language other than English and speak English "Less than 'very well,'" the household is considered part of this group that may be in need of English language assistance.

Income Poverty Ratio

Poverty statistics in ACS adhere to the standards specified by the Office of Management and Budget in Statistical Policy Directive 14. The Census Bureau uses a set of dollar value thresholds that vary by family size and composition to determine who is in poverty. Further, poverty thresholds for people living alone or with nonrelatives vary by age. The poverty thresholds for two-person families also vary by the age of the householder. The income-poverty ratio is estimated by comparing the person's total family income in the last 12 months with the poverty threshold appropriate for that person's family size and composition. If the total income of that person's family is less than the threshold appropriate for that family, then the person is considered "below the poverty level," together with every member of his or her family. If a person is not living with anyone related by birth, marriage, or adoption, then the person's own income is compared with his or her poverty threshold. Since ACS is a continuous survey, people respond throughout the year. Because the income questions specify a period covering the last 12 months, the appropriate poverty thresholds are determined by multiplying the base-year poverty thresholds (1982) by the average of the monthly inflation factors for the 12 months preceding the data collection. Income is obtained by summing eight different types of income: 1. wage or salary income, 2. (farm and non-farm) self-employment income, 3. interest, dividends, net rental income, royalty income, or income from estates and trusts, 4. social security income, 5. public assistance income, 6. retirement, survivor or disability income, and 8. all other incomes. Monthly Consumer Price Indices (CPI) factors are used to inflation-adjust these components to a reference calendar year (January through December).

Employment Status

The ACS defines the "Employed" as all civilians 16 years old and over who either (1) were "at work,""
that is, those who did any work at all during the reference week as paid employees, worked in their own
business or profession, worked on their own farm, or worked 15 hours or more as unpaid workers on a
family farm or in a family business; or (2) were "with a job but not at work". The "Unemployed" consist
of all civilians 16 years old and over who (1) were neither "at work" nor "with a job but not at work"
during the reference week, and (2) were actively looking for work during the last 4 weeks, and (3) were
available to start a job. Also included as unemployed are civilians who did not work at all during the
reference week, were waiting to be called back to a job from which they had been laid off, and were
available for work except for temporary illness. The reference week is the calendar week preceding the
date on which the respondents completed their questionnaires or were interviewed. This week is not
the same for all respondents since the interviewing was conducted over a 12-month period. Since
employment data from the ACS are obtained from respondents in households, they differ from statistics
based on reports from individual business establishments, farm enterprises, and certain government
programs. People employed at more than one job are counted only once in the ACS and are classified
according to the job at which they worked the greatest number of hours. In statistics based on reports
from business and farm establishments, people who work for more than one establishment may be
counted more than once. People who had a job but were not at work are included with the employed in
the ACS, whereas many of these people are likely to be excluded from employment figures based on
establishment payroll reports. Furthermore, the employment status data in ACS include people on the
basis of place of residence regardless of where they work, whereas establishment data report people at
their place of work regardless of where they live.

Housing Costs: Selected Monthly Owner Costs

Selected monthly owner costs as a percentage of household income provide information on the monthly
housing cost expenses for owners. The information offers an excellent measure of housing affordability
and excessive shelter costs. Selected monthly owner costs are the sum of payments for mortgages,
deeds of trust, contracts to purchase, or similar debts on the property (including payments for the first
mortgage, second mortgages, home equity loans, and other junior mortgages); real estate taxes; fire,
hazard, and flood insurance on the property; utilities (electricity, gas, and water and sewer); and fuels
(oil, coal, kerosene, wood, etc.). It also includes, where appropriate, the monthly condominium fee for
condominiums and mobile home costs (installment loan payments, personal property taxes, site rent,
registration fees, and license fees). Selected monthly owner costs were tabulated for all owner-occupied
units, and usually are shown separately for units "with a mortgage" and for units "not mortgaged."

Housing Costs: Gross Rent

Gross rent provides information on the monthly housing cost expenses for renters. When the data is
used in conjunction with income data, the information offers an excellent measure of housing
affordability and excessive shelter costs. Gross rent is the contract rent plus the estimated average
monthly cost of utilities (electricity, gas, and water and sewer) and fuels (oil, coal, kerosene, wood, etc.)

if these are paid by the renter (or paid for the renter by someone else). Gross rent is intended to eliminate differentials that result from varying practices with respect to the inclusion of utilities and fuels as part of the rental payment. The estimated costs of water and sewer, and fuels are reported on a 12-month basis but are converted to monthly figures for the tabulations. Renter units occupied without payment of rent are shown separately as "No rent paid" in the tabulations.

Occupants per Room

This data is the basis for estimating the amount of living and sleeping spaces within a housing unit. These data allow officials to plan and allocate funding for additional housing to relieve crowded housing conditions. The number of occupants per room is obtained by dividing the number of people in each occupied housing unit by the number of rooms in the unit. The figures show the number of occupied housing units having the specified ratio of people per room. Although the Census Bureau has no official definition of crowded units, many users consider units with more than one occupant per room to be crowded.