

## **The Value Added of a Multidimensional Deprivation Index**

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### **Abstract**

Multidimensional deprivation measures are based on the idea that income is not the only factor that affects well-being. In other words, there are non-income-based indicators that may classify people as deprived. The value-added of multidimensional measures, as compared to traditional poverty measures, is that they can identify people who may not be income poor, but face hardships or deprivations in other areas of their lives. Though this is implicit in the measurement and study of multidimensional deprivation and the demographic make-up of the multidimensionally deprived has been thoroughly explored, little has been done to examine the demographics of individuals identified as being multidimensionally deprived but not income poor. In other words, who are these people facing multiple deprivations that traditional income poverty measures fail to capture?

In order to answer this question, the population is divided into four groups based on their multidimensional deprivation Index (MDI) status and whether they are income poor according to the official poverty measure: MDI deprived but not income poor, income poor but not MDI deprived, both income poor and MDI deprived, and neither income poor nor MDI deprived. First, deprivation in individual dimensions are compared to examine the deprived population that is and is not captured by measuring the income poor. Second, these groups are compared using labor market characteristics, demographics, and geography to identify who these groups represent.

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<sup>1</sup> This paper is released to inform interested parties of ongoing research and to encourage discussion of work in progress. Any views expressed are those of the author and not necessarily of the U.S. Census Bureau. The Census Bureau reviewed this data product for unauthorized disclosure of confidential information and has approved the disclosure avoidance practices applied to this release. CDDRB-FY21-POP001-0158.

## Introduction

Multidimensional deprivation measurement is based on the idea that there are income and non-income-based indicators that may identify people as deprived. Multidimensional deprivation provides a more expansive view of well-being than income-based poverty measures. Multidimensional deprivation estimates may include people who are income poor and would be considered in poverty by traditional unidimensional income measures. However, these estimates also include people who may not be income poor, but face hardships or deprivations in other areas of their lives. Multidimensional deprivation estimates also exclude people who are only income poor but are not deprived in other areas.

There has been increased interest in multidimensional poverty since Alkire and Foster published their dual-cutoff approach in 2011. This approach involves setting one cutoff to determine deprivation in a particular dimension and a second cutoff to determine in how many dimensions a person must be deprived in order to be considered multidimensionally deprived.

The Census Bureau released its first report on Multidimensional Deprivation in 2019.<sup>2</sup> The report included MDI rates for the years 2009 through 2017 calculated from the American Community Survey (ACS). The U.S. Census Bureau also produces official<sup>3</sup> as well as alternate measures of poverty from several household surveys and programs. The Census Bureau releases poverty statistics from the Current Population Survey Annual Social and Economic Supplement (CPS ASEC), the American Community Survey (ACS) and the Survey of Income and Program Participation (SIPP). The CPS ASEC is the source for both official poverty estimates and estimates using an alternative methodology, the supplemental poverty measure (SPM). The official methodology is also used to produce poverty estimates from both the ACS and SIPP.<sup>4</sup> Both the official poverty measure (OPM) and the supplemental poverty measure are unidimensional measures of poverty that compare resources to a poverty threshold to determine poverty status.<sup>5</sup>

The MDI should be viewed as a separate measure from the OPM or SPM. The OPM and SPM measure income and resources available to meet some minimum threshold of consumption needs, while the MDI evaluates deprivations in a number of different areas in addition to income poverty. However, the overlap across the two types of measures is valuable because it shows how much of the population with multiple deprivations is captured by the unidimensional poverty measures.

In previous work on multidimensional deprivation, the value-added of a multidimensional measure as compared to a unidimensional measure was assumed. However, it has not actually been quantified or explored up to now. This paper addresses this gap in the literature. The main research questions in this paper are:

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<sup>2</sup> See <https://www.census.gov/content/dam/Census/library/publications/2019/demo/acs-40.pdf>.

<sup>3</sup> Following the standard specified by the Office of Management and Budget (OMB) in Statistical Policy Directive 14, data from the Current Population Survey Annual and Social Economic Supplement are used to estimate the official national poverty rate, which can be found in the report [Income and Poverty in the United States: 2019](#).

<sup>4</sup> See [Income and Poverty in the United States: 2019](#); [Poverty: 2018 and 2019](#); [Supplemental Poverty Measure: 2019](#); [Monthly and Average Monthly Poverty Rates by Selected Demographic Characteristics: 2013](#).

<sup>5</sup> In this report, we use OPM to refer to estimates from the ACS that use the official poverty methodology.

- 1) What is the value-added of a multidimensional measure?
- 2) Who are the people facing multiple deprivations that traditional income poverty measures fail to capture?

In order to answer these questions, the population is divided into four groups based on their multidimensional deprivation (MDI) status and whether they are income poor according to the official poverty measure: MDI deprived but not income poor, income poor but not MDI deprived, both income poor and MDI deprived, and neither income poor nor MDI deprived.

The paper is organized as follows. Section 1 of the paper discusses the data and methodology for the MDI. Section 2 lays out the main results of the paper. First, differences between multidimensional deprivation and income poverty are explored at the national level. Second, the poverty-deprivation groups are compared using labor market characteristics, demographics, and geography to identify who these groups represent. Finally, decompositions by dimension are performed in order to explore how contributions of individual dimensions to the MDI only rate differ by demographic group. Section 3 discusses the main findings and concludes.

## Data and methods

The data used to construct the MDI comes from the ACS 1-year estimates.<sup>6</sup> The ACS is a nationwide survey designed to provide communities with reliable and timely demographic, social, economic, and housing data for the nation, states, congressional districts, counties, places, and other localities every year. It has an annual sample size of about 3.5 million addresses across the United States and Puerto Rico and includes both housing units and group quarters (e.g., nursing facilities and prisons).<sup>7</sup> The ACS is the best source of sub-national economic, social, and employment characteristics and its large sample size allows for decompositions by demographic characteristics and small geographical areas.

The ACS data is supplemented with data at the block group level from the Area Deprivation Index (ADI) created by the University of Wisconsin-Madison.<sup>8</sup> The ADI is an index of seventeen socioeconomic indicators from the American Community Survey 5-year estimates.

The MDI is constructed using the Alkire-Foster method, a widely-used flexible methodology (Alkire 2011a) in which individual-level indicators of deprivation in multiple dimensions are used to identify who is deprived and to assess the intensity of their deprivation. Similar to the poverty estimates using official thresholds from the CPS ASEC, SIPP and ACS, the MDI is limited to the poverty universe - all

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<sup>6</sup> For information on confidentiality protection, sampling error, nonsampling error, and definitions in the ACS, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>

<sup>7</sup> While people living in group quarters are sampled in the ACS, those living in institutional group quarters (e.g., nursing homes or correctional facilities) are not included in the poverty universe. Homeless populations are not included in the sample universe unless they are living in shelters at the time of the survey. Puerto Rico is not included in this paper.

<sup>8</sup> This project was supported by National Institute on Aging Award (RF1AG057784 [PI Kind, MPI Bendlin]) and National Institute on Minority Health and Health Disparities Award (R01MD010243 [PI Kind]). This material is the result of work also supported with the resources and the use of facilities at the University of Wisconsin Department of Medicine Health Services and Care Research Program. The content is solely the responsibility of the authors and does not necessarily represent the official views of the National Institutes of Health. For more information on the ADI, see <https://www.neighborhoodatlas.medicine.wisc.edu/>. For an extensive list of publications using the ADI, see <https://www.neighborhoodatlas.medicine.wisc.edu/citations>.

persons except unrelated individuals under age 15 and individuals residing in institutional group quarters. A person is defined as deprived according to the MDI if they are deprived in at least two dimensions.<sup>9</sup>

The MDI consists of six dimensions: standard of living, education, health, economic security, housing quality and neighborhood quality.<sup>10</sup> The standard of living dimension is a traditional unidimensional poverty measure. A person is considered deprived in standard of living if they are in poverty according to the official poverty measure.

A person is considered deprived in education if he or she is 19 years of age and over and is without a high school degree or GED. Since people under age 19 are likely to still be in school, for this group the educational attainment of the householder is substituted for their own educational attainment. Therefore, a child under age 19 is deprived in this dimension if the householder lacks a high school degree or GED.

Two variables in the ACS can be used as a reasonable approximation of health. The first variable is health insurance coverage. Studies have found a consistent positive relationship between health insurance coverage and health-related outcomes. The evidence suggests that health insurance is associated with more appropriate use of health care services and better health outcomes (Institute of Medicine Committee on the Consequences of Uninsurance 2002; Sommers et al. 2017).

A second variable, number of disabilities, is used for people age 65 and over since nearly all people in this age group have health insurance coverage. People can report up to six disabilities in the ACS.<sup>11</sup> For this dimension, a person is health deprived if they lack health insurance coverage or if they are 65 years of age or over and report at least two disabilities.

Economic security is included in the MDI because it is possible to be above the standard of living threshold but still face economic insecurity. An economically insecure person is one with a tenuous connection to the labor market. A person can meet this deprivation requirement in a number of ways. A person is considered economically insecure if they are:

- 1) Under age 65:
  - i. Aged 18 and older and unemployed at the time of the survey OR
  - ii. Live in a household in which average household hours worked OR average household weeks worked for working-age adults (age 18 to 64, not currently enrolled in school) is less than 20 hours a week or less than 26 weeks a year, respectively<sup>12</sup>
- 2) Age 65 and over:
  - i. Unemployed at the time of the survey OR
  - ii. Work less than 20 hours a week OR less than 26 weeks a year AND retirement plus Social Security plus Supplemental Security Income for the

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<sup>9</sup> A cut-off of two dimensions is used in much of the literature to define multidimensional deprivation.

<sup>10</sup> For a more detailed description of the MDI and the individual dimensions, see <https://www.census.gov/library/working-papers/2021/demo/SEHSD-WP2021-03.html>.

<sup>11</sup> There are six disabilities a person can report in the ACS: Hearing difficulty, vision difficulty, difficulty going out, difficulty dressing, physical difficulty, and difficulty remembering.

<sup>12</sup> Those with zero weeks/hours worked were included in the hours and weeks calculations.

household is less than the minimum Social Security benefit assuming 30 years of work experience.<sup>13</sup>

The housing quality dimension accounts for the need for physical space and security within one's home. A household has poor housing quality if it is overcrowded. An overcrowded household is defined as having more than two people per bedroom. Furthermore, people living in emergency or transitional shelters are considered deprived in housing quality.

The neighborhood quality measure used in this paper is the Area Deprivation Index (ADI) created by researchers at the University of Wisconsin-Madison. The ADI score includes block group measures of education (percent with less than 9 years of education; percent with at least a high school diploma), employment (percent employed in a white-collar occupation; unemployment rate), income (median family income; income disparity;<sup>14</sup> percent below poverty level; percent below 150% of poverty level), housing (median home value; median gross rent; median monthly mortgage; home ownership rate), household composition (percent of single parent households), and household resources (percent without a car; percent without a telephone; percent without complete plumbing; percent of housing units with more than one person per room). The ADI measure is constructed by ranking the ADI score from lowest to highest for the nation and grouping the block groups into bins corresponding to each 1 percent range of the ADI score. The ADI ranks block groups from 1, least disadvantaged, to 100, most disadvantaged in the U.S. To be deprived in neighborhood quality, a person must live in a Census block group that is in the top ten percent of deprived areas, an ADI over 90.

## Results

### I. Overall U.S. estimates

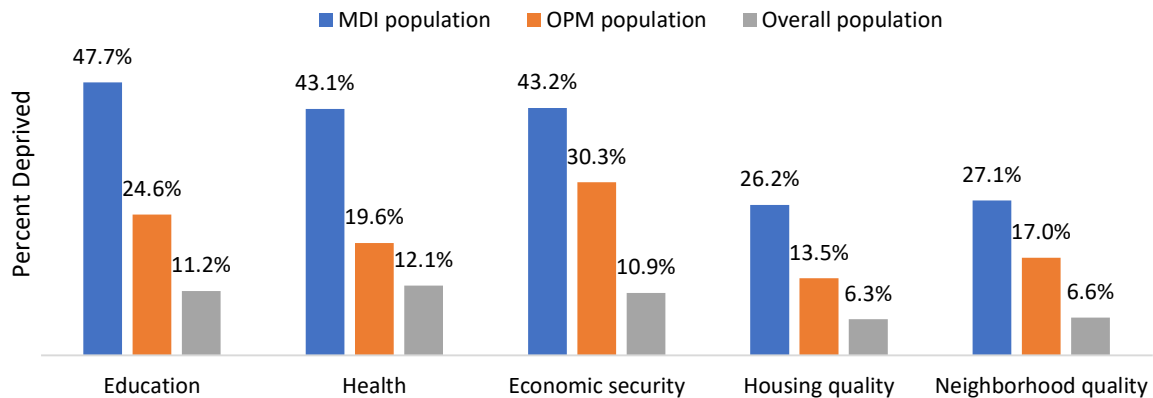
In Figure 1, the percentage of the MDI, OPM, and overall populations that are deprived in each of the five dimensions of the MDI, other than standard of living, are shown. As a reference, the percent of the overall population deprived according to the MDI is 14.9 percent and the percent of the overall population in poverty according to the OPM is 12.3 percent. In general, the deprivation levels for each dimension were higher for the OPM population than for the overall population and even higher for the MDI population than for the OPM population. For three dimensions, education, health and housing quality, the MDI population was almost twice as likely to be deprived as the OPM population.

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<sup>13</sup> The minimum social security benefit was calculated using tables available at <https://www.ssa.gov/cgi-bin/smt.cgi>. To calculate the minimum benefit, it was assumed that the person worked the maximum number of years, 30. For the year 2019, the minimum benefit was \$872.50 per month or \$10,470 annually.

<sup>14</sup> Defined as the ratio of households with income less than \$10,000 to households with income > \$50,000.

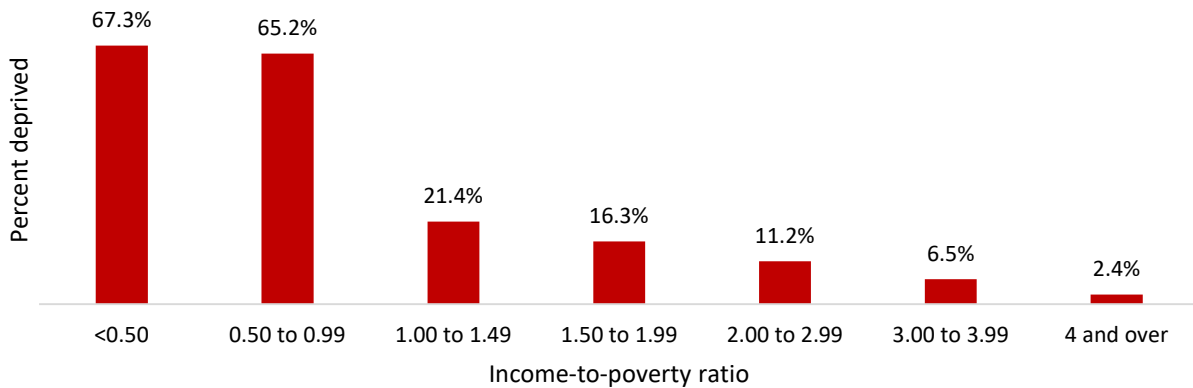
Figure 1: Percent Deprived in Each Dimension



Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

In Figure 2, the percent MDI deprived are shown for distinct income groups based on the income-to-poverty ratio. There are several takeaways from this figure. First, nearly two-thirds of each income group below the poverty level (less than 0.5 and 0.5 percent to 0.99) were MDI deprived in 2019. Second, as the income-to-poverty ratio increases above 1, the percent of the income group that was MDI deprived decreases. This means that there was a negative relationship between income and MDI deprivation status. However, it was also the case that at least 10 percent of each income group with income-to-poverty ratios between 1 and 2.99 was MDI deprived. Furthermore, even at an income-to-poverty ratio of 4 (\$52,044 for an individual or \$103,704 for a 2 adult, 2 child family in 2019) and over, there existed a non-trivial segment of the population with at least two non-income-based deprivations.

Figure 2: Percent of the Population that is MDI Deprived by Income-to-Poverty Ratio: 2019



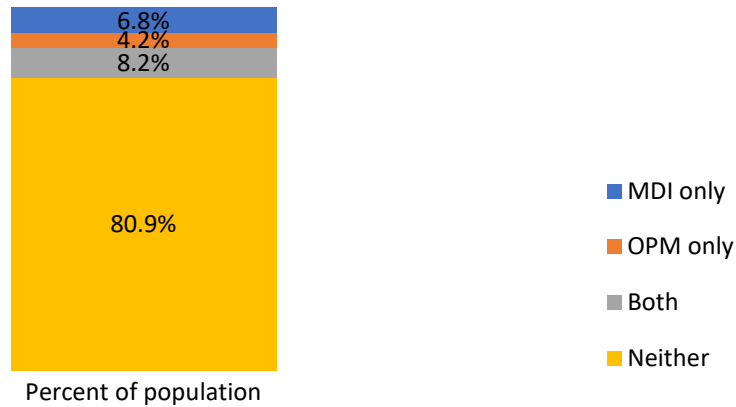
Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

For the remainder of this paper, the population is divided into four distinct groups. The “MDI only” group consists of people deprived according to the MDI but not in poverty according to the OPM. Similarly, the “OPM only” group consists of people in poverty according to the OPM but not deprived according to the MDI. The “Both” group consists of people who are deprived according to the MDI and in poverty according to the OPM. Lastly, the “Neither” group consists of people who are not deprived according to the MDI and not in poverty according to the OPM.

The most important group, for the purposes of this paper, is the MDI only group. This comprises a section of the population that was not already identified as deprived in some way by the OPM. The most interesting comparison group is the OPM only population since this group includes people in poverty who are not deprived in any other dimension of the MDI.

In Figure 3, the percent of the total U.S. population is divided into the four distinct poverty-deprivation groups. Approximately 8.2 percent of the population was in poverty according to the OPM and is deprived in at least one other dimension. Conversely, 4.2 percent of the population was in poverty according to the OPM but was not deprived in any other dimensions of the MDI. Another 6.8 percent of the population was deprived in at least two dimensions, but was not in poverty according to the OPM. This 6.8 percent represents the value-added of the MDI. Finally, 80.9 percent of the population were not in poverty according to the OPM nor deprived according to the MDI.

Figure 3: Percent of Total Population in Each Poverty-Deprivation Group: 2019



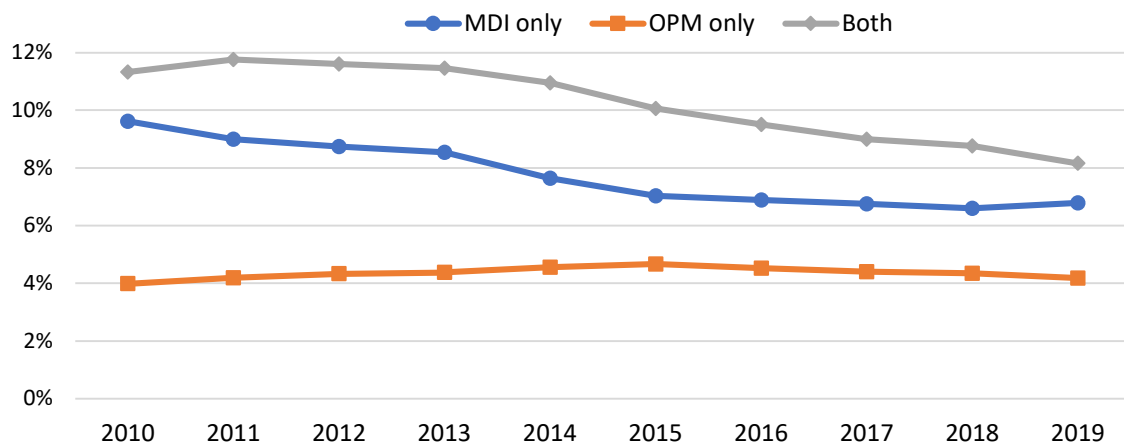
Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

Most of the analysis in this paper is a snapshot examining 2019 data. Figure 4, however, displays changes over time from 2010 through 2019 for three of the poverty-deprivation groups. The OPM only population increased by 0.2 percentage points from 4.0 percent in 2010 to 4.2 percent in 2019. Conversely, the MDI only population decreased by 2.8 percentage points, from 9.6 percent in 2010 to 6.8 percent in 2019 and the Both population decreased by 3.2 percentage points from 11.3 percent in 2010 to 8.2 percent in 2019.

The 2010 to 2014 period encompasses the end of the Great Recession and a period of slow recovery. This coincides with the implementation of the Affordable Care Act (ACA) in 2014 which led to increased health insurance rates. The difficulties people faced during this time were more likely to be captured by the MDI as shown by the large gaps between the top two rates and the OPM only rate in Figure 4. Part of the decrease in these gaps occurred in 2014 and beyond after the slow recovery period and at the beginning of the implementation of the ACA.



Figure 4: Distinct Poverty-Deprivation Rates Over Time



Source: U.S. Census Bureau, 2010 through 2019 American Community Surveys 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see . [Code Lists, Definitions, and Accuracy \(census.gov\)](#).

## II. Demographics

In this section, the four poverty-deprivation rates are shown by different demographic groups. In Table 1, each poverty-deprivation rate is shown by selected demographic groups. The first breakdown is by race and Hispanic origin.<sup>15</sup> Hispanics were most likely to be MDI only deprived, Blacks were most likely to be OPM deprived, American Indian and Alaska Natives were most likely to be deprived in both, and Whites were most likely to be deprived in neither. Furthermore, Hispanics were four times as likely to be deprived in MDI only (16.1 percent) than in OPM only (3.9 percent), while Whites and other races were the only groups less likely to be deprived in MDI only than in OPM only.

People under age 18 were more likely than the other age groups to be OPM only deprived and less likely than the other age groups to be MDI only deprived. People age 18 and over were more likely to be MDI only deprived than OPM only deprived, while people under age 18 were less likely to be MDI only deprived than OPM only deprived.

The MDI does a better job than the poverty measure at capturing the hardships faced by the foreign-born. Noncitizens were 4 times as likely to be MDI only deprived as native citizens and more than twice as likely to be MDI only deprived as naturalized citizens. Conversely, native citizens were more likely than the other two groups to be OPM only deprived.

Male-headed households were most likely to be MDI only deprived, while female-headed households were most likely to be OPM only deprived and deprived in both measures. Unrelated individuals were nearly twice as likely to be OPM only deprived as they were to be MDI only deprived.

<sup>15</sup> Each race group is non-Hispanic for the purposes of this paper.

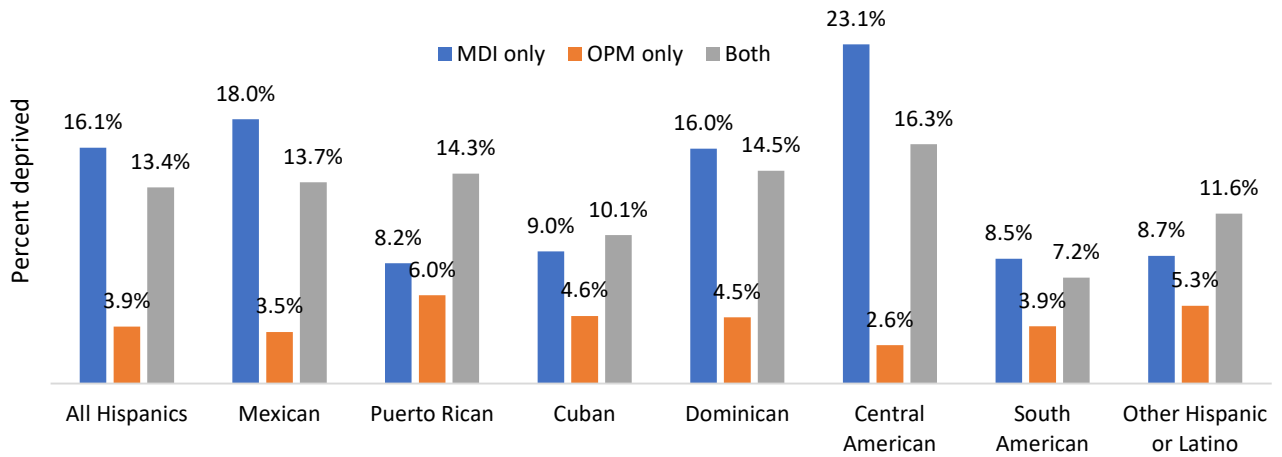
Renters were most likely to be deprived in MDI only, OPM only, and both measures, while homeowners with a mortgage were most likely to not be deprived according to either measure.

Table 1: Poverty-Deprivation Rates by Demographic Groups: 2019								
	MDI only		OPM only		Both		Neither	
	Estimate	Std. error	Estimate	Std. error	Estimate	Std. error	Estimate	Std. error
Overall	6.79	0.03	4.18	0.02	8.16	0.03	80.88	0.07
White, NH	3.64	0.03	3.72	0.02	5.30	0.03	87.34	0.07
Black, NH	8.21	0.09	6.64	0.07	14.59	0.11	70.57	0.14
Asian, NH	6.83	0.10	3.48	0.06	6.10	0.10	83.53	0.14
American Indian, Alaska Native, NH	12.26	0.31	6.02	0.24	18.10	0.43	63.62	0.52
Other races, NH	5.42	0.13	6.14	0.14	8.92	0.17	79.52	0.24
Hispanic	16.07	0.10	3.87	0.05	13.35	0.10	66.71	0.15
Under age 18	5.55	0.06	6.25	0.06	10.51	0.09	77.69	0.13
Between age 18 and 64	7.12	0.04	4.13	0.02	7.37	0.03	81.38	0.06
Age 65 and over	7.22	0.05	1.53	0.02	7.92	0.04	83.33	0.07
Native citizen	5.28	0.03	4.39	0.02	7.73	0.03	82.60	0.07
Naturalized citizen	9.60	0.10	2.57	0.04	7.11	0.08	80.72	0.12
Non-citizen	23.21	0.14	3.10	0.07	14.88	0.15	58.80	0.19
Married-couple household	6.32	0.04	1.42	0.02	3.79	0.03	88.47	0.07
Male-headed household	11.57	0.16	5.06	0.08	10.85	0.13	72.52	0.19
Female-headed household	9.08	0.08	9.28	0.07	16.62	0.12	65.02	0.14
Unrelated individuals	4.38	0.04	8.23	0.05	13.30	0.07	74.10	0.08
Homeowner with a mortgage	4.09	0.03	1.94	0.02	2.68	0.03	91.30	0.07
Homeowner without a mortgage	7.02	0.06	3.08	0.03	6.89	0.06	83.02	0.06
Renter	10.26	0.07	7.75	0.05	15.89	0.07	66.11	0.10

Note: NH = non-Hispanic.  
Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

In Figure 5, the diverse Hispanic group is divided into six distinct groups: Mexican (62%), Puerto Rican (10%), Cuban (4%), Dominican (3%), Central American (9%), South American (7%) and other Hispanic (6%). Hispanics with Mexican, Dominican, Central American, or South American backgrounds are consistent with the overall pattern for all Hispanics (Hispanics were more likely to be deprived in MDI only than in OPM only or in both measures). However, Hispanics are not homogeneous. Puerto Ricans, Cubans, and other Hispanics were more likely to be deprived in both measures than in the MDI only.

Figure 5: Poverty-Deprivation Rates by Detailed Hispanic Origin: 2019

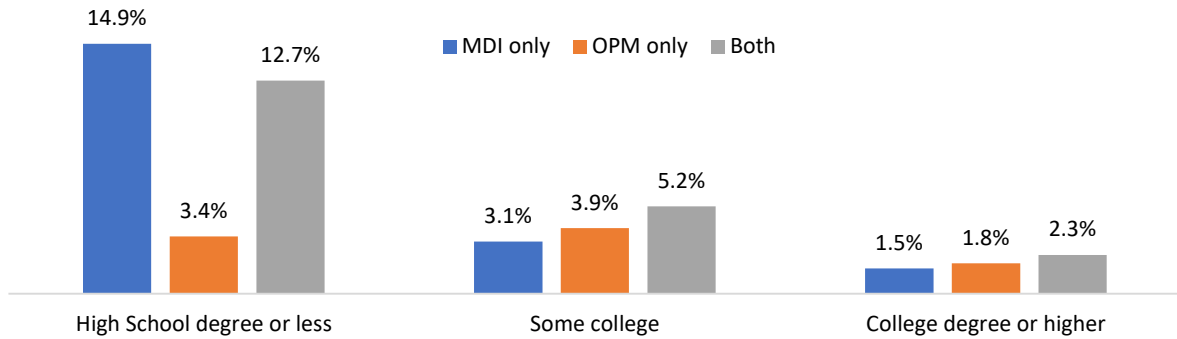


Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

### III. Education and labor market characteristics

In this section of the paper, the deprivations captured by different educational and labor market characteristics are examined. An important caveat to this area is that education and labor market characteristics are included in the definition of several dimensions of the MDI. In figure 6, the poverty-deprivation rates are shown based on whether people aged 25 and over received a high school degree or less, some college education, or a college degree or higher. People with a high school degree or less were most likely to be MDI only deprived than deprived in OPM only or deprived in both measures, while people with at least some college education were more likely to be deprived in both measures than in MDI only or in OPM only. Therefore, the MDI is more likely than the OPM to capture the lower end of the educational attainment distribution.

**Figure 6: Poverty-Deprivation Rates by Educational Attainment: 2019**

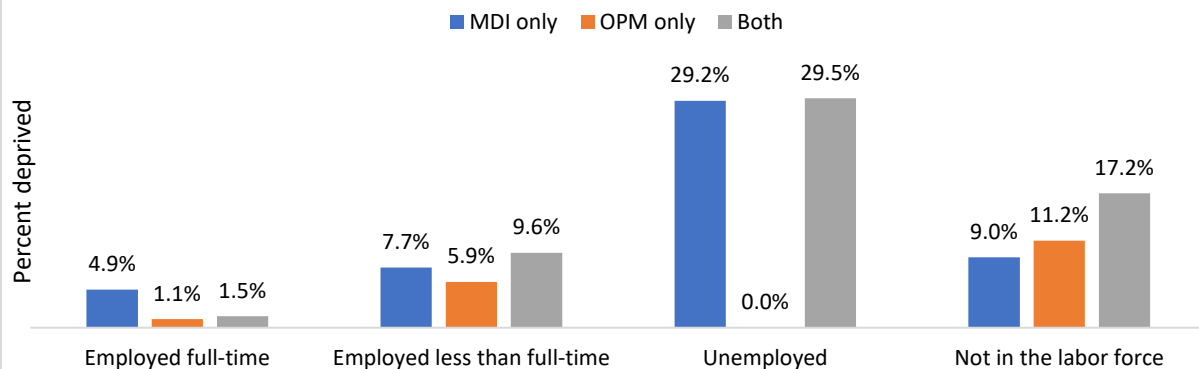


Note: Universe restricted to people age 25 and over.

Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

In Figure 7, poverty-deprivation rates are displayed based on whether people between the ages of 18 and 64 are employed full-time (defined as working at least 50 weeks and at least 35 hours in the average week during the past year), employed less than full-time, unemployed (at the time of the survey), and not in the labor force (at the time of the survey). Unemployed at the time of the survey is part of the economic security dimension of the MDI; therefore, no people in the OPM only group were unemployed by definition. However, it is interesting that about half of the unemployed that were MDI deprived (MDI only plus both) were deprived in multiple deprivations, but not in poverty (MDI only). The employed were also more likely to be MDI only deprived than OPM only deprived, while those not in the labor force were more likely to be OPM only deprived than MDI only deprived.

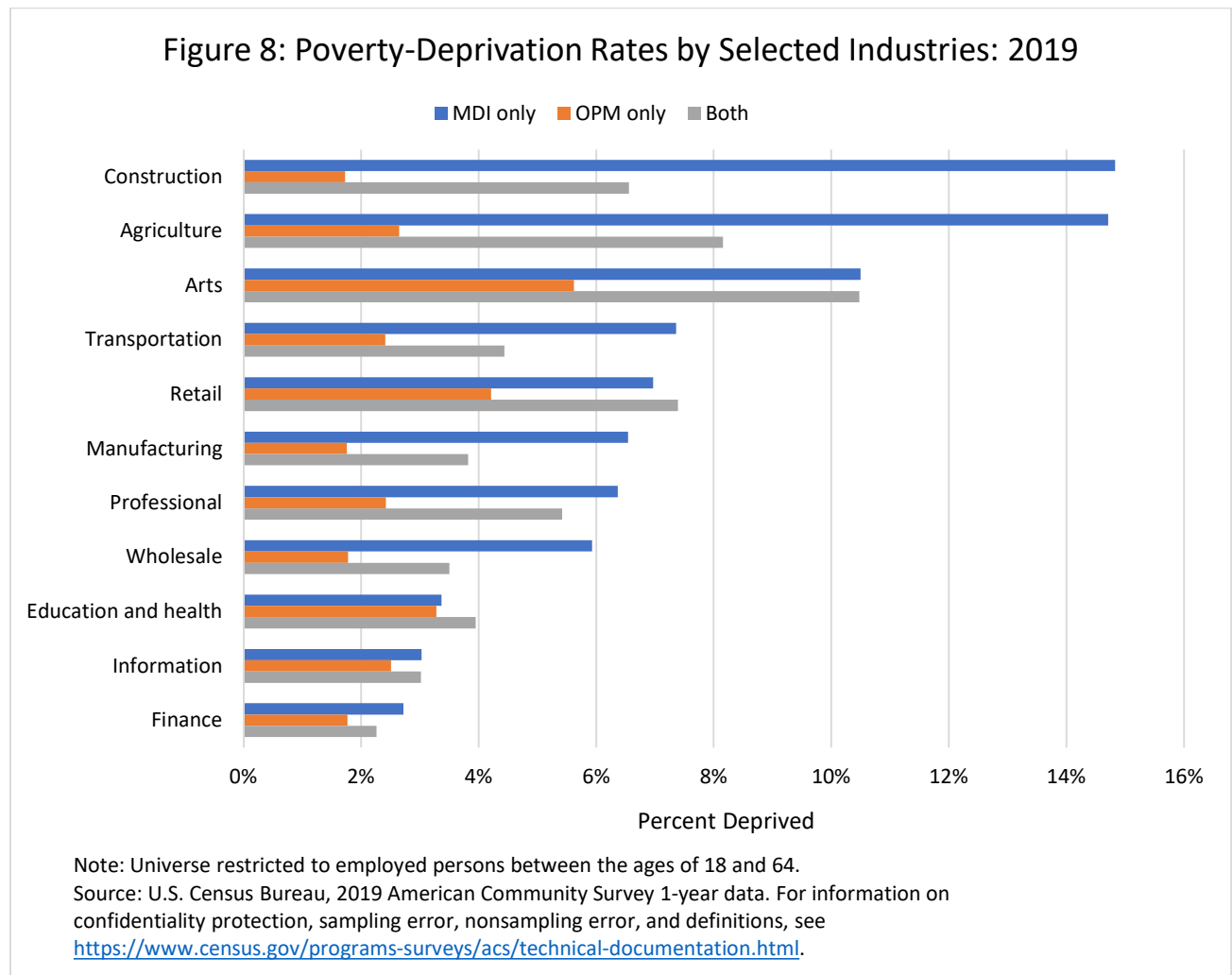
**Figure 7: Poverty-Deprivation Rates by Employment Status: 2019**



Note: Universe restricted to between the ages of 18 and 64.

Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

In Figure 8, the percent of each poverty-deprivation groups is shown for employed persons between the ages of 18 and 64 working in selected industries. People working in each industry were more likely to be MDI only deprived than OPM only deprived. Furthermore, people in all industries except for Arts and Information were more likely to be MDI only deprived than deprived in both measures. In the extreme, people in the agriculture and construction industries were more than five times as likely to be MDI only deprived than to be OPM only deprived.



#### IV. Geography

In Figure 9, MDI only rates are shown by region and state for 2019. The U.S. overall rate (vertical blue line) is shown for comparison. People living in the Northeast and Midwest were less likely than average to be MDI only deprived while people living in the South and West were more likely than average to be MDI only deprived.

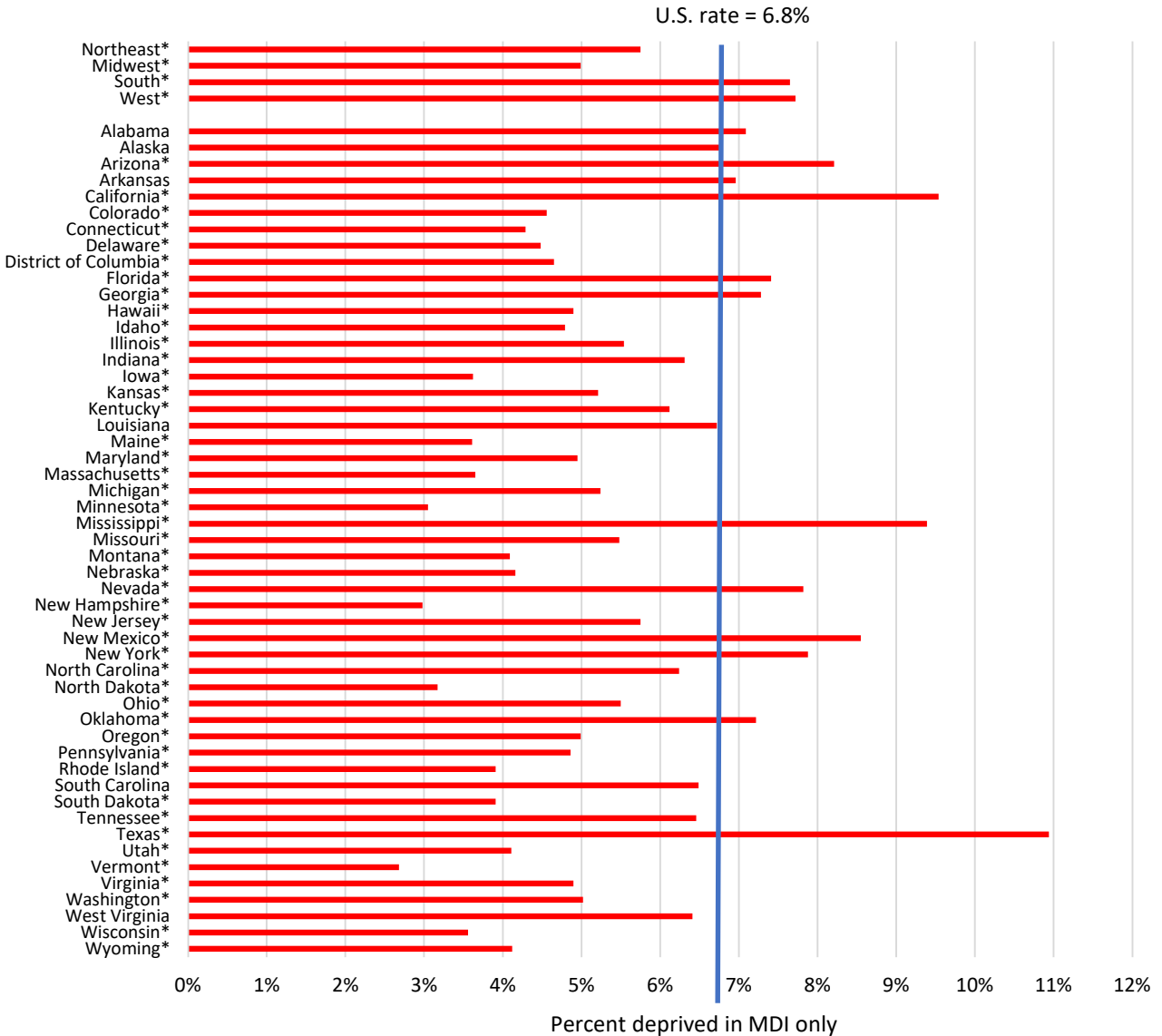
People were more likely than average to be MDI only deprived in 10 states and less likely to be MDI only deprived in 34 states and the District of Columbia. In 6 states, the difference between the state MDI only rate and the U.S. MDI only rate was not statistically significant.<sup>16</sup> Similarly, people in 18 states were more likely than average to be deprived in both measures and people in 28 states were less likely than average to be deprived in both measures. Conversely, people were more likely than average to be OPM only deprived in 21 states and the District of Columbia and less likely than average to be OPM only deprived in 10 states (see Appendix Tables A.1).

It is notable that the two of the three states with the highest MDI only rates, California and Texas, also have large Hispanic populations. For this reason, Figure 9 is re-created in the Appendix for non-Hispanics (see Figure A.1). Mississippi still has a high MDI only rate, but California and Texas were no longer among the states with the highest MDI only rates. For non-Hispanics, the MDI only rate was higher than the U.S. rate in 19 states and lower than the MDI only rate in 27 states and the District of Columbia.

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<sup>16</sup> See Appendix Table A.1 for all poverty-deprivation rates by state.

Figure 9: MDI Only Deprivation Rates by State and Region: 2019



Note: \* denotes state or regional estimate is significantly different from the U.S. MDI only rate at the 90 percent confidence level.

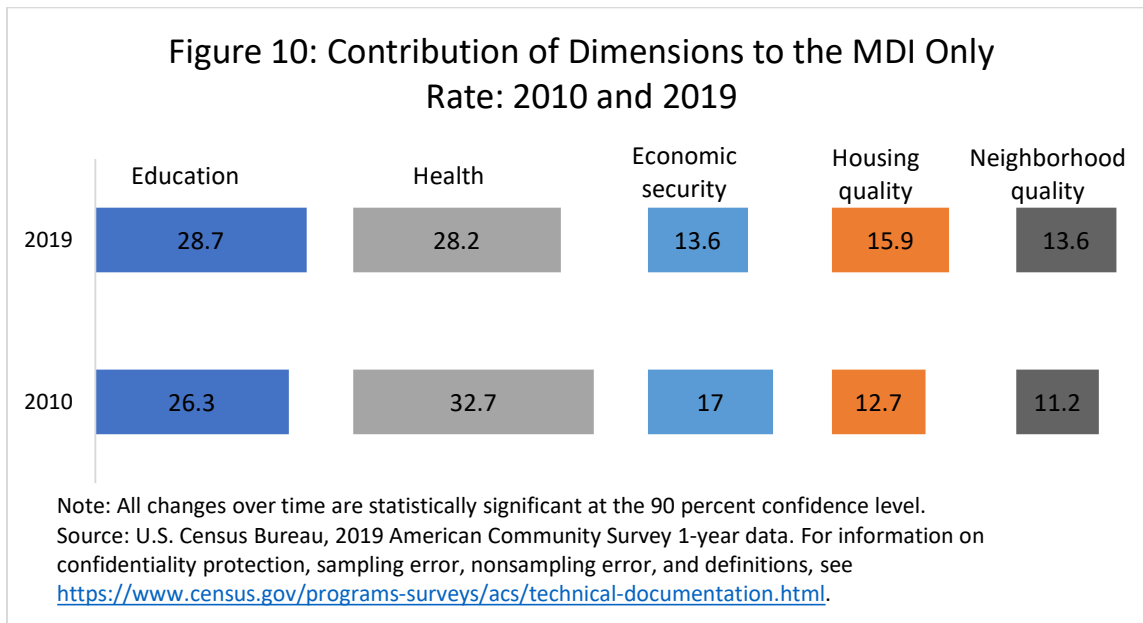
Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

## V. Decompositions of MDI only rate

One of the advantages of the multidimensional measures is that they can be decomposed into the contributions that individual dimensions make to the overall rate. The MDI only rate is a headcount ratio: the count of people who are MDI only deprived divided by the total population. In order to perform a decomposition, the MDI only rate must be converted to an adjusted headcount ratio. In 2019, the adjusted headcount ratio (2.9 percent) is defined as the headcount ratio (6.8 percent)

multiplied by the intensity of deprivation (0.4). The intensity measure is derived by first calculating the average number of deprivations for people who were multi-dimensionally deprived according to the MDI only (2.1). This number is then divided by the total possible number of deprivations, which was five in this case.<sup>17</sup> These decompositions allow us to understand the impact that each dimension had on the overall MDI only rate.

Dimension decomposition provides the contributions that each dimension made to the MDI only rate. In order to decompose the MDI only rate by its dimensions, the proportion of people who are both deprived in the dimension and multidimensionally deprived was calculated. Then, this value was divided by the number of dimensions, five, and then by the overall adjusted headcount ratio. As shown in Figure 10, in both years, 2010 and 2019, education and health were the largest contributors to the MDI only rate. However, education, housing quality, and neighborhood quality became larger contributors from 2010 to 2019 while health and economic security became smaller contributors.



In Table 1, significant differences in MDI only deprivation rates were shown by different demographic groups. In Table 2 below, these differences are explored by looking at how individual dimensions contributed to the MDI only rate. Education was a large contributor for all three age groups. Health was a large contributor for those age 18 to 64 (indicating lack of health insurance coverage) and those age 65 and over (indicating presence of multiple disabilities) while housing quality was a large contributor for those under age 18. More specifically, health was over twice as large a contributor to the MDI only rate for people over age 18 as for people under age 18, and housing quality was nearly twice as large a contributor for people age 18 to 64 and over five times as large a contributor for people under age 18 as it was for people age 65 and over.

<sup>17</sup> Five dimensions are used because no one is deprived in standard of living for the MDI only population.



By race and Hispanic origin, health was the largest contributor to the MDI only rate for Whites, American Indians and Alaska Natives, and the other race category. For Blacks, health and neighborhood quality were the largest contributors to the MDI only rate, while for Asians and Hispanics, education was the largest contributor to the MDI only rate. The largest differences were in the neighborhood quality dimension, 8.1 for Asians compared to 25.9 for Blacks, and education, 19.4 for American Indian and Alaska Natives compared to 32.6 for Hispanics.

For nativity, health was the largest contributor for native citizens, while education was the largest contributor for naturalized citizens and non-citizens. One of the largest differences for these groups was for neighborhood quality. Neighborhood quality accounted for 16.1 percent of the MDI only rate for native citizens and less than ten percent of the MDI only rate for naturalized citizens and non-citizens.

	Education		Health		Economic Security		Housing quality		Neighborhood quality	
	Est.	Std Err.	Est.	Std Err.	Est.	Std Err.	Est.	Std Err.	Est.	Std Err.
Overall	28.74	0.23	28.20	0.23	13.57	0.11	15.86	0.17	13.63	0.13
Under Age 18	30.92	0.57	14.66	0.31	10.88	0.24	29.10	0.54	14.43	0.31
Age 18 to 64	26.73	0.22	30.80	0.26	13.71	0.12	14.98	0.16	13.78	0.14
Age 65 and over	33.47	0.33	32.93	0.32	15.80	0.20	5.50	0.13	12.30	0.17
White, NH	27.42	0.32	34.14	0.35	15.77	0.20	10.60	0.22	12.06	0.17
Black, NH	21.29	0.38	25.80	0.43	14.53	0.35	12.47	0.42	25.91	0.51
Asian, NH	27.95	0.67	22.23	0.54	21.67	0.60	20.95	0.69	8.13	0.31
AIAN, NH	19.39	0.87	29.99	1.23	14.60	0.77	15.80	0.95	20.23	1.03
Other race, NH	22.43	0.94	25.40	1.00	17.12	0.82	20.94	1.05	14.10	0.76
Hispanic	32.58	0.33	25.98	0.27	10.65	0.15	19.43	0.24	11.37	0.18
Native	26.95	0.26	27.67	0.24	14.07	0.14	15.26	0.22	16.05	0.17
Naturalized	32.29	0.50	25.38	0.44	16.46	0.28	16.00	0.35	9.88	0.23
Non-citizen	31.87	0.31	30.73	0.31	11.10	0.16	17.34	0.25	8.96	0.15
Married-couple household	29.48	0.32	26.73	0.30	14.29	0.18	18.49	0.27	11.01	0.16
Male-headed household	29.76	0.64	28.64	0.59	12.28	0.33	16.32	0.49	13.00	0.42
Female-headed household	26.96	0.40	27.07	0.35	14.14	0.25	14.75	0.33	17.07	0.34
Unrelated individuals	27.61	0.36	37.41	0.47	10.33	0.19	4.07	0.18	20.58	0.32
Homeowner with mortgages	30.56	0.38	30.32	0.38	16.86	0.27	13.84	0.30	8.42	0.18
Homeowner without mortgages	30.92	0.41	31.24	0.39	12.94	0.21	10.35	0.29	14.54	0.25
Renters	26.99	0.30	25.92	0.27	12.23	0.15	19.06	0.25	15.80	0.20

Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

By household type, education and health were the largest contributors to the MDI only rate for each type of household. However, health contributed 26.7 percent to the MDI only rate for married-couple households and 37.4 percent to the MDI only rate for unrelated individuals. There were also large differences in housing quality. Housing quality contributed 4.1 percent to the MDI only rate for unrelated individuals and contributed at least 14.0 percent to the MDI only rate for the other three household types.

Education and health were larger contributors to the MDI only rates for all homeowners than for renters, economic security was a larger contributor for homeowners with mortgages than for the other two groups, housing quality was a larger contributor for renter than for the other two groups, and neighborhood quality was a larger contributor for renters and for homeowners without a mortgage than for homeowner with a mortgage.

## **Discussion**

The purpose of this paper was to explore the value-added of a multidimensional deprivation measure as compared to a traditional income deprivation measure. In theory, the value-added would come from the determination that people who faced hardships and deprivations were not being captured by a traditional income measure. In practice, this group of people are considered deprived according to the MDI but are not income poor according to the OPM. There is an important caveat. The group of people who are income poor, but do not face any other deprivations, are people who may face real hardship, but are not captured by the MDI. However, the point of the MDI is that it is identifying people who face the compounding effect of deprivation in multiple areas.

This paper separates people into one of four groups: MDI deprived but not income poor, income poor but not MDI deprived, both income poor and MDI deprived, and neither income poor nor MDI deprived. The main focus is identifying people in the MDI deprived but not income poor group. The identification of the people in this group is the true value-added of a multidimensional measure.

The MDI only group is not trivial: in 2019 it consisted of 6.8 percent of the U.S. population or approximately 21.7 million people. This group made up about 45.4 percent of the entire MDI population (the other 55.6 percent is people who are income poor AND deprived according to the MDI). As show in Figure 9, Table A.1 and Figure A.1, a plurality of states had MDI only rates higher than the U.S. rate while a plurality of states OPM only rates lower than the U.S. rate. The rates changed but the overall pattern remains the same when restricting the universe to non-Hispanics.

The demographic and labor market characteristics differed for the MDI only group as compared to the other poverty-deprivation groups. Hispanics were most likely to be MDI only deprived, 16.1 percent, while Whites were least likely to be MDI only deprived, 3.6 percent. Noncitizens were more than four times as likely to be MDI only deprived and twice as likely to be deprived in both measures as native citizens.

By age group, people under 18 were least likely to be MDI only deprived and most likely to be OPM only deprived. People living in male-headed households were most likely to be MDI only deprived, while people living in female-led households were most likely to be OPM only deprived and to be deprived in both measures.

There were large differences for educational attainment for people 25 years of age and over. People with a high school degree or less were more likely to be MDI only deprived than OPM only deprived while the reverse was true for people with some college education and for people with at least a college degree.

For people between the ages of 18 and 64, approximately half of the unemployed who were also deprived according to the MDI were not also income poor (MDI only). The MDI is identifying a different working-age population than the OPM population. Specifically, OPM poverty is more strongly associated with being out of the labor force, while the MDI is more associated with the deprivations faced by the employed.

Finally, the contribution that each dimension made to the MDI only rate varied significantly among demographic groups. By racial and Hispanic origin, for example, the education dimension ranged from 19.4 percent to 32.6 percent, the health dimension ranged from 22.2 percent to 34.1 percent, the economic security dimension ranged from 10.6 percent to 21.7 percent, the housing quality dimension ranged from 10.6 percent to 20.9 percent, and the neighborhood quality dimension ranged from 8.1 percent to 25.9 percent.

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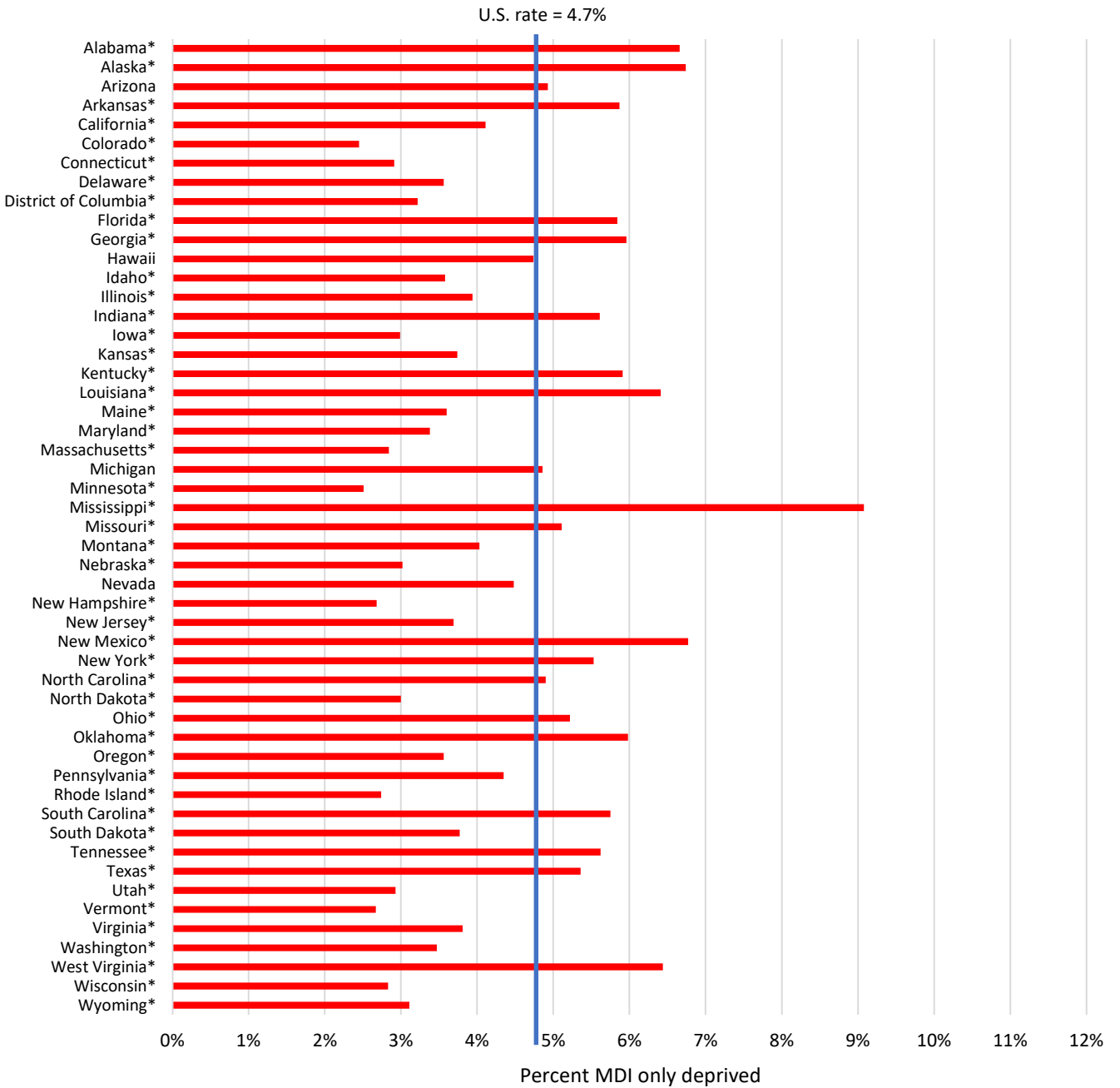
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## Appendix

	<b>MDI only</b>	<b>Std. Err.</b>	<b>OPM only</b>	<b>Std. Err.</b>	<b>Both</b>	<b>Std. Err.</b>	<b>Neither</b>	<b>Std. Err.</b>
<b>United States</b>	<b>6.79</b>	<b>0.03</b>	<b>4.18</b>	<b>0.02</b>	<b>8.16</b>	<b>0.03</b>	<b>80.88</b>	<b>0.07</b>
Alabama	7.09	0.20	5.33	0.21	10.13	0.25	77.45	0.34
Alaska	6.79	0.50	4.05	0.41	6.02	0.48	83.13	0.80
Arizona	8.21	0.20	4.25	0.14	9.21	0.27	78.32	0.29
Arkansas	6.96	0.24	6.03	0.23	10.18	0.30	76.83	0.39
California	9.54	0.09	3.61	0.05	8.14	0.10	78.70	0.12
Colorado	4.56	0.17	4.38	0.16	4.97	0.17	86.10	0.29
Connecticut	4.29	0.20	3.84	0.16	6.19	0.19	85.68	0.28
Delaware	4.48	0.43	4.13	0.35	7.13	0.57	84.26	0.72
D.C.	4.65	0.52	6.01	0.49	7.44	0.59	81.90	0.81
Florida	7.41	0.11	4.13	0.08	8.53	0.13	79.93	0.17
Georgia	7.28	0.16	4.14	0.13	9.16	0.18	79.42	0.25
Hawaii	4.90	0.32	3.66	0.29	5.68	0.40	85.77	0.48
Idaho	4.79	0.29	4.34	0.23	6.83	0.41	84.04	0.48
Illinois	5.54	0.12	4.12	0.10	7.36	0.15	82.98	0.22
Indiana	6.31	0.16	4.28	0.13	7.62	0.17	81.79	0.29
Iowa	3.62	0.19	5.21	0.18	5.95	0.23	85.21	0.37
Kansas	5.21	0.21	4.08	0.17	7.35	0.29	83.35	0.37
Kentucky	6.12	0.19	5.69	0.19	10.57	0.28	77.62	0.33
Louisiana	6.72	0.17	6.53	0.22	12.47	0.31	74.28	0.37
Maine	3.61	0.22	4.84	0.25	6.03	0.31	85.52	0.45
Maryland	4.95	0.19	3.58	0.14	5.45	0.17	86.02	0.29
Massachusetts	3.65	0.13	4.21	0.15	5.19	0.12	86.95	0.21
Michigan	5.24	0.11	4.34	0.10	8.64	0.15	81.78	0.19
Minnesota	3.05	0.10	3.87	0.11	5.09	0.19	87.98	0.24
Mississippi	9.39	0.29	5.44	0.26	14.17	0.43	71.01	0.57
Missouri	5.48	0.14	4.48	0.15	8.45	0.18	81.59	0.27
Montana	4.09	0.29	5.98	0.36	6.67	0.29	83.26	0.57
Nebraska	4.16	0.22	4.16	0.18	5.74	0.25	85.94	0.35
Nevada	7.82	0.28	4.03	0.20	8.47	0.30	79.69	0.47
New Hampshire	2.98	0.21	3.23	0.26	4.04	0.25	89.75	0.39
New Jersey	5.75	0.14	3.00	0.12	6.16	0.15	85.09	0.22
New Mexico	8.55	0.33	4.92	0.25	13.25	0.43	73.27	0.52
New York	7.88	0.13	3.74	0.07	9.29	0.13	79.09	0.19
North Carolina	6.24	0.12	4.75	0.13	8.84	0.18	80.17	0.23
North Dakota	3.17	0.28	4.20	0.31	6.37	0.46	86.26	0.60
Ohio	5.50	0.13	4.44	0.11	8.63	0.14	81.44	0.21
Oklahoma	7.22	0.19	4.86	0.16	10.31	0.22	77.61	0.29
Oregon	4.99	0.20	4.64	0.17	6.74	0.22	83.63	0.31
Pennsylvania	4.86	0.11	4.49	0.11	7.54	0.14	83.12	0.20
Rhode Island	3.91	0.35	4.54	0.37	6.28	0.51	85.27	0.59
South Carolina	6.49	0.19	4.78	0.16	9.06	0.27	79.66	0.37
South Dakota	3.91	0.28	3.77	0.28	8.16	0.51	84.16	0.57
Tennessee	6.46	0.18	4.72	0.14	9.14	0.19	79.68	0.28
Texas	10.94	0.12	3.38	0.07	10.25	0.13	75.43	0.21
Utah	4.11	0.20	3.72	0.22	5.19	0.21	86.98	0.30
Vermont	2.68	0.31	5.06	0.37	5.10	0.33	87.15	0.54
Virginia	4.90	0.11	4.11	0.12	5.83	0.15	85.16	0.22
Washington	5.02	0.18	3.99	0.12	5.78	0.18	85.20	0.27
West Virginia	6.41	0.29	6.40	0.31	9.63	0.41	77.57	0.62
Wisconsin	3.56	0.12	4.50	0.15	5.92	0.14	86.01	0.21
Wyoming	4.12	0.45	5.11	0.44	5.00	0.44	85.77	0.73
Higher than U.S.	10		22		18		32	
Lower than U.S.	35		10		28		18	

Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.

Figure A.1: MDI Only Deprived Rates by State for Non-Hispanics: 2019



Note: \* denotes state or regional estimate is significantly different from the U.S. MDI only rate at the 90 percent confidence level.

Source: U.S. Census Bureau, 2019 American Community Survey 1-year data. For information on confidentiality protection, sampling error, nonsampling error, and definitions, see <https://www.census.gov/programs-surveys/acs/technical-documentation.html>.