

SVI 2016 Documentation - 1/24/2018

Please see data dictionary as well as SVI 2016-2014 crosswalk below.

Introduction

What is Social Vulnerability?

Every community must prepare for and respond to hazardous events, whether a natural disaster like a tornado or a disease outbreak, or an anthropogenic event such as a harmful chemical spill. The degree to which a community exhibits certain social conditions, including high poverty, low percentage of vehicle access, or crowded households, may affect that community's ability to prevent human suffering and financial loss in the event of disaster. These factors describe a community's social vulnerability.

What is the Social Vulnerability Index?

ATSDR's Geospatial Research, Analysis & Services Program (GRASP) created the Social Vulnerability Index (SVI) to help public health officials and emergency response planners identify and map the communities that will most likely need support before, during, and after a hazardous event.

CDC's SVI indicates the relative vulnerability of every U.S. Census tract. Census tracts are subdivisions of counties for which the Census collects statistical data. The SVI ranks the tracts on 15 social factors, including unemployment, minority status, and disability, and further groups them into four related themes. Thus each tract receives a ranking for each Census variable and for each of the four themes, as well as an overall ranking. In addition to tract-level rankings, SVI 2010, 2014, and 2016 also have corresponding rankings at the county level. Notes below that describe "tract" methods also refer to county methods.

How can the SVI help communities be better prepared for hazardous events?

The SVI provides specific socially and spatially relevant information to help public health officials and local planners better prepare communities to respond to emergency events such as severe weather, floods, disease outbreaks, or chemical exposure.

The SVI can be used to:

- Allocate emergency preparedness funding by community need.
- Estimate the amount and type of needed supplies like food, water, medicine, and bedding.
- Decide how many emergency personnel are required to assist people.
- Identify areas in need of emergency shelters.
- Create a plan to evacuate people, accounting for those who have special needs, such as those without vehicles, the elderly, or people who do not understand English well.
- Identify communities that will need continued support to recover following an emergency or natural disaster.

Important Notes on the SVI Database

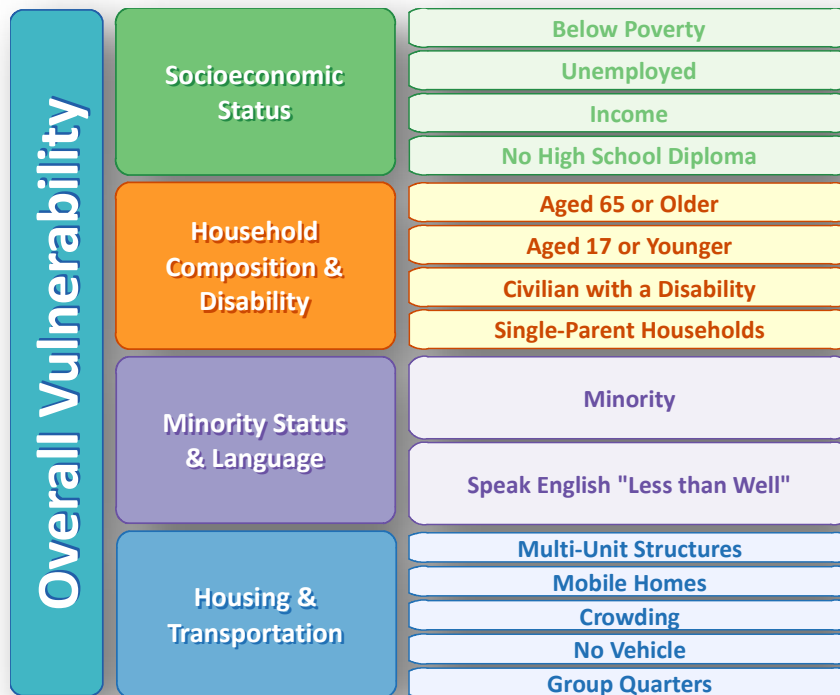
- SVI 2014 and 2016 are available for download in shapefile format from <https://svi.cdc.gov/SVIDataToolsDownload.html>. SVI 2014 and 2016 are also available via ArcGIS Online. Search on "CDC's Social Vulnerability Index."
- For SVI 2000 and 2010, keep the data in geodatabase format when downloading from <https://svi.cdc.gov/SVIDataToolsDownload.html>. Converting to shapefile changes the field names.
- A SVI 2016 to 2014 "crosswalk" is included in this documentation. See [SVI 2014 documentation \(https://svi.cdc.gov/Documents/Data/2014_SVI_Data/SVI2014Documentation.pdf\)](https://svi.cdc.gov/Documents/Data/2014_SVI_Data/SVI2014Documentation.pdf) for SVI 2014 to 2010 crosswalk.

- For US-wide or multi-state mapping and analysis, use the US database, in which all tracts are ranked against one another. For individual state mapping and analysis, use the state-specific database, in which tracts are ranked only against other tracts in the specified state.
- Starting with SVI 2014, we've added a stand-alone, state-specific Commonwealth of Puerto Rico database. Puerto Rico is not included in the US-wide ranking.
- Starting with SVI 2014, we've added a database of [Tribal Census Tracts](http://factfinder.census.gov/help/en/tribal_census_tract.htm) (http://factfinder.census.gov/help/en/tribal_census_tract.htm). Tribal tracts are defined independently of, and in addition to, standard county-based tracts. The tribal tract database contains only estimates, percentages, and their respective MOEs, along with the adjunct variables described in the data dictionary below. Because of geographic separation and cultural diversity, tribal tracts are not ranked against each other nor against standard census tracts.
- Tracts with zero estimates for total population (N = 417 for the U.S.) were removed during the ranking process. These tracts were added back to the SVI databases after ranking. The TOTPOP field value is 0, but the percentile ranking fields (RPL_THEME1, RPL_THEME2, RPL_THEME3, RPL_THEME4, and RPL_THEMES) were set to -999.
- For tracts with > 0 TOTPOP, a value of -999 in any field either means the value was unavailable from the original census data or we could not calculate a derived value because of unavailable census data.
- Any cells with a -999 were not used for further calculations. For example, total flags do not include fields with a -999 value.
- ArcGIS preserves leading 0s in the FIPS code fields of csv files. To preserve leading 0s in Excel, follow these steps:
 - Open a blank worksheet in Excel.
 - Click the DATA tab and choose to open a file from Text
 - Navigate to the csv file and choose to Import
 - In the Text Import Wizard, choose the Delimited data type, then Next
 - Choose the Comma delimiter, then Next
 - One by one, select fields based on FIPS codes (TRACTCE, ST, STCNTY, FIPS), set the Column data format to Text, then click Finish to open the csv with leading 0s preserved.
- See the **Methods** section below for further details.
- Questions? Please visit the SVI web site at <http://svi.cdc.gov> for additional information or email the SVI Coordinator at svi_coordinator@cdc.gov.

Methods

Variables Used

American Community Survey (ACS), 2012-2016 (5-year) data for the following estimates:



For SVI 2016, we included two adjunct variables, 1) 2012-2016 ACS estimates for persons without health insurance, and 2) an estimate of daytime population derived from LandScan 2016 estimates. These adjunct variables are excluded from the SVI rankings.

Raw data estimates and percentages for each variable, for each tract, are included in the database. In addition, the margins of error (MOEs) for each estimate, at the Census Bureau standard of 90%, are also included. Confidence intervals can be calculated by subtracting the MOE from the estimate (lower limit) and adding the MOE to the estimate (upper limit). Because of relatively small sample sizes, some of the MOEs are high. It's important to identify the amount of error acceptable in any analysis.

Rankings

We ranked Census tracts within each state and the District of Columbia, to enable mapping and analysis of relative vulnerability in individual states. We also ranked tracts for the entire United States against one another, for mapping and analysis of relative vulnerability in multiple states, or across the U.S. as a whole. Tract rankings are based on percentiles. Percentile ranking values range from 0 to 1, with higher values indicating greater vulnerability.

For each tract, we generated its percentile rank among all tracts for 1) the fifteen individual variables, 2) the four themes, and 3) its overall position.

Theme rankings: For each of the four themes, we summed the percentiles for the variables comprising each theme. We ordered the summed percentiles for each theme to determine theme-specific percentile rankings.

The four summary theme ranking variables, detailed in the Data Dictionary below, are:

- Socioeconomic theme - RPL_THEME1
- Household Composition and Disability - RPL_THEME2
- Minority Status & Language - RPL_THEME3
- Housing & Transportation - RPL_THEME4

Overall tract rankings: We summed the sums for each theme, ordered the tracts, and then calculated overall percentile rankings. Please note; taking the sum of the sums for each theme is the same as summing individual variable rankings. **The overall tract summary ranking variable is RPL_THEMES.**

Flags

Tracts in the top 10%, i.e., at the 90th percentile of values, are given a value of 1 to indicate high vulnerability. Tracts below the 90th percentile are given a value of 0.

For a theme, the flag value is the number of flags for variables comprising the theme. We calculated the overall flag value for each tract as the number of all variable flags.

For a detailed description of SVI variable selection rationale and methods, see [A Social Vulnerability Index for Disaster Management](#)

(<http://gis.cdc.gov/grasp/svi/A%20Social%20Vulnerability%20Index%20for%20Disaster%20Management.pdf>).

SVI 2016 Data Dictionary – American Community Survey field names that changed between 2014 and 2016 are noted in *RED*

| |
|----------------------------------|
| Theme Colors |
| Socioeconomic |
| Household Composition/Disability |
| Minority Status/Language |
| Housing/Transportation |

Variables beginning with “E_” are estimates. Variables beginning with “M_” are margins of error for those estimates. Values of -999 represent “null” or “no data.”

The four summary theme ranking variables, detailed in the Data Dictionary below, are:

- Socioeconomic theme - RPL_THEME1
- Household Composition and Disability - RPL_THEME2
- Minority Status & Language - RPL_THEME3
- Housing & Transportation - RPL_THEME4

The overall tract summary ranking variable is RPL_THEMES.

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|---|-------------------------|--|---|
| ST | State-level FIPS code | S0601 | FIPS | In Excel, from Tract-level FIPS code, LEFT (FIPS, 2) | |
| STATE | State name | S0601 | GEO.display-label | In Excel, use DATA Text to Columns to extract state name | |
| ST_ABBR | State abbreviation | N/A | N/A | Joined from Esri state boundary shapefile | |
| STCNTY | County-level FIPS code | S0601 | FIPS | In Excel, from Tract-level FIPS code, LEFT (FIPS, 5) | In the county-level SVI database, the 5-digit STCNTY field is the FIPS field, used for joins. |
| COUNTY | County name | S0601 | GEO.display-label | In Excel, use DATA Text to Columns to extract county name | |
| FIPS | Tract-level FIPS code | S0601 | GEO.id | In Excel, RIGHT (GEO.id, 11) | |
| LOCATION | Text description of tract, county, state | S0601 | GEO.display-label | | |
| AREA_SQMI | Tract area in square miles | Census Cartographic Boundary File - U.S. Tracts 2016 500K | ALAND * 3.86102e-7 | Conversion from square meters to square miles | |
| E_TOTPOP | Population estimate, 2012-2016 ACS | S0601 | HC01_EST_VC01 | | |
| M_TOTPOP | Population estimate MOE, 2012-2016 ACS | S0601 | HC01_MOE_VC01 | | |
| E_HU | Housing units estimate, 2012-2016 ACS | DP04 | HC01_VC03 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|-------------------------|-------------------------|--|
| M_HU | Housing units estimate MOE, 2012-2016 ACS | DP04 | HC02_VC03 | | |
| E_HH | Households estimate, 2012-2016 ACS | DP02 | HC01_VC03 | | |
| M_HH | Households estimate MOE, 2012-2016 ACS | DP02 | HC02_VC03 | | |
| E_POV | Persons below poverty estimate, 2012-2016 ACS | B17001 | HD01_VD02 | | |
| M_POV | Persons below poverty estimate MOE, 2012-2016 ACS | B17001 | HD02_VD02 | | |
| E_UNEMP | Civilian (age 16+) unemployed estimate, 2012-2016 ACS | DP03 | HC01_VC07 | | |
| M_UNEMP | Civilian (age 16+) unemployed estimate MOE, 2012-2016 ACS | DP03 | HC02_VC07 | | |
| E_PCI | Per capita income estimate, 2012-2016 ACS. | B19301 | HD01_VD01 | | Fewer rows than other variables - joined to Census 2016 tracts. Contains null cells (i.e. -999). |
| M_PCI | Per capita income estimate MOE, 2012-2016 ACS | B19301 | HD02_VD01 | | Fewer rows than other variables - joined to Census 2016 tracts |
| E_NOHSDP | Persons (age 25+) with no high school diploma estimate, 2012-2016 ACS | B06009 | HD01_VD03 | | |
| M_NOHSDP | Persons (age 25+) with no high school diploma estimate MOE, 2012-2016 ACS | B06009 | HD02_VD03 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|------------------------|--|--|-------|
| E_AGE65 | Persons aged 65 and older estimate, 2012-2016 ACS | S1501 | HC01_EST_VC32 | | |
| M_AGE65 | Persons aged 65 and older estimate MOE, 2012-2016 ACS | S1501 | HC01_MOE_VC32 | | |
| E_AGE17 | Persons aged 17 and younger estimate, 2012-2016 ACS | B09001 | HD01_VD01 | | |
| M_AGE17 | Persons aged 17 and younger estimate MOE, 2012-2016 ACS | B09001 | HD02_VD01 | | |
| E_DISABL | Civilian noninstitutionalized population with a disability estimate, 2012-2016 ACS | DP02 | HC01_VC106 | | |
| M_DISABL | Civilian noninstitutionalized population with a disability estimate MOE, 2012-2016 ACS | DP02 | HC02_VC106 | | |
| E_SNGPNT | Single parent household with children under 18 estimate, 2012-2016 ACS | DP02 | HC01_VC09 + HC01_VC11 | Estimate male householder, no wife present, family - With own children under 18 years + Estimate female householder, no husband present, family - With own children under 18 years | |
| M_SNGPNT | Single parent household with children under 18 estimate MOE, 2012-2016 ACS | DP02 | $\text{SQRT}(\text{HC02_VC09}^2 + \text{HC02_VC11}^2)$ | $\text{SQRT}(\text{MOE male householder, no wife present, family - With own children under 18 years}^2 + \text{Estimate female householder, no husband present, family - With own children under 18 years}^2)$ | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|---|-------|
| E_MINRTY | Minority (all persons except white, non-Hispanic) estimate, 2012-2016 ACS | B01001H | E_TOTPOP - HD01_VD01 | | |
| M_MINRTY | Minority (all persons except white, non-Hispanic) estimate MOE, 2012-2016 ACS | B01001H | $\text{SQRT}(M_TOTPOP^2 + HD02_VD01^2)$ | $\text{SQRT}(\text{MOE total population}^2 - \text{MOE white, non-Hispanic}^2)$ | |
| E_LIMENG | Persons (age 5+) who speak English "less than well" estimate, 2012-2016 ACS | B16005 | HD01_VD07 + HD01_VD08 + HD01_VD12 + HD01_VD13 + HD01_VD17 + HD01_VD18 + HD01_VD22 + HD01_VD23 + HD01_VD29 + HD01_VD30 + HD01_VD34 + HD01_VD35 + HD01_VD39 + HD01_VD40 + HD01_VD44 + HD01_VD45 | Estimate; Native: - Speak Spanish: - Speak English "not well" + Estimate; Native: - Speak Spanish: - Speak English "not at all" + Estimate; Native: - Speak other Indo-European languages: - Speak English "not well" + Estimate; Native: - Speak other Indo-European languages: - Speak English "not at all" + Estimate; Native: - Speak Asian and Pacific Island languages: - Speak English "not well" + Estimate; Native: - Speak Asian and Pacific Island languages: - Speak English "not at all" + Estimate; Native: - Speak other languages: - Speak English "not well" + Estimate; Native: - Speak other languages: - Speak English "not at all" + Estimate; Foreign born: - Speak Spanish: - Speak English "not well" + Estimate; Foreign born: - Speak Spanish: - Speak English "not at all" + Estimate; Foreign born: - Speak other Indo-European languages: - Speak English "not well" + Estimate; Foreign born: - Speak other Indo-European languages: - Speak English "not at all" + Estimate; Foreign born: - Speak Asian and Pacific Island languages: - Speak English "not well" + Estimate; Foreign born: - Speak Asian and Pacific Island languages: - Speak English "not at all" + Estimate; Foreign born: - Speak other languages: - Speak English "not well" + Estimate; Foreign born: - Speak other languages: - Speak English "not at all" | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|--|--|-------|
| M_LIMENG | Persons (age 5+) who speak English "less than well" estimate MOE, 2012-2016 ACS | B16005 | $\text{SQRT}(\text{HD02_VD07}^2 + \text{HD02_VD08}^2 + \text{HD02_VD12}^2 + \text{HD02_VD13}^2 + \text{HD02_VD17}^2 + \text{HD02_VD18}^2 + \text{HD02_VD22}^2 + \text{HD02_VD23}^2 + \text{HD02_VD29}^2 + \text{HD02_VD30}^2 + \text{HD02_VD34}^2 + \text{HD02_VD35}^2 + \text{HD02_VD39}^2 + \text{HD02_VD40}^2 + \text{HD02_VD44}^2 + \text{HD02_VD45}^2)$ | SQRT (MOE Native: - Speak Spanish: - Speak English "not well"^2 + MOE Native: - Speak Spanish: - Speak English "not at all"^2 + MOE Native: - Speak other Indo-European languages: - Speak English "not well"^2 + MOE Native: - Speak other Indo-European languages: - Speak English "not at all"^2 + MOE Native: - Speak Asian and Pacific Island languages: - Speak English "not well"^2 + MOE Native: - Speak Asian and Pacific Island languages: - Speak English "not at all"^2 + MOE Native: - Speak other languages: - Speak English "not well"^2 + MOE Native: - Speak other languages: - Speak English "not at all"^2 + MOE Foreign born: - Speak Spanish: - Speak English "not well"^2 + MOE Foreign born: - Speak Spanish: - Speak English "not at all"^2 + MOE Foreign born: - Speak other Indo-European languages: - Speak English "not well"^2 + MOE Foreign born: - Speak other Indo-European languages: - Speak English "not at all"^2 + MOE Foreign born: - Speak Asian and Pacific Island languages: - Speak English "not well"^2 + MOE Foreign born: - Speak Asian and Pacific Island languages: - Speak English "not at all"^2 + MOE Foreign born: - Speak other languages: - Speak English "not well"^2 + MOE Foreign born: - Speak other languages: - Speak English "not at all"^2) | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---------------------------------------|--|-------|
| E_MUNIT | Housing in structures with 10 or more units estimate, 2012-2016 ACS | DP04 | HC01_VC19 + HC01_VC20 | Estimate; UNITS IN STRUCTURE - Total housing units - 10 to 19 units + Estimate; UNITS IN STRUCTURE - Total housing units - 20 or more units | |
| M_MUNIT | Housing in structures with 10 or more units estimate MOE, 2012-2016 ACS | DP04 | $SQRT(HC02_VC19^2 + HC02_VC20^2)$ | $SQRT(MOE UNITS IN STRUCTURE - Total housing units - 10 to 19 units^2 + MOE; UNITS IN STRUCTURE - Total housing units - 20 or more units^2)$ | |
| E_MOBILE | Mobile homes estimate, 2012-2016 ACS | DP04 | HC01_VC21 | | |
| M_MOBILE | Mobile homes estimate MOE, 2012-2016 ACS | DP04 | HC02_VC21 | | |
| E_CROWD | At household level (occupied housing units), more people than rooms estimate, 2012-2016 ACS | DP04 | HC01_VC114 + HC01_VC115 | Estimate; OCCUPANTS PER ROOM - Occupied housing units - 1.01 to 1.50 + Estimate; OCCUPANTS PER ROOM - Occupied housing units - 1.51 or more | |
| M_CROWD | At household level (occupied housing units), more people than rooms estimate MOE, 2012-2016 ACS | DP04 | $SQRT(HC02_VC114^2 + HC02_VC115^2)$ | $SQRT(MOE OCCUPANTS PER ROOM - Occupied housing units - 1.01 to 1.50^2 + MOE OCCUPANTS PER ROOM - Occupied housing units - 1.51 or more^2)$ | |
| E_NOVEH | Households with no vehicle available estimate, 2012-2016 ACS | DP04 | HC01_VC85 | | |
| M_NOVEH | Households with no vehicle available estimate MOE, 2012-2016 ACS | DP04 | HC02_VC85 | | |
| E_GROUPQ | Persons in institutionalized group quarters estimate, 2012-2016 ACS | B26001 | HD01_VD01 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|-------------------------|-------------------------|----------------------------|
| M_GROUPQ | Persons in institutionalized group quarters estimate MOE, 2012-2016 ACS | B26001 | HD02_VD01 | | |
| EP_POV | Percentage of persons below poverty estimate | S0601 | HC01_EST_VC67 | | |
| MP_POV | Percentage of persons below poverty estimate MOE | S0601 | HC01_MOE_VC67 | | |
| EP_UNEMP | Percentage of civilian (age 16+) unemployed estimate | DP03 | HC03_VC12 | | |
| MP_UNEMP | Percentage of civilian (age 16+) unemployed estimate MOE | DP03 | HC04_VC12 | | |
| EP_PCI | Per capita income estimate, 2012-2016 ACS | B19301 | HD01_VD01 | | Value is the same as E_PCI |
| MP_PCI | Per capita income estimate MOE, 2012-2016 ACS | B19301 | HD02_VD01 | | Value is the same as M_PCI |
| EP_NOHSDP | Percentage of persons with no high school diploma (age 25+) estimate | S0601 | HC01_EST_VC46 | | |
| MP_NOHSDP | Percentage of persons with no high school diploma (25+) estimate MOE | S0601 | HC01_MOE_VC46 | | |
| EP_AGE65 | Percentage of persons aged 65 and older estimate, 2012-2016 ACS | S0101 | HC01_EST_VC31 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|------------------------|---|---|---|
| MP_AGE65 | Percentage of persons aged 65 and older estimate MOE, 2012-2016 ACS | S0101 | HC01_MOE_VC31 | | |
| EP_AGE17 | Percentage of persons aged 17 and younger estimate, 2012-2016 ACS | SVI | $(E_AGE17 / E_TOTPOP) * 100$ | $(\text{Persons aged 17 and younger estimate} / \text{Total population estimate}) * 100$ | This calculation resulted in some division by 0 errors in cases where E_TOTPOP equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |
| MP_AGE17 | Percentage of persons aged 17 and younger estimate MOE, 2012-2016 ACS | SVI | $((\text{SQRT}(M_AGE17^2 - ((EP_AGE17/100)^2 * M_TOTPOP^2))) / E_TOTPOP) * 100$ | $((\text{SQRT}(\text{MOE Population under 18 years}^2 - (\text{Estimated proportion of persons aged 17 and younger}^2 * \text{MOE Total Population}^2))) / \text{Total population estimate}) * 100$ | Two MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |
| EP_DISABL | Percentage of civilian noninstitutionalized population with a disability estimate, 2012-2016 ACS | DP02 | HC03_VC106 | | |
| MP_DISABL | Percentage of civilian noninstitutionalized population with a disability estimate MOE, 2012-2016 ACS | DP02 | HC04_VC106 | | |
| EP_SNGPNT | Percentage of single parent households with children under 18 estimate, 2012-2016 ACS | SVI | $(E_SNGPNT / E_HH) * 100$ | $(\text{Single parent household with children under 18 estimate} / \text{Households estimate}) * 100$ | This calculation resulted in some division by 0 errors in cases where E_HH equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|--|---|
| MP_SNGPNT | Percentage of single parent households with children under 18 estimate MOE, 2012-2016 ACS | SVI | $((\text{SQRT}(\text{M_SNGPNT}^2 - ((\text{EP_SNGPNT}/100)^2 * \text{M_HH}^2)))/\text{E_HH}) * 100$ | $((\text{SQRT}(\text{MOE Single parent households}^2 - (\text{Estimated proportion single parent households}^2 * \text{MOE Households}^2))) / \text{Households estimate}) * 100$ | Two MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |
| EP_MINRTY | Percentage minority (all persons except white, non-Hispanic) estimate, 2012-2016 ACS | SVI | $(\text{E_MINRTY}/\text{E_TOTPOP}) * 100$ | $(\text{Minority estimate} / \text{Total population estimate}) * 100$ | This calculation resulted in some division by 0 errors in cases where E_HH equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |
| MP_MINRTY | Percentage minority (all persons except white, non-Hispanic) estimate MOE, 2012-2016 ACS | SVI | $((\text{SQRT}(\text{M_MINRTY}^2 - ((\text{EP_MINRTY}/100)^2 * \text{M_TOTPOP}^2)))/\text{E_TOTPOP}) * 100$ | $((\text{SQRT}(\text{MOE Minority}^2 - (\text{Estimated proportion minority}^2 * \text{MOE Total population}^2))) / \text{Total population estimate}) * 100$ | |
| EP_LIMENG | Percentage of persons (age 5+) who speak English "less than well" estimate, 2012-2016 ACS | SVI and B16005 | $(\text{E_LIMENG}/\text{HD01_VD01}) * 100$ | $(\text{Persons who speak English "less than well" estimate} / \text{Population age 5 and over estimate}) * 100$ | This calculation resulted in some division by 0 errors in cases where total population age 5 and over equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|--|---|
| MP_LIMENG | Percentage of persons (age 5+) who speak English "less than well" estimate MOE, 2012-2016 ACS | SVI and B16005 | $((\text{SQRT}(\text{M_LIMENG}^2 - ((\text{EP_LIMENG}/100)^2 * \text{HD02_VD01}^2)))/\text{HD01_VD01}) * 100$ | $((\text{SQRT}(\text{MOE Persons who speak English less than well}^2 - (\text{Estimated proportion persons who speak English less than well}^2 * \text{MOE population age 5 and over}^2)))/\text{Population age 5 and over estimate}) * 100$ | Two MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |
| EP_MUNIT | Percentage of housing in structures with 10 or more units estimate | SVI | $(\text{E_MUNIT}/\text{E_HU}) * 100$ | $(\text{Housing in structures with 10 or more units estimate} / \text{Housing units estimate}) * 100$ | This calculation resulted in some division by 0 errors in cases where E_HU equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |
| MP_MUNIT | Percentage of housing in structures with 10 or more units estimate MOE | SVI | $((\text{SQRT}(\text{M_MUNIT}^2 - ((\text{EP_MUNIT}/100)^2 * \text{M_HU}^2)))/\text{E_HU}) * 100$ | $((\text{SQRT}(\text{MOE Housing in structures with 10 or more units}^2 - (\text{Estimated proportion housing in structures with 10 or more units}^2 * \text{MOE Housing units}^2)))/\text{Housing units estimate}) * 100$ | Two MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |
| EP_MOBILE | Percentage of mobile homes estimate | DP04 | HC03_VC21 | | |
| MP_MOBILE | Percentage of mobile homes estimate MOE | DP04 | HC04_VC21 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|--|--|--|
| EP_CROWD | Percentage of occupied housing units with more people than rooms estimate | SVI and DP04 | (E_CROWD/HC01_VC04)*100 | (Occupied housing units with more people than rooms estimate / Occupied housing units estimate)*100 | This calculation resulted in some division by 0 errors in cases where HC01_VC04 equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |
| MP_CROWD | Percentage of occupied housing units with more people than rooms estimate MOE | SVI and DP04 | ((SQRT(M_CROWD^2-((EP_CROWD/100)^2*HC02_VC04^2)))/HC01_VC04)*100 | ((SQRT(MOE Occupied housing units with more people than rooms^2 - (Estimated proportion of occupied housing units with more people than rooms^2 * MOE Occupied housing units^2)))/Occupied housing units estimate) * 100 | Some MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |
| EP_NOVEH | Percentage of households with no vehicle available estimate | DP04 | HC03_VC85 | | |
| MP_NOVEH | Percentage of households with no vehicle available estimate MOE | DP04 | HC04_VC85 | | |
| EP_GROUPQ | Percentage of persons in institutionalized group quarters estimate, 2012-2016 ACS | SVI | (E_GROUPQ/E_TOTPOP)*100 | (Persons in group quarters estimate / Total population estimate) * 100 | This calculation resulted in some division by 0 errors in cases where E_TOTPOP equals 0. These rows were revised with the estimated proportions set to 0 and their corresponding MOEs set to -999. |
| MP_GROUPQ | Percentage of persons in institutionalized group quarters estimate MOE, 2012-2016 ACS | SVI | ((SQRT(M_GROUPQ^2-((EP_GROUPQ/100)^2*M_TOTPOP^2)))/E_TOTPOP)*100 | ((SQRT(MOE Persons in group quarters^2 - (Estimated proportion persons in group quarters^2 * MOE Total population^2)))/ Total population estimate) * 100 | Some MOE calculations resulted in errors because the value under the square root was negative. For these rows, as the Census Bureau suggests, we used the formula for derived ratios, as opposed to that for derived proportions. Instead of the subtraction in the standard formula, we add. See <i>A Compass for Understanding and Using American Community Survey Data</i> , page A-15 (https://www.census.gov/content/dam/Census/library/publications/2008/acs/ACSGeneralHandbook.pdf). |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|-------------------------|--|
| EPL_POV | Percentile Percentage of persons below poverty estimate | SVI | In Excel: PERCENTRANK.INC on EP_POV array with 4 significant digits | | |
| EPL_UNEMP | Percentile Percentage of civilian (age 16+) unemployed estimate | SVI | In Excel: PERCENTRANK.INC on EP_UNEMP array with 4 significant digits | | |
| EPL_PCI | Percentile per capita income estimate | SVI | In Excel: 1-(PERCENTRANK.INC on EP_PCI array with 4 significant digits) | | Per capita income necessarily reversed as high income equates with low vulnerability and vice versa. Null values (-999) removed from the array before calculating output percentile ranks. Output for -999 input cells set to -999. |
| EPL_NOHSDP | Percentile Percentage of persons with no high school diploma (age 25+) estimate | SVI | In Excel: PERCENTRANK.INC on EP_NOHSDP array with 4 significant digits | | |
| SPL_THEME1 | Sum of series for Socioeconomic theme | SVI | EPL_POV + EPL_UNEMP + EPL_PCI + EPL_NOHSDP | | Null values (-999) removed before calculating output sum. Output for sums with null values in the same row set to -999. |
| RPL_THEME1 | Percentile ranking for Socioeconomic theme summary | SVI | In Excel: PERCENTRANK.INC on SPL_THEME1 array with 4 significant digits | | Null values (-999) removed from the array before calculating output percentile ranks. Output for -999 input cells set to -999. |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|------------------------|---|-------------------------|-------|
| EPL_AGE65 | Percentile percentage of persons aged 65 and older estimate | SVI | In Excel: PERCENTRANK.INC on EP_AGE65 array with 4 significant digits | | |
| EPL_AGE17 | Percentile percentage of persons aged 17 and younger estimate | SVI | In Excel: PERCENTRANK.INC on EP_AGE17 array with 4 significant digits | | |
| EPL_DISABL | Percentile percentage of civilian noninstitutionalized population with a disability estimate | SVI | In Excel: PERCENTRANK.INC on EP_DISABL array with 4 significant digits | | |
| EPL_SNGPNT | Percentile percentage of single parent households with children under 18 estimate | SVI | In Excel: PERCENTRANK.INC on EP_SNGPNT array with 4 significant digits | | |
| SPL_THEME2 | Sum of series for Household Composition theme | SVI | EPL_AGE65 + EPL_AGE17 + EPL_DISABL + EPL_SNGPNT | | |
| RPL_THEME2 | Percentile ranking for Household Composition theme summary | SVI | In Excel: PERCENTRANK.INC on SPL_THEME2 array with 4 significant digits | | |
| EPL_MINRTY | Percentile percentage minority (all persons except white, non-Hispanic) estimate | SVI | In Excel: PERCENTRANK.INC on EP_MINRTY array with 4 significant digits | | |
| EPL_LIMENG | Percentile percentage of persons (age 5+) who speak English "less than well" estimate | SVI | In Excel: PERCENTRANK.INC on EP_LIMENG array with 4 significant digits | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|-------------------------|-------|
| SPL_THEME3 | Sum of series for Minority Status/Language theme | SVI | EPL_MINRTY + EPL_LIMENG | | |
| RPL_THEME3 | Percentile ranking for Minority Status/Language theme | SVI | In Excel: PERCENTRANK.INC on SPL_THEME3 array with 4 significant digits | | |
| EPL_MUNIT | Percentile percentage housing in structures with 10 or more units estimate | SVI | In Excel: PERCENTRANK.INC on EP_MUNIT array with 4 significant digits | | |
| EPL_MOBILE | Percentile percentage mobile homes estimate | SVI | In Excel: PERCENTRANK.INC on EP_MOBILE array with 4 significant digits | | |
| EPL_CROWD | Percentile percentage households with more people than rooms estimate | SVI | In Excel: PERCENTRANK.INC on EP_CROWD array with 4 significant digits | | |
| EPL_NOVEH | Percentile percentage households with no vehicle available estimate | SVI | In Excel: PERCENTRANK.INC on EP_NOVEH array with 4 significant digits | | |
| EPL_GROUPQ | Percentile percentage of persons in institutionalized group quarters estimate | SVI | In Excel: PERCENTRANK.INC on EP_GROUPQ array with 4 significant digits | | |
| SPL_THEME4 | Sum of series for Housing/Transportation theme | SVI | EPL_MUNIT + EPL_MOBIL + EPL_CROWD + EPL_NOVEH + EPL_GROUPQ | | |
| RPL_THEME4 | Percentile ranking for Housing/Transportation theme | SVI | In Excel: PERCENTRANK.INC on SPL_THEME4 array with 4 significant digits | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|---|-------------------------|--|
| SPL_THEMES | Sum of series themes | SVI | SPL_THEME1 + SPL_THEME2 + SPL_THEME3 + SPL_THEME4 | | Null values (-999) removed before calculating output sum. Output for sums with null values in the same row set to -999. |
| RPL_THEMES | Overall percentile ranking | SVI | In Excel: PERCENTRANK.INC on SPL_THEMES array with 4 significant digits | | Null values (-999) removed from the array before calculating output percentile ranks. Output for -999 input cells set to -999. |
| F_POV | Flag -the percentage of persons in poverty is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_POV >= 0.90 | | |
| F_UNEMP | Flag -the percentage of civilian unemployed is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_UNEMP >= 0.90 | | |
| F_PCI | Flag -per capita income is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_PCI >= 0.90 | | Output for -999 input cells set to -999. |
| F_NOHSDP | Flag -the percentage of persons with no high school diploma is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_NOHSDIP >= 0.90 | | |
| F_THEME1 | Sum of flags for Socioeconomic Status theme | SVI | F_POV + F_UNEMP + F_PCI + F_NOHSDP | | Null values (-999) removed before calculating output sum. Output for sums with null values in the same row set to -999. |
| F_AGE65 | Flag - the percentage of persons aged 65 and older is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_AGE65 >= 0.90 | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|------------------------|---|-------------------------|-------|
| F_AGE17 | Flag - the percentage of persons aged 17 and younger is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_AGE17 >= 0.90 | | |
| F_DISABL | Flag - the percentage of persons with a disability is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_DISABL >= 0.90 | | |
| F_SNGPNT | Flag - the percentage of single parent households is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_SNGPNT >= 0.90 | | |
| F_THEME2 | Sum of flags for Household Composition theme | SVI | F_AGE65 + F_AGE17 + F_DISABL + F_SNGPNT | | |
| F_MINRTY | Flag - the percentage of minority is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_MINRTY >= 0.90 | | |
| F_LIMENG | Flag - the percentage those with limited English is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_LIMENG >= 0.90 | | |
| F_THEME3 | Sum of flags for Minority Status/Language theme | SVI | F_MINRTY + F_LIMENG | | |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|--|------------------------|---|-------------------------|---|
| F_MUNIT | Flag - the percentage of households in multi-unit housing is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_MUNIT >= 0.90 | | |
| F_MOBILE | Flag - the percentage of mobile homes is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_MOBILE >= 0.90 | | |
| F_CROWD | Flag - the percentage of crowded households is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_CROWD >= 0.90 | | |
| F_NOVEH | Flag - the percentage of households with no vehicles is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_NOVEH >= 0.90 | | |
| F_GROUPQ | Flag - the percentage of persons in institutionalized group quarters is in the 90th percentile (1 = yes, 0 = no) | SVI | EPL_GROUPQ >= 0.90 | | |
| F_THEME4 | Sum of flags for Housing/Transportation theme | SVI | F_MUNIT + F_MOBILE + F_CROWD + F_NOVEH + F_GROUPQ | | |
| F_TOTAL | Sum of flags for the four themes | SVI | F_THEME1 + F_THEME2 + F_THEME3 + F_THEME4 | | Null values (-999) removed before calculating output sum. Output for sums with null values in the same row set to -999. |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | NOTES |
|--------------------|---|------------------------|-------------------------|--|--|
| E_UNINSUR | Adjunct variable - Uninsured in the total civilian noninstitutionalized population estimate, 2012-2016 ACS | S2701 | HC04_EST_VC01 | | |
| M_UNINSUR | Adjunct variable - Uninsured in the total civilian noninstitutionalized population estimate MOE, 2012-2016 ACS | S2701 | HC04_MOE_VC01 | | |
| EP_UNINSUR | Adjunct variable - Percentage uninsured in the total civilian noninstitutionalized population estimate, 2012-2016 ACS | S2701 | HC05_EST_VC01 | | |
| MP_UNINSUR | Adjunct variable - Percentage uninsured in the total civilian noninstitutionalized population estimate MOE, 2012-2016 ACS | S2701 | HC05_MOE_VC01 | | |
| E_DAYPOP | Adjunct variable - Estimated daytime population, LandScan 2016 | N/A | | Derived from LandScan 2016 - http://web.ornl.gov/sci/landscan/index.shtml . We followed ORNL's instructions for processing in ArcGIS, loading the LandScan grid first and maintaining WGS84 projection parameters. Using Spatial Analyst, we ran the Zonal Statistics as Table function to sum estimated daytime population for each LandScan raster cell to obtain an estimated daytime population for each SVI 2016 census tract. | Tracts having no LandScan cells that overlay have been assigned null values (i.e. -999). |

SVI 2016 – SVI 2014 Crosswalk (ACS Changes)

| |
|----------------------------------|
| Theme Colors |
| Socioeconomic |
| Household Composition/Disability |
| Minority Status/Language |
| Housing/Transportation |

Some of the American Community Survey (ACS) variable names changed from 2014 to 2016. This summary table lists only the SVI variables for which calculations are affected by these changes. The SVI 2016 Data Dictionary immediately above details all the calculations.

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | 2014 TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | 2016 TABLE FIELD CALCULATION |
|--------------------|---|------------------------|--|--|--|
| E_AGE65 | Persons aged 65 and older estimate, 2012-2016 ACS | S1501 | HC01_EST_VC31 | | HC01_EST_VC32 |
| M_AGE65 | Persons aged 65 and older estimate MOE, 2012-2016 ACS | S1501 | HC01_MOE_VC31 | | HC01_MOE_VC32 |
| E_CROWD | At household level (occupied housing units), more people than rooms estimate, 2012-2016 ACS | DP04 | HC01_VC113 + HC01_VC114 | Estimate; OCCUPANTS PER ROOM - Occupied housing units - 1.01 to 1.50 + Estimate; OCCUPANTS PER ROOM - Occupied housing units - 1.51 or more | HC01_VC114 + HC01_VC115 |
| M_CROWD | At household level (occupied housing units), more people than rooms estimate MOE, 2012-2016 ACS | DP04 | $\text{SQRT}(\text{HC02_VC113}^2 + \text{HC02_VC114}^2)$ | $\text{SQRT}(\text{MOE OCCUPANTS PER ROOM - Occupied housing units - 1.01 to 1.50}^2 + \text{MOE OCCUPANTS PER ROOM - Occupied housing units - 1.51 or more}^2)$ | $\text{SQRT}(\text{HC02_VC114}^2 + \text{HC02_VC115}^2)$ |
| E_NOVEH | Households with no vehicle available estimate, 2012-2016 ACS | DP04 | HC01_VC84 | | HC01_VC85 |
| M_NOVEH | Households with no vehicle available estimate MOE, 2012-2016 ACS | DP04 | HC02_VC84 | | HC02_VC85 |

| 2016 VARIABLE NAME | 2016 DESCRIPTION | CENSUS or SVI TABLE(S) | 2014 TABLE FIELD CALCULATION | CALCULATION DESCRIPTION | 2016 TABLE FIELD CALCULATION |
|--------------------|---|------------------------|------------------------------|-------------------------|------------------------------|
| EP_NOVEH | Percentage of households with no vehicle available estimate | DP04 | HC03_VC84 | | HC03_VC85 |
| MP_NOVEH | Percentage of households with no vehicle available estimate MOE | DP04 | HC04_VC84 | | HC04_VC85 |
| E_UNINSUR | Adjunct variable - Uninsured in the total civilian noninstitutionalized population estimate, 2012-2016 ACS | S2701 | HC02_EST_VC01 | | HC04_EST_VC01 |
| M_UNINSUR | Adjunct variable - Uninsured in the total civilian noninstitutionalized population estimate MOE, 2012-2016 ACS | S2701 | HC02_MOE_VC01 | | HC04_MOE_VC01 |
| EP_UNINSUR | Adjunct variable - Percentage uninsured in the total civilian noninstitutionalized population estimate, 2012-2016 ACS | S2701 | HC03_EST_VC01 | | HC05_EST_VC01 |
| MP_UNINSUR | Adjunct variable - Percentage uninsured in the total civilian noninstitutionalized population estimate MOE, 2012-2016 ACS | S2701 | HC03_MOE_VC01 | | HC05_MOE_VC01 |