

Understand Exposure | Social Vulnerability Indicators and Spatial Data

WHO

This provides additional guidance for the practitioner during data collection in the Understand Exposure step and tools and resources that can be used for additional social vulnerability mapping in the Assess Vulnerability and Risk step.

WHAT

This is a guidance document for identifying and recording collected spatial data for social vulnerability indicators in the Understand Exposure step. Additional tools are provided for the Assess Vulnerability and Risk step.

SUPPORTING RESOURCES

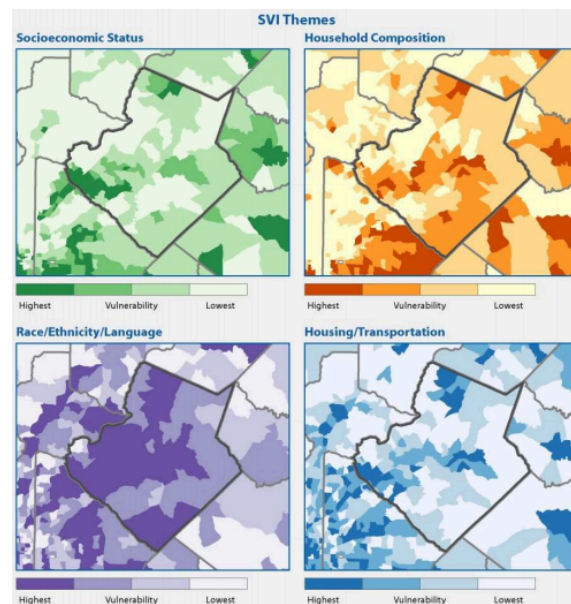
- [U.S. Centers for Disease Control and Prevention Social Vulnerability Index \(2018\)](#)
- [USDA Food Access Research Atlas](#)
- [Climate and Economic Justice Screening Tool \(Council on Environmental Quality\)](#)

INSTRUCTIONS

- Review the tools and information below. In the Understand Exposure step, use the list of indicators and instructions for collecting spatial data from the U.S. Census.
 - Determine the scale that is most appropriate for the community (tracts or block group)
 - Record what has been collected in the table on the last page; extra rows have been added for any additional indicators or spatial datasets collected.
- Come back to this resource in the Assess Vulnerability and Risk step; use the indicators collected previously and any of the suggested tools to provide a deeper understanding of social vulnerability within the community.

About Social Vulnerability Indicators

CDC Social Vulnerability Index and Indicators



The [CDC Social Vulnerability Index](#) (SVI) is one of the most commonly used datasets. The socioeconomic variables listed below are those that are found within the four themes (above) of the SVI. The SVI overall index and four themes are available at the census tract level directly from the CDC, however, the corresponding individual indicators at both the tract and block group levels are based on census data and can be downloaded at various scales. Investigating this information by individual indicators can help uncover social vulnerabilities within a neighborhood that make the effects of climate change felt at a disproportionate magnitude.

USDA Food Access Research Atlas

The Food Access Research Atlas is a hub for both an interactive tool and data download. This information helps identify areas that are considered “food deserts,” or neighborhoods that may have a difficult time accessing affordable and nutritious food because they live far from a supermarket and do not have access to transportation.

Climate and Economic Justice Screening Tool

This tool was specifically designed to help federal agencies identify disadvantaged communities that are considered marginalized, underserved, and overburdened by pollution. The tool provides socioeconomic, environmental, and climate information. Practitioners can use this tool to understand the context of the community with which they are working and factor this into strategies and actions in later steps.

Use Census Data to Collect Indicators

To use census data, you'll need to download both the tables listed here and the corresponding geographies (either tracts or block groups). First, determine the year and survey type you'll use. The two most commonly used surveys are the Decennial Census and the American Community Survey (ACS) and, depending on the year the project is completed, one will be older than the other. To explore Census data and download the tabular and spatial data, follow these steps:

1. Go to data.census.gov and copy the table ID (see [Social Vulnerability Indicators](#)) from column B into the search bar on the Census homepage.

HOUSEHOLD COMPOSITION / DISABILITY						
Total number of people aged 65 and older	B01001	B01001_020E + B01001_021E + B01001_022E + B01001_023E + B01001_024E + B01001_025E + B01001_044E + B01001_045E + B01001_046E + B01001_047E + B01001_048E + B01001_049E	Sex by Age	S0101	S0101_C01_030E	Age and Sex
Percentage of people aged 65 and older		(E_AGE65/TOTAL POPULATION)*100		S0101	S0101_C02_030E	Age and Sex
		B01001_006E + B01001_005E + B01001_004E + B01001_003E +				

2. The table will show up in the search results, select it and the table will open for the United States.

The screenshot shows the Census Bureau website interface. The search bar contains 'B01001'. The search results show '1 Result' for 'American Community Survey B01001 | SEX BY AGE'. A data table is displayed for the United States, showing estimates and margins of error for different age groups.

United States		
Label	Estimate	Margin of Error
Total:	328,239,523	*****
Male:	161,588,973	±34,808
Under 5 years	9,938,937	±19,654
5 to 9 years	10,033,518	±51,101
10 to 14 years	10,987,313	±52,483
15 to 17 years	6,361,859	±15,524
18 and 19 years	4,541,794	±21,312

3. Narrow down to the community. Under “Find a Filter,” choose “Geography”.

The screenshot shows the 'Find a Filter' menu on the Census Bureau website. The 'Geography' filter is selected. The 'Select Geography' dialog is open, showing various geographic options. The 'Most Commonly Used Geographies' section includes Nation, State, County, Place, Zip Code Tabulation Area, Metropolitan Statistical Area, Tract, Block, and Block Group. The 'All Other Geographies' section includes 5-Digit Zip Code and Alaska Native Regional Corporation.

4. For this community, we want to look at Block Groups, so we'll choose that. Next, select your state and county. Even if you're looking at one community within a particular county, it's typically easier to get the data for the entire county. You'll check the box that says "All Block Groups..." (highlighted below).

The screenshot shows the United States Census Bureau website interface. The search bar contains 'B01001'. The navigation tabs are 'All', 'Tables', 'Maps', and 'Pages'. The left sidebar shows '1 Filter' and 'Find a Filter' options. The main content area displays 'Block Group / Kentucky / Bourbon County, Kentucky / Select Tract' and lists several census tracts. The option 'All Block Groups within Bourbon County, Kentucky' is highlighted in yellow. The right sidebar shows '1 Result' for 'American Community Survey B01001 | SEX BY AGE'.

5. Finally, you'll want to select the survey and year. For this particular table, the only survey available is the American Community Survey. Add the filter to the list anyway. Under "Years," select the most recent year. If you aren't sure or lose track of what filters you have set, a running list will appear in the upper-left corner.

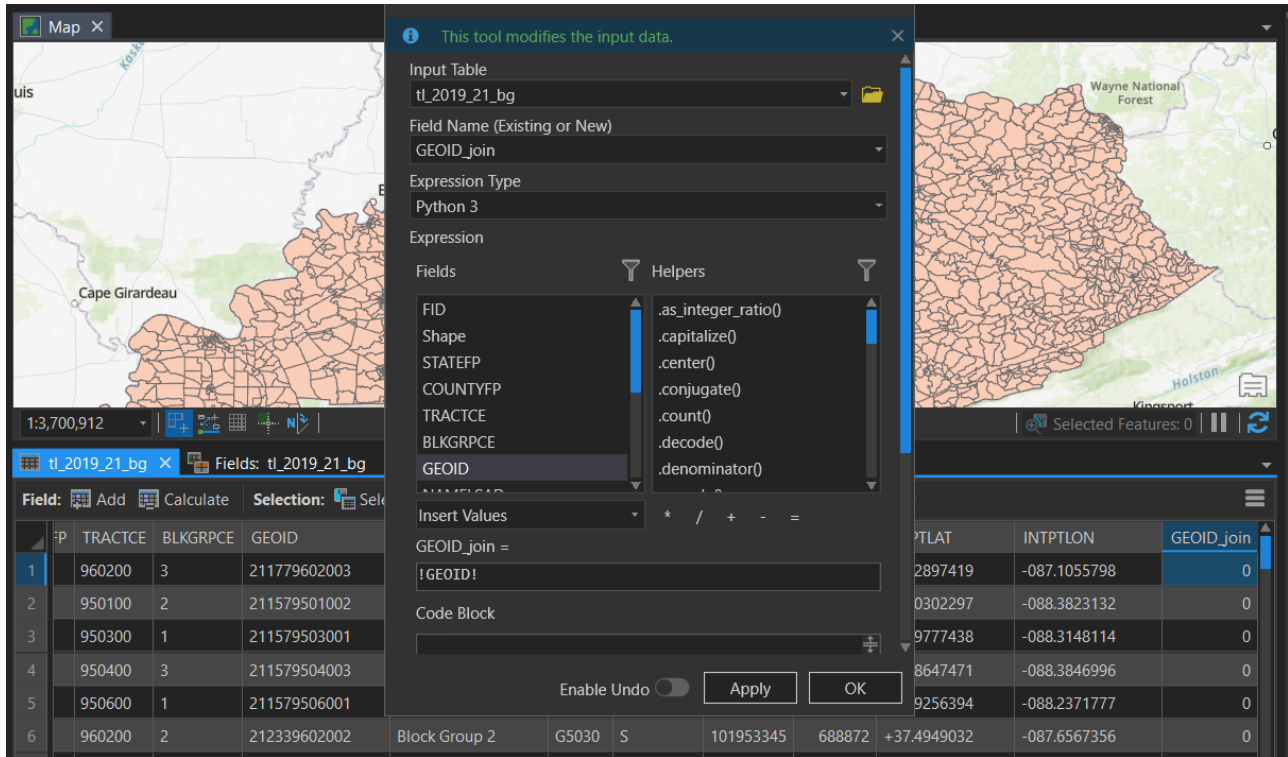
The screenshot shows the United States Census Bureau website interface with four filters applied. The search bar contains 'B01001'. The navigation tabs are 'All', 'Tables', 'Maps', and 'Pages'. The left sidebar shows '4 Filters' and 'Find a Filter' options. The main content area displays '1 Result' for 'American Community Survey B01001 | SEX BY AGE'. The right sidebar shows the table structure for '2019: ACS 5-Year Estimates Detailed Tables'.

Label	Block
▼ Total:	
▼ Male:	
Under 5 years	
5 to 9 years	
10 to 14 years	
15 to 17 years	
18 and 19 years	
20 years	
21 years	
22 to 24 years	

6. Now you'll download the tables. At the top of the Results section, choose "Download tables." Select the table you want to download by checking the box next to the name and then choose "Download Selected (1)" at the top of the section (highlighted below).

The screenshot shows the United States Census Bureau data interface. At the top, there is a search bar with the text "B01001" and an "Advanced Search" button. Below the search bar, there are tabs for "All", "Tables", "Maps", and "Pages". The "Tables" tab is selected. On the left side, there is a "Filters" panel with 4 filters applied: "B01001", "All Block Groups within Bour...", "ACS 5-Year Estimates Detaile...", and "2019". Below the filters is a "Find a Filter" search box. In the center, there is a "1 Result" section with a "Download Selected (1)" button highlighted in yellow. Below this, there is a table with one row: "B01001 | SEX BY AGE" with a checked checkbox and the subtitle "2019: ACS 5-Year Estimates Detailed Tables". On the right side, there is a "Table" view of the data for "Block Group 1, Census Tract 301, Bourbon County, Kentucky". The table has columns for "Label", "Estimate", and "Margin of Error". The data rows are: "Total:" (1,309, ±2%), "Male:" (589, ±1%), and "Under 5 years" (22, ±%).

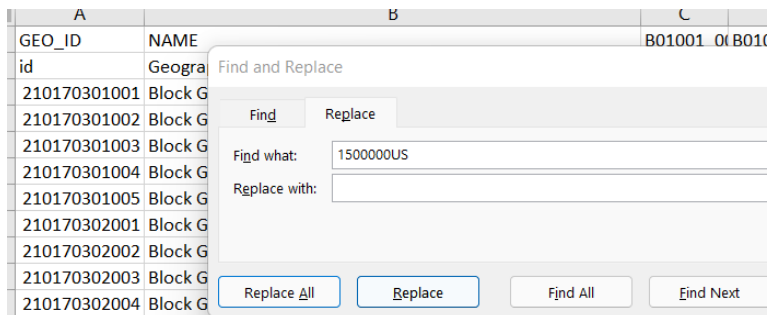
7. The file downloaded will be in a tabular format (CSV), which you can open in Excel or other similar processing software.
8. Next, you'll need to get the spatial data to be able to use your tabular data. [TIGER/Line](#) is the official source of spatial data for the U.S. Census Bureau. It's important to make sure that you download the same vintage as tabular data. For the table above, recall that the year 2019 was selected. Choose the same year on the TIGER/Line homepage and navigate to either the web interface or the FTP archive. Either way, you'll have to download the data at the state-level.
 - a. If you use the web interface, you'll navigate through a series of menus to download the required data. For this example, select the year "2019" and "block groups" from the drop down menus, click Submit. Next, you'll choose the state and click Download.
 - b. If you use the FTP archive, you'll need to have some familiarity with the Census geography abbreviations and state FIPS code in order to download the data.
9. Finally, prepare the data, both spatial and tabular, to be joined and used in the project.
 - a. Starting with the spatial data, add the data to a new map and open the attribute table. You'll notice the field "GEOID" is a string. It needs to be a number so that the tabular data can be joined. Add a new field, call it "GEOID_join" and make it a double. Right click the new field and choose calculate to copy the GEOID field data over as a number.



- b. Open the tabular data in Excel or other similar software.
 - i. You'll notice that the GEO_ID column contains a lot more than the join field you just created. Edit the table to remove everything before and including "US" by using Find and Replace:

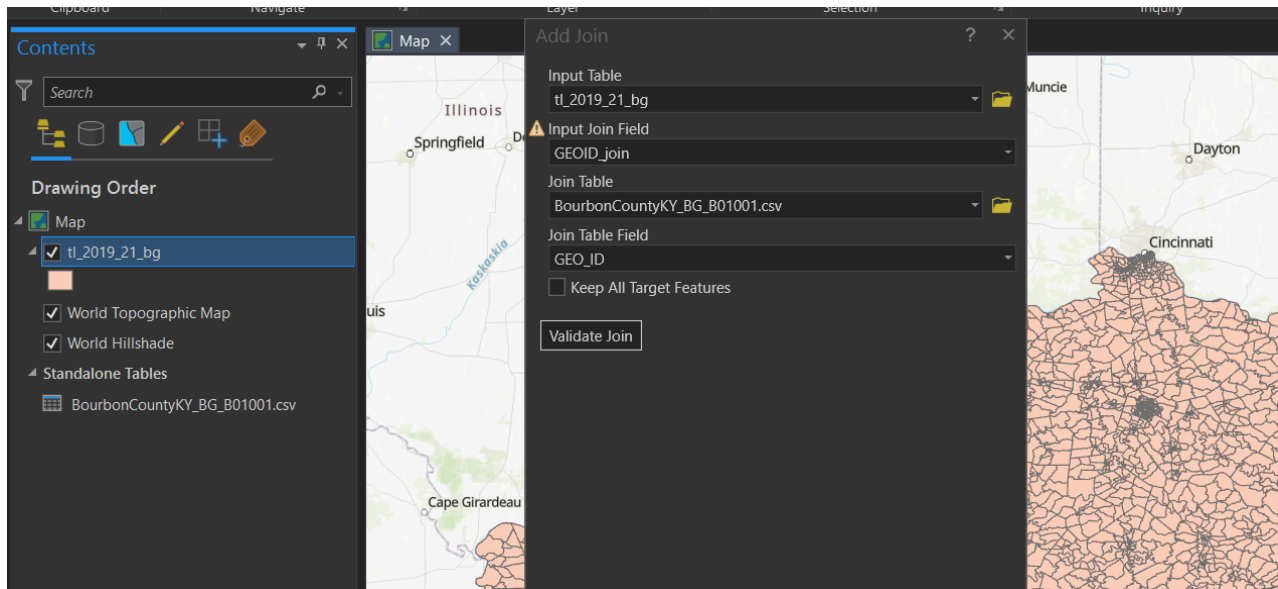
GEO_ID	NA
id	Ge
1500000US210170301001	Blc
1500000US210170301002	Blc
1500000US210170301003	Blc
1500000US210170301004	Blc
1500000US210170302001	Blc
1500000US210170302002	Blc
1500000US210170302003	Blc
1500000US210170302004	Blc

This is what needs to be removed and will be entered into "Find what" →



Enter the highlighted values into "Find what" and nothing in "Replace with." Choose "Replace all."

- ii. Ensure that your new column A (GEO_ID) is a numeric value by right clicking the A column and choosing *Format cells*. Select Number and make the decimal places 0, click OK.
 - iii. Finally, delete the second row (the overlay row) of the table. Save the table to a new file. As you will likely have several Census tables, consider using a standard naming structure throughout the project. Close the file after you've saved it.
- c. Add the new CSV to the same map.
- d. Right click the spatial data in the table of contents and choose Joins and Relates > Add Join.
- i. Be sure to add the field you created in the spatial data, not the original string field.
 - ii. Uncheck "Keep all target features" to only keep the features within your tabular data.



Add join settings for the spatial and tabular data.

- e. Right click the joined layer in the table of contents and choose Data > Export Features. As you will likely have several Census-related shapefiles, consider using a standard naming structure throughout the project.

Some social vulnerability metrics require calculations within a single table. This can either be done in Excel or GIS.

Social Vulnerability Indicators

Variable	Block Group			Tracts			Notes
	Table ID	Fields and/or Calculation	Table Name	Table ID	Fields and/or Calculation	Table Name	
Total Population	B01003	B01003_001E	Total Population				
Total people below poverty	B17021	B17021_02E	Poverty Status of Individuals in the past 12 months by living arrangement	B17001	B17001_002E	Poverty Status in the last 12 months by sex by age	
Total people unemployed (ages 16+)	B23025	B23025_005E	Employment Status for the Population 16 years and over	DP03	DP03_0005E	Selected Economic Characteristics	
Income per person	B19301	B19301_001E	Per capita income in the last 12 months (in 2019 inflation-adjusted dollars)	B19301	B19301_001E	Per capita income in the past 12 months (in 2019 inflation-adjusted dollars)	
Total people with no high school diploma (ages 25+)	B15003	B15003_002E + B15003_003E + B15003_004E + B15003_005E + B15003_006E + B15003_007E + B15003_008E + B15003_009E + B15003_010E + B15003_011E + B15003_012E + B15003_013E +	Educational attainment for the population 25 years and over	B06009	B06009_002E	Place by birth by educational attainment in the United States	

Variable	Block Group			Tracts			Notes
	Table ID	Fields and/or Calculation	Table Name	Table ID	Fields and/or Calculation	Table Name	
		B15003_014E + B15003_015E + B15003_016E					
Total people aged 65 and older	B01001	B01001_020E + B01001_021E + B01001_022E + B01001_023E + B01001_024E + B01001_025E + B01001_044E + B01001_045E + B01001_046E + B01001_047E + B01001_048E + B01001_049E	Sex by Age	S0101	S0101_C01_030E	Age and Sex	
Total people aged 17 and younger	B01001	B01001_006E + B01001_005E + B01001_004E + B01001_003E + B01001_030E + B01001_029E + B01001_028E + B01001_027E	Sex by Age	B09001	B09001_001E	Population under 18 years by age	
Total single parent households with children under 18	B09002	B09002_009E + B09002_015E	Own Children under 18 years by Family Type and Age	DP02	DP02_0007E + DP02_0009E	Selected social characteristics in the United States	

Variable	Block Group			Tracts			Notes
	Table ID	Fields and/or Calculation	Table Name	Table ID	Fields and/or Calculation	Table Name	
Total minority population (all persons except white, non-hispanic)	B02001	[TOTAL POPULATION - B02001_002E]	Race	B01001H	[TOTAL POPULATION - B01001H_001E]	Sex by age (white alone, not hispanic or latino)	
Total people aged 5+ who speak English “less than well”	B16004	B16004_007E + B16004_029E + B16004_051E + B16004_008E + B16004_030E + B16004_052E + B16004_012E + B16004_034E + B16004_056E + B16004_013E + B16004_035E + B16004_057E + B16004_017E + B16004_039E + B16004_061E + B16004_018E + B16004_040E + B16004_062E + B16004_022E + B16004_044E + B16004_066E + B16004_023E + B16004_045E + B16004_067E	Age by Language Spoken at home by ability to speak english for the population 5 years and over	B16005	B16005_007E + B16005_008E + B16005_012E + B16005_013E + B16005_017E + B16005_018E + B16005_022E + B16005_023E + B16005_029E + B16005_030E + B16005_034E + B16005_035E + B16005_039E + B16005_040E + B16005_044E + B16005_045E	Nativity by language spoken at home by ability to speak english for the population 5 years and over	

Variable	Block Group			Tracts			Notes
	Table ID	Fields and/or Calculation	Table Name	Table ID	Fields and/or Calculation	Table Name	
Total number of housing structures with 10 or more units	B25024	B25024_007E + B25024_008E + B25024_009E	Units in Structure	DP04	DP04_0012E + DP04_0013E	Selected Housing Characteristics	
Total number of housing units with more people than rooms	B25014	B25014_005E + B25014_006E + B25014_007E + B25014_011E + B25014_012E + B25014_013E	Tenure by Occupants per Room	DP04	DP04_0014E	Selected Housing Characteristics	
Total number of mobile homes	B25024	B25024_010E	Tenure by Vehicle Available	DP04	DP04_0058E	Selected Housing Characteristics	
Total number of people in group quarters	B09019	B09019_026E	Household type (including living alone) by relationship	B26001	B26001_001E	Group Quarters Population	