

# Package ‘findSVI’

July 22, 2025

**Title** Calculate Social Vulnerability Index for Communities

**Version** 0.2.0

**Description** Developed by CDC/ATSDR (Centers for Disease Control and Prevention/ Agency for Toxic Substances and Disease Registry), Social Vulnerability Index (SVI) serves as a tool to assess the resilience of communities by taking into account socioeconomic and demographic factors. Provided with year(s), region(s) and a geographic level of interest, 'findSVI' retrieves required variables from US census data and calculates SVI for communities in the specified area based on CDC/ATSDR SVI documentation. Reference for the calculation methods: Flanagan BE, Gregory EW, Hallisey EJ, Heitgerd JL, Lewis B (2011) <[doi:10.2202/1547-7355.1792](https://doi.org/10.2202/1547-7355.1792)>.

**License** MIT + file LICENSE

**Encoding** UTF-8

**LazyData** true

**RoxygenNote** 7.3.1

**URL** <https://github.com/heli-xu/findSVI>,  
<https://heli-xu.github.io/findSVI/>

**BugReports** <https://github.com/heli-xu/findSVI/issues>

**Depends** R (>= 3.5.0)

**Imports** cli, dplyr, magrittr, purrr, stringr, tidycensus, tidyr,  
tidyselect, rlang, utils

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glue, sf, ggplot2, reactable, cowplot

**Config/testthat/edition** 3

**VignetteBuilder** knitr

**NeedsCompilation** no

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census_variables	<i>List of census variables for SVI calculation</i>
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**Description**

Each of these datasets contains a list of census variable names for a year between 2012-2022.

**Usage**

- census\_variables\_2012
- census\_variables\_2013
- census\_variables\_2014
- census\_variables\_2015
- census\_variables\_2016
- census\_variables\_2017
- census\_variables\_2018
- census\_variables\_2019
- census\_variables\_2020

census\_variables\_2021  
census\_variables\_2022  
census\_variables\_exp\_2012  
census\_variables\_exp\_2013  
census\_variables\_exp\_2014  
census\_variables\_exp\_2015  
census\_variables\_exp\_2016  
census\_variables\_exp\_2017  
census\_variables\_exp\_2018  
census\_variables\_exp\_2019  
census\_variables\_exp\_2020  
census\_variables\_exp\_2021  
census\_variables\_exp\_2022

## Format

### **a list of census variables, grouped into sublists named t0-t5 or:**

t0-t4 (for 2012). t1-t4 represent the 4 themes the corresponding SVI variables are categorized into:

- Socioeconomic
- Household Composition/Disability
- Minority Status/Language
- Housing Type/Transportation

t0 represents 3 census variables of total counts, and their corresponding SVI variables are not categorized into any theme. t5 contains the census variables for SVI "adjunct variables", which are included for reference but not used in SVI calculation. For 2012, adjunct variables are not included, as the variable listed in 2014 documentation was not in 2012 Census data, and there's no adjunct variables in 2010 documentation.

Datasets starting with census\_variable\_ contains variables corresponding to variable\_e\_ep\_calculation\_ series of tables, where "EP\_" (percent) variables are retrieved directly from Census when available; Datasets starting with census\_variables\_exp\_ contains variables corresponding to variable\_cal\_exp\_ tables, where denominators for "EP\_" variables are explicitly defined using census variables (adjunct variables are not modified).

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An object of class list of length 6.

Source

CDC/ATSDR SVI Documentation [https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)

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cty_cz_2020_xwalk	<i>Relationship file (crosswalk) between US counties and commuting zones</i>
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Description

This table contains GEOIDs for US counties and the commuting zones they are nested in. Commuting zones can be used to study regional economy with considerations of urban-rural interconnections across state lines. For details refer to papers by Fowler Jensen and Rhubart (2016) [doi:10.1007/s11113-016-9386-0](https://doi.org/10.1007/s11113-016-9386-0) and Fowler (2024) [doi:10.17605/OSF.IO/J256U](https://doi.org/10.17605/OSF.IO/J256U).

Usage

cty\_cz\_2020\_xwalk

**Format**

**A data frame with 2 columns and 3222 rows::**

**GEOID** US county FIPS code.

**GEOID2** Commuting zone ID for the year 2020.

**Source**

<https://sites.psu.edu/psucz/data/>

---

find_svi	<i>Retrieve census data and calculate SVI for one or multiple year(s)/state(s)</i>
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**Description**

find\_svi() is like a wrapper for `get_census_data()` and `get_svi()` that retrieves census data and produces SVI for one or multiple years(s) and state(s). For multiple year-state entries, SVI is obtained from percentile rankings for each entry and summarised into one table. Note that a Census API key is required for this function to work, which can be obtained at [https://api.census.gov/data/key\\_signup.html](https://api.census.gov/data/key_signup.html) and set up using `tidycensus::census_api_key()`.

**Usage**

```
find_svi(year, state = NULL, geography, key = NULL, full.table = FALSE)
```

**Arguments**

year	A vector containing years of interest (available 2012-2022). Length $\geq 1$ . Acting as pairs with state, year should be of the same length as state. The exception is when it's a single year entry (length 1), other than providing one state of interest, supply state = NULL as default or state = 'US' retrieves and processes nation level data to obtain SVI.
state	A vector containing states of interest. Length $\geq 0$ . Length 0 (state = NULL), or state = 'US' must be used with single year argument, when SVI is calculated from nation-level census data. In other cases, state must have the same elements as year (same length).
geography	One geography level of interest for all year-state combination (e.g."county", "zcta", "tract").
key	Your Census API key. Obtain one at <a href="https://api.census.gov/data/key_signup.html">https://api.census.gov/data/key_signup.html</a> . To set up, use <code>tidycensus::census_api_key("YOUR KEY GOES HERE")</code> , or include it as an argument.
full.table	Default as FALSE, returning SVI table with only "GEOID", and SVI for each theme and all themes. If set as TRUE, a full SVI table with individual SVI variables and intermediate ranking calculations are also included in addition to the theme-related SVIs (similar style to tables from CDC/ATSDR database( <a href="https://www.atsdr.cdc.gov/placea">https://www.atsdr.cdc.gov/placea</a>

## Value

A tibble of summarised SVI for one or multiple year-state combination(s) of interest. Rows represent the geographic units, and columns represent its SVI for each theme and all themes. Additional two columns at the end indicate the corresponding state and year information. For `full.table = TRUE`, estimated count and percentage values for individual SVI variables are also included. For description of variable names (column names), please refer to CDC/ATSDR documentation ([https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)).

## Examples

```
# Census API key required
# For one year-state entry
find_svi(
  year = 2019,
  state = "AZ",
  geography = "county"
)

# For multiple year-state pairs
## All ZCTAs for 2017-AZ; 2017-DE; and 2018-DC
year <- c(2017, 2017, 2018)
state <- c("AZ", "DE", "DC")
info <- data.frame(year, state)

find_svi(
  year = info$year,
  state = info$state,
  geography = "zcta"
)
```

---

find_svi_x	<i>Retrieve census data and calculate SVI for a customized geographic level</i>
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## Description

`find_svi_x()` is like a wrapper for `get_census_data()` and `get_svi_x()` that retrieves census data and produces SVI for a customized geographic level consisted of a Census geography. The census data is retrieved at the Census geographic level, and estimate counts are summed across the customized geographic level to calculate SVI. Note that a Census API key is required for this function to work, which can be obtained at [https://api.census.gov/data/key\\_signup.html](https://api.census.gov/data/key_signup.html) and set up using `tidycensus::census_api_key()`.

**Usage**

```
find_svi_x(
  year,
  geography,
  state = NULL,
  county = NULL,
  key = NULL,
  geometry = FALSE,
  xwalk
)
```

**Arguments**

year	A year of interest (available 2012-2022).
geography	The Census geography level of interest (e.g. "county", "zcta", "tract").
state	(Optional) Specify the state of interest. Default state = NULL or state = 'US' return nation-level data.
county	(Optional) Specify the county of interest, must be combined with a value supplied to "state".
key	Your Census API key. Obtain one at <a href="https://api.census.gov/data/key_signup.html">https://api.census.gov/data/key_signup.html</a> . To set up, use <code>tidycensus::census_api_key("YOUR KEY GOES HERE")</code> , or include it as an argument.
geometry	Default as FALSE for retrieving census data without spatial information. Set as TRUE for retrieving census data with an additional geometry column containing simple feature geometry.
xwalk	A crosswalk (relationship table) between the Census geographic level and the customized geographic level of interest. A crosswalk between US counties and commuting zones <code>cty_cz_2020_xwalk</code> is included as an example, and please set the column names of the crosswalk as follows: <p><b>GEOID</b> Identifiers for the Census geographic level. Must contain values from GEOID column in data, and be in a compatible data type (character).</p> <p><b>GEOID2</b> Identifiers (characters or numeric values) for the customized geographic level that is larger geographic than the Census geographic level. The Census geographic level should be nested in the customized geographic level.</p> <p><b>NAME</b> An optional column of the names or description of the customized geographic level.</p>

**Value**

A tibble of SVI with rows representing the customized geographic units (with a column name of GEOID), and columns indicating variable names (first two columns containing geographic information). For detailed description of the variable names (column names), please refer to CDC/ATSDR documentation ([https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)).

## See Also

`find_svi()` for retrieving census data and calculating SVI for multiple year-state pairs at a Census geographic level. `get_census_data()` (with `exp = TRUE`) and `get_svi_x()` for separate functions for data retrieval and SVI calculation at a customized geographic level.

## Examples

```
# Census API key required

find_svi_x(
  year = 2020,
  geography = "county",
  xwalk = cty_cz_2020_xwalk
)
```

---

get_census_data	<i>Retrieve American Community Survey data for SVI variables</i>
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## Description

This function uses `tidycensus::get_acs()` with a pre-defined list of variables to retrieve ACS data for SVI calculation. Note that a Census API key is required for this function to work, which can be obtained at [https://api.census.gov/data/key\\_signup.html](https://api.census.gov/data/key_signup.html) and set up using `tidycensus::census_api_key()`.

## Usage

```
get_census_data(
  year,
  geography,
  state = NULL,
  county = NULL,
  key = NULL,
  geometry = FALSE,
  exp = FALSE,
  ...
)
```

## Arguments

year	The year of interest (available 2012-2022).
geography	The geography of interest (eg. state, county, zcta, tract)
state	(Optional) Specify the state of interest. If data for multiple states are retrieved together, ranking for SVI calculation will be performed among all states. <code>state = NULL</code> as default, or <code>state = 'US'</code> return nation-level data.
county	(Optional) Specify the county(s) of interest, must be combined with a value supplied to "state".



key	Your Census API key. Obtain one at <a href="https://api.census.gov/data/key_signup.html">https://api.census.gov/data/key_signup.html</a> . Include it in this argument or set up your key using <code>tidycensus::census_api_key("YOUR KEY GOES HERE")</code> .
geometry	Default as FALSE for a regular tibble of census data. If set as TRUE, returns a tibble with an additional geometry column containing simple feature geometry.
exp	Default as FALSE for retrieving EP_(percent estimate) variables directly from ACS when available (as described in CDC/ADSTR SVI dictionary ( <a href="https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html">https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html</a> )). If set as TRUE, uses explicitly defined denominators and retrieves the ACS data to calculate the EP variables for easier aggregation in downstream analysis (e.g. <code>get_svi_x()</code> ).
...	Other arguments; more details please see <code>tidycensus::get_acs()</code>

### Value

A tibble of ACS data with each row represents an enumeration (geographic) unit and each column represents a census variable ("wide" form).

### Examples

```
# Census API key required
get_census_data(
  year = 2018,
  geography = "county",
  state = "PA"
)
```

---

get_svi	<i>Calculate SVI for communities in a region from census data</i>
---------	---

---

### Description

`get_svi()` calculates and constructs an SVI table for a geographic level of interest based on CDC/ATSDR SVI documentation ([https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)). Briefly, by taking into account 4 themes of census variables that represent challenges in socioeconomic status, household characteristics, racial and ethnic minority status and housing/transportation, SVI uses percentile ranking within a region to indicate the relative social vulnerability of the geographic units (communities) in that region.

### Usage

```
get_svi(year, data)
```

### Arguments

year	The year of interest (available 2012-2021), must match the year specified in retrieving census data.
data	The census data retrieved by <code>get_census_data()</code> .

**Value**

A tibble of SVI with rows representing geographic units, and columns indicating variable names (first two columns containing geographic information). For detailed description of the variable names (column names), please refer to CDC/ATSDR documentation.

**Examples**

```
# Census API key required
pa2018 <- get_census_data(
  year = 2018,
  geography = "county",
  state = "PA")

get_svi(2018, pa2018)
```

---

get_svi_x	<i>Calculate SVI for communities from census data using customized boundaries</i>
-----------	---

---

**Description**

get\_svi\_x() calculates and constructs an SVI table for a *customized* geographic level of interest based on CDC/ATSDR SVI documentation ([https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)). By supplying a crosswalk (relationship table) between a Census geographic level and a customized geographic level, census data are summed across the customized geographic units, and SVI is calculated accordingly to indicate the relative social vulnerability of the geographic units (communities).

**Usage**

```
get_svi_x(year, data, xwalk)
```

**Arguments**

year	The year of interest (available 2012-2021), must match the year specified in retrieving census data.
data	The census data retrieved by get_census_data().
xwalk	A crosswalk (relationship table) between the Census geographic level and the customized geographic level of interest. A crosswalk between US counties and commuting zones <code>cty_cz_2020_xwalk</code> is included as an example, and please set the column names of the crosswalk as follows:  <b>GEOID</b> Identifiers for the Census geographic level. Must contain values from GEOID column in data, and be in a compatible data type (character). <b>GEOID2</b> Identifiers (characters or numeric values) for the customized geographic level that is larger geographic than the Census geographic level. The Census geographic level should be nested in the customized geographic level.

**NAME** An optional column of the names or description of the customized geographic level.

### Value

A tibble of SVI with rows representing the customized geographic units (with a column name of GEOID), and columns indicating variable names (first two columns containing geographic information). For detailed description of the variable names (column names), please refer to CDC/ATSDR documentation.

### See Also

[get\\_svi\(\)](#) for SVI calculation from census data at a Census geographic level, and [find\\_svi\(\)](#) for retrieving census data and calculating SVI for multiple year-state pairs.

### Examples

```
# Census API key required
cty2020 <- get_census_data(
  year = 2020,
  geography = "county",
  exp = TRUE
)

get_svi_x(year = 2020, data = cty2020, xwalk = cty_cz_2020_xwalk)
```

---

state\_valid

*Table of valid full names/abbreviations/FIPS codes of 52 states*

---

### Description

A reference table for valid input for state in `get_census_data()` and `find_svi()`. In addition, `state = "US"` or `state = NULL` is also accepted for nation-level data.

### Usage

```
state_valid
```

### Format

**A data frame with 3 columns and 52 rows::**

**st\_abbr** 2-letter abbreviation for states.

**state** State full name.

**fips\_code** Federal Information Processing System (FIPS) Codes for states.

### Source

County-state reference file 2020 <https://www.census.gov/programs-surveys/popest/geographies/reference-files.html>

---

variable\_calculation    *Table of census variables and formula for SVI calculation*

---

### Description

Each of these datasets contains a table of SVI variable names, related census variable names and their corresponding calculation formula for a year between 2012-2022. This is used to construct SVI results for the variables starting with "E\_"(estimate) and "EP\_"(percentage) after obtaining census data. Sometimes SVI variables are directly linked to census variables, and other times one or more census variable(s) are included to derive an SVI variable. Two series of calculation tables are included with different approaches to construct EP\_ variables. variable\_cal\_exp\_ series of dataset uses census variables explicitly as denominators, whereas variable\_e\_ep\_calculation\_ series of dataset retrieves percent from ACS when available (as described by CDC SVI documentation). Variables in theme 5 (adjunct variables) follow CDC SVI documentation and remain the same across both series of tables.

### Usage

```
variable_e_ep_calculation_2012
variable_e_ep_calculation_2013
variable_e_ep_calculation_2014
variable_e_ep_calculation_2015
variable_e_ep_calculation_2016
variable_e_ep_calculation_2017
variable_e_ep_calculation_2018
variable_e_ep_calculation_2019
variable_e_ep_calculation_2020
variable_e_ep_calculation_2021
variable_e_ep_calculation_2022
variable_cal_exp_2012
variable_cal_exp_2013
variable_cal_exp_2014
variable_cal_exp_2015
```

variable\_cal\_exp\_2016

variable\_cal\_exp\_2017

variable\_cal\_exp\_2018

variable\_cal\_exp\_2019

variable\_cal\_exp\_2020

variable\_cal\_exp\_2021

variable\_cal\_exp\_2022

### Format

#### **A data frame with 3 columns and various number of rows, depending:**

on the year:

**\_variable\_name** With a prefix "x" followed by the year, eg. x2018\_variable\_name, this column is the SVI variable name

**theme** SVI variables are categorized into four themes/domains: socioeconomic, household composition/disability, minority status/language and housing type/transportation. Theme 0 is used for 3 variables representing total counts, while theme 5 is used for adjunct variables (not included in calculation). Adjunct variables are not included in 2012 due to unavailable data/documentation.

**\_table\_field\_calculation** With a prefix "x" followed by the year, eg. x2018\_table\_field\_calculation, this column contains the corresponding census variable names, and/or the calculation using SVI/census variables.

An object of class tbl\_df (inherits from tbl, data.frame) with 35 rows and 3 columns.

An object of class tbl\_df (inherits from tbl, data.frame) with 35 rows and 3 columns.

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An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 35 rows and 3 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 51 rows and 3 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 51 rows and 3 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 51 rows and 3 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 51 rows and 3 columns.

## Source

CDC/ATSDR SVI Documentation [https://www.atsdr.cdc.gov/placeandhealth/svi/data\\_documentation\\_download.html](https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html)

---

<code>zcta_state_xwalk</code>	<i>Relationship file (crosswalk) for ZCTAs by state</i>
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---

## Description

Each of these tables contains ZIP Code Tabulation Areas (ZCTAs), their intersecting counties and the states (state name, abbreviation, state FIPS code) they are nested in. It's used in `get_census_data()` for retrieving ZCTA-level census data by state, as `tidycensus::get_acs()` (CRAN version) currently does not support obtaining state-specific ZCTA-level data.

## Usage

`zcta_state_xwalk2021`

`zcta_state_xwalk2020`

`zcta_state_xwalk2019`

`zcta_state_xwalk2022`

## Format

**A data frame with 5 columns and various number of rows, depending on the year::**

**ZCTA** 5 digit ZCTA code.

**st\_code** Federal Information Processing System (FIPS) Codes for States.

**county** County name within the state that the ZCTA intersects/corresponds to.

**state** State full name corresponding to the FIPS code.

**st\_abb** Two-letter state abbreviation.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 538426 rows and 5 columns.

An object of class `data.frame` with 519726 rows and 5 columns.

An object of class `tbl_df` (inherits from `tbl`, `data.frame`) with 538152 rows and 5 columns.

**Source**

Census ZCTA-county relationship file (2010) <https://www.census.gov/geographies/reference-files/time-series/geo/relationship-files.2010.html#list-tab-1709067297> Geocorr ZCTA-county relationship file (2020) <https://mcdc.missouri.edu/applications/geocorr2022.html> County-state reference file (2019, 2020, 2021, 2022) <https://www.census.gov/programs-surveys/popest/geographies/reference-files.html>

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