

Package ‘findSVI’

August 25, 2023

Title Calculate Social Vulnerability Index for Communities

Version 0.1.2

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)>.

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Encoding UTF-8

LazyData true

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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)

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glue, sf, ggplot2, tmap

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 2012-2021.

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

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.

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Source

CDC/ATSDR SVI Documentation https://www.atsdr.cdc.gov/placeandhealth/svi/data_documentation_download.html

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

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 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 2012-2021). Length ≥ 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 ≥ 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 https://api.census.gov/data/key_signup.html . To set up, use tidycensus::census_api_key("YOUR KEY GOES HERE"), 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).

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](#).

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"
  )

```

get_census_data

Retrieve American Community Survey data for SVI variables

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 and set up using `tidycensus::census_api_key()`.

Usage

```

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

```

Arguments

year	The year of interest (available 2012-2021).
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 https://api.census.gov/data/key_signup.html . Include it in this argument or set up your key using <code>tidycensus::census_api_key("YOUR KEY GOES HERE")</code> .
geometry	Default as <code>FALSE</code> for a regular tibble of census data. If set as <code>TRUE</code> , returns a tibble with an additional geometry column containing simple feature geometry.
...	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

Calculate SVI for communities in a region from census data

Description

get_svi() calculates and constructs an SVI table for a geographic level of interest based on [CDC/ATSDR SVI documentation](#). 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 2014-2021), must match the year specified in retrieving census data.
data	The census data retrieved by get_census_data().

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)
```

state_valid	<i>Table of valid full names/abbreviations/FIPS codes of 52 states</i>
-------------	--

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	<i>Table of census variables and formula for SVI calculation</i>
----------------------	--

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 2012-2021. 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.

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

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 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

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

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
```

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 542995 rows and 5 columns.

An object of class `data.frame` with 523727 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) <https://www.census.gov/programs-surveys/popest/geographies/reference-files.html>

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