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Texas Water Research Network

Texas Social Vulnerability Index
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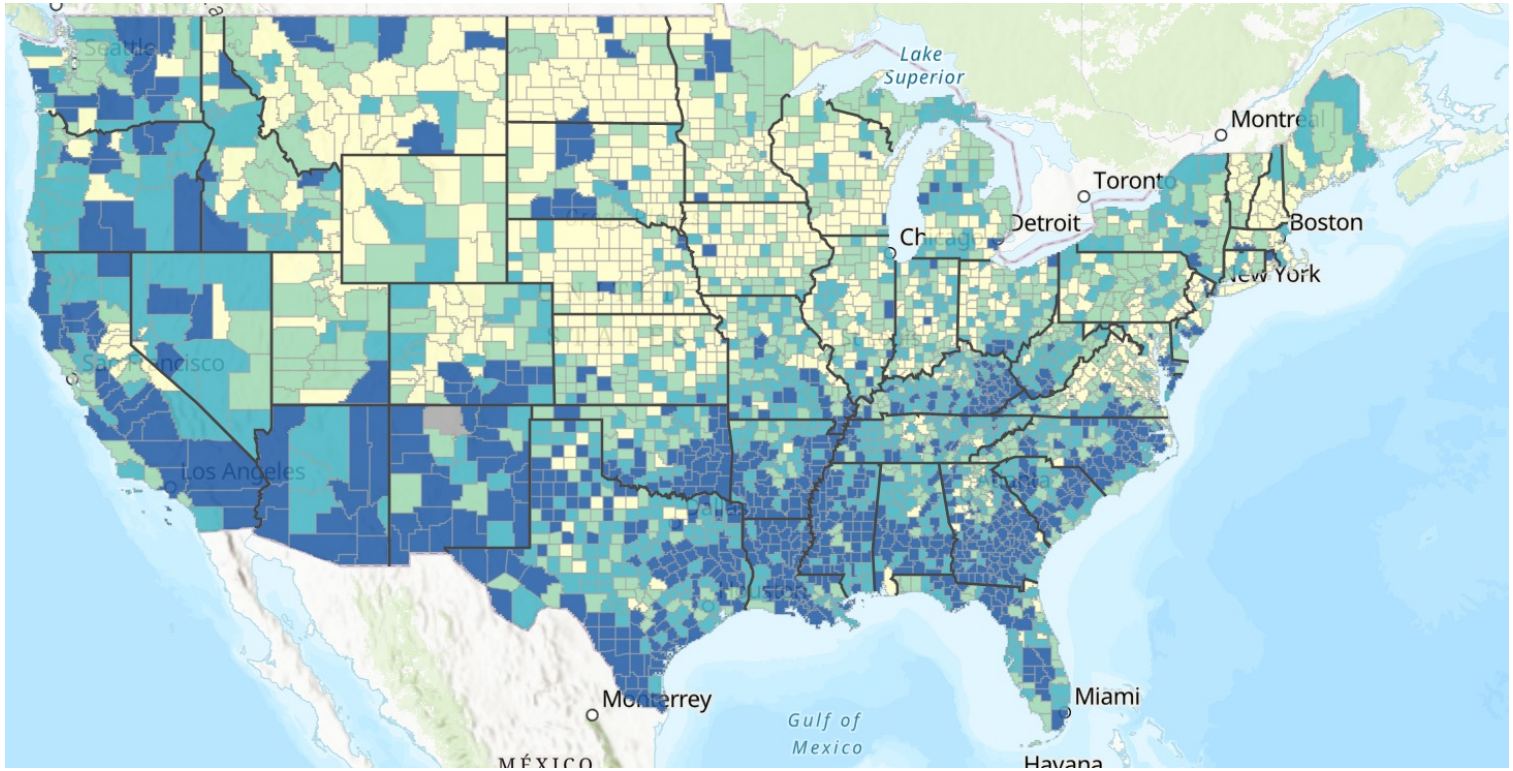
Lyndon B. Johnson School of Public Affairs

Social Vulnerability Index: What?

- A census-based index used to determine the sensitivity of communities to shocks and stressors based on social, economic, and demographic factors.
- First developed in 2006 (following the Pandemic and All-Hazards Preparedness Act).
- Rapid use and utilization as a research tool for climate preparedness and planning, as well as recovery efforts among vulnerable communities following a disaster.



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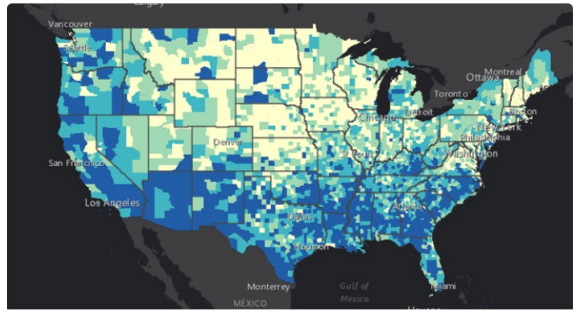
CDC/ATSDR Social Vulnerability Index

Social vulnerability refers to the potential negative effects on communities caused by external stresses on human health. Such stresses include natural or human-caused disasters, or disease outbreaks. Reducing social vulnerability can decrease both human suffering and economic loss.



Explore the CDC/ATSDR SVI Interactive Map

ATSDR Agency for Toxic Substances and Disease Registry

SoVI® — Social Vulnerability Index

The Social Vulnerability Index (SoVI®) 2010–2014 measures the social vulnerability of all United States counties to environmental hazards. The index was created using 29 socieconomic variables, which research literature suggests contribute to the reduction in a community's ability to prepare for, respond to, and recover from hazards. Download the county level scores by state for SoVI 2010-2014 and county SoVI maps.

Social Vulnerability Index: What?

CDC SVI:

- 15 variables
- Available at county and census tract
- Last updated in 2018 (2014-2018 ACS data)
- Download by state available, but PCA conducted by national variables

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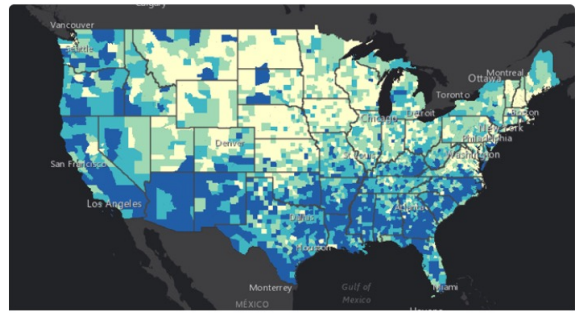

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University of South Carolina

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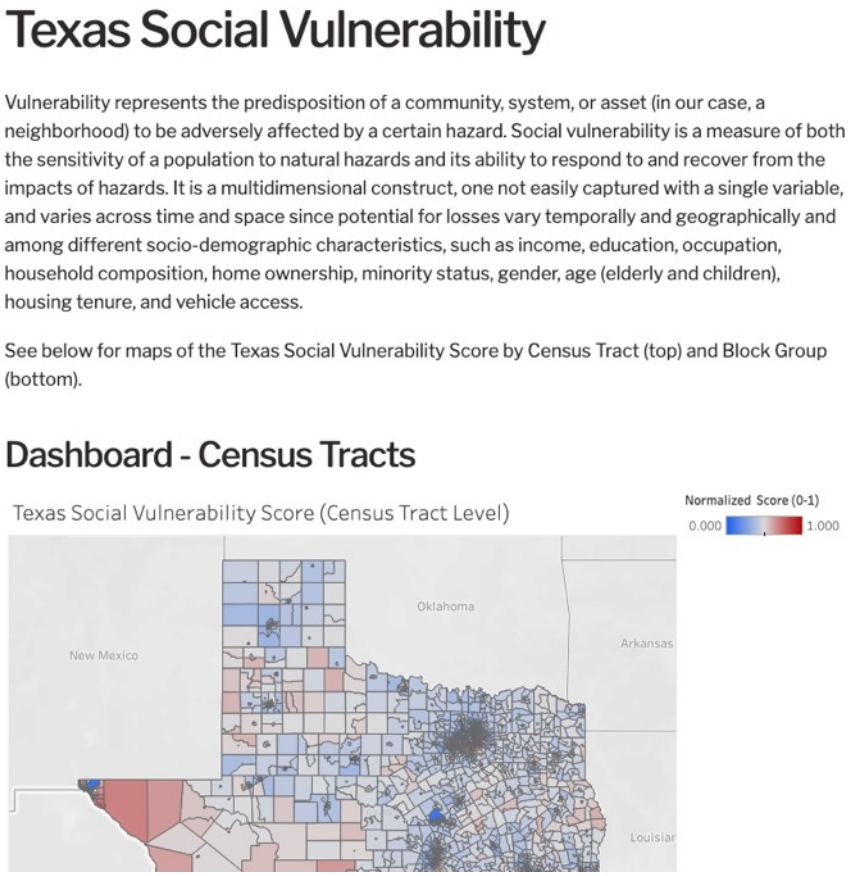
Social Vulnerability Index: Why?



Texas SVI addresses the following gaps:

- Regularly update based on annual release of census data
- Use variables that are important in Texas
- Assess at a lower spatial resolution (census block groups vs. census tracts and county)

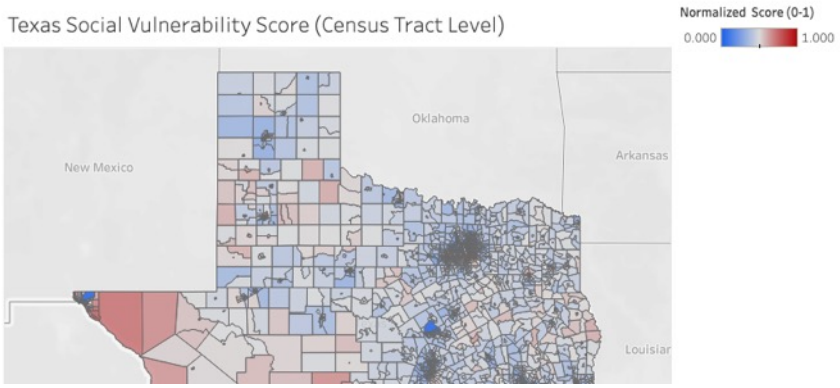
Texas Metro Observatory

Texas Social Vulnerability

Vulnerability represents the predisposition of a community, system, or asset (in our case, a neighborhood) to be adversely affected by a certain hazard. Social vulnerability is a measure of both the sensitivity of a population to natural hazards and its ability to respond to and recover from the impacts of hazards. It is a multidimensional construct, one not easily captured with a single variable, and varies across time and space since potential for losses vary temporally and geographically and among different socio-demographic characteristics, such as income, education, occupation, household composition, home ownership, minority status, gender, age (elderly and children), housing tenure, and vehicle access.

See below for maps of the Texas Social Vulnerability Score by Census Tract (top) and Block Group (bottom).

Dashboard - Census Tracts



Bixler and Yang 2020a, tmo.utexas.edu

- First constructed in 2018
- Started with ~50 variables derived from literature
- Tract measure contains 22 variables
- Block group contains 18 variables

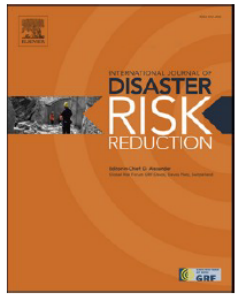
	Variables	Category/ Cardinality	Components / Loading scores					
			1	2	3	4	5	6
1	QRICH	Wealth (-)	**0.915**	-0.13	0.059	0.014	-0.085	-0.042
2	MDHSEVAL		**0.892**	-0.09	-0.065	-0.145	-0.072	-0.006
3	PERCAP		**0.86**	-0.258	0.093	-0.223	-0.2	-0.016
4	MDGRENT		**0.61**	-0.384	-0.177	0.158	-0.171	0.03
5	QESL	Language & Education (+)	-0.134	**0.806**	-0.105	0.175	-0.002	-0.09
6	QSPANISH		-0.288	**0.739**	-0.104	0.379	-0.104	-0.066
7	QED12LES		-0.365	**0.732**	0.022	0.291	0.131	-0.126
8	QSSBEN	Elderly (+)	-0.161	-0.041	**0.896**	-0.02	0.053	0.022
9	QAGEDEP		-0.003	-0.001	**0.859**	-0.116	-0.012	0.114
10	MEDAGE		0.235	-0.181	**0.658**	-0.357	-0.196	-0.008
11	PPUNIT	Housing Status (+)	-0.083	0.216	-0.138	**0.874**	-0.038	-0.067
12	QFAM		-0.064	0.159	-0.162	**0.844**	0.055	0.096
13	QCVLUN	Social Status (+)	-0.09	0.054	0.135	0.243	**0.723**	-0.097
14	QBLACK		-0.185	-0.278	-0.178	-0.056	**0.666**	0.151
15	QNOAUTO		-0.12	0.486	0.039	-0.299	**0.559**	0.095
16	QPOVTY		-0.144	0.432	-0.166	-0.111	**0.533**	0.082
21	QFEMALE	Female (+)	0.052	0.031	0.146	0.067	-0.021	**0.877**
22	QFEMLBR		-0.081	-0.173	-0.021	-0.048	0.105	**0.836**

*Rotation Method: Varimax with Kaiser Normalization.

Contents lists available at ScienceDirect

International Journal of Disaster Risk Reduction

journal homepage: www.elsevier.com/locate/ijdrr



Boundary crossing for urban community resilience: A social vulnerability and multi-hazard approach in Austin, Texas, USA

R. Patrick Bixler [a,b,*], Euijin Yang [c], Steven M. Richter [b], Marc Coudert [d]

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[b] Community and Regional Planning Program, School of Architecture, University of Texas at Austin, USA
[c] Department of Civil, Architectural and Environmental Engineering, The University of Texas at Austin, USA
[d] Office of Sustainability, City of Austin, USA

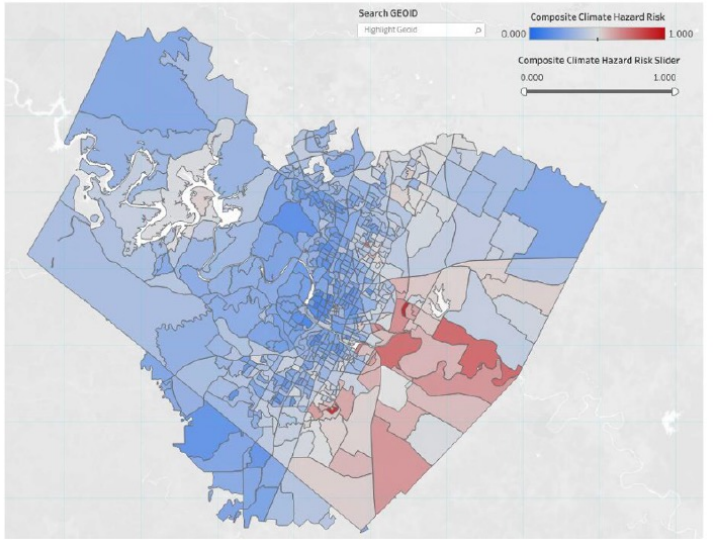


Fig. 4. Austin Multi-hazard Risk (flood + wildfire + heat + social vulnerability).

Creating a Social Vulnerability Index with ACS Data

Patrick Bixler and Ethan Tenison

May 16, 2022

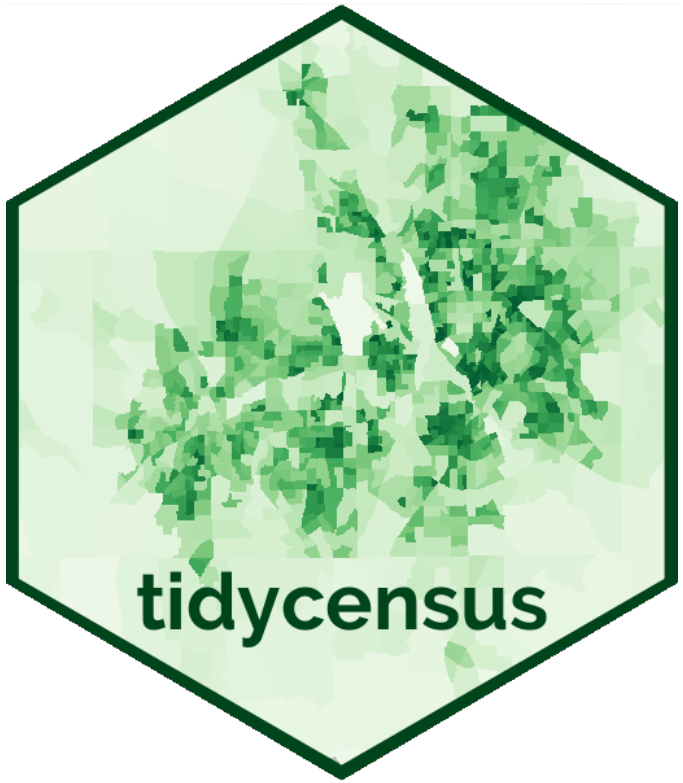
Constructing the Social Vulnerability index

For reference, the following (Medium Post)[https://medium.com/analytics-vidhya/the-factor-analysis-for-constructing-a-composite-index-2496686fc54c] was used to guide the svi's consturction. While it was conducted in Python using a variety of packages, I was able to recreate it in R using primarily the `psych` and `caret` packages which are used extensively in statistics.

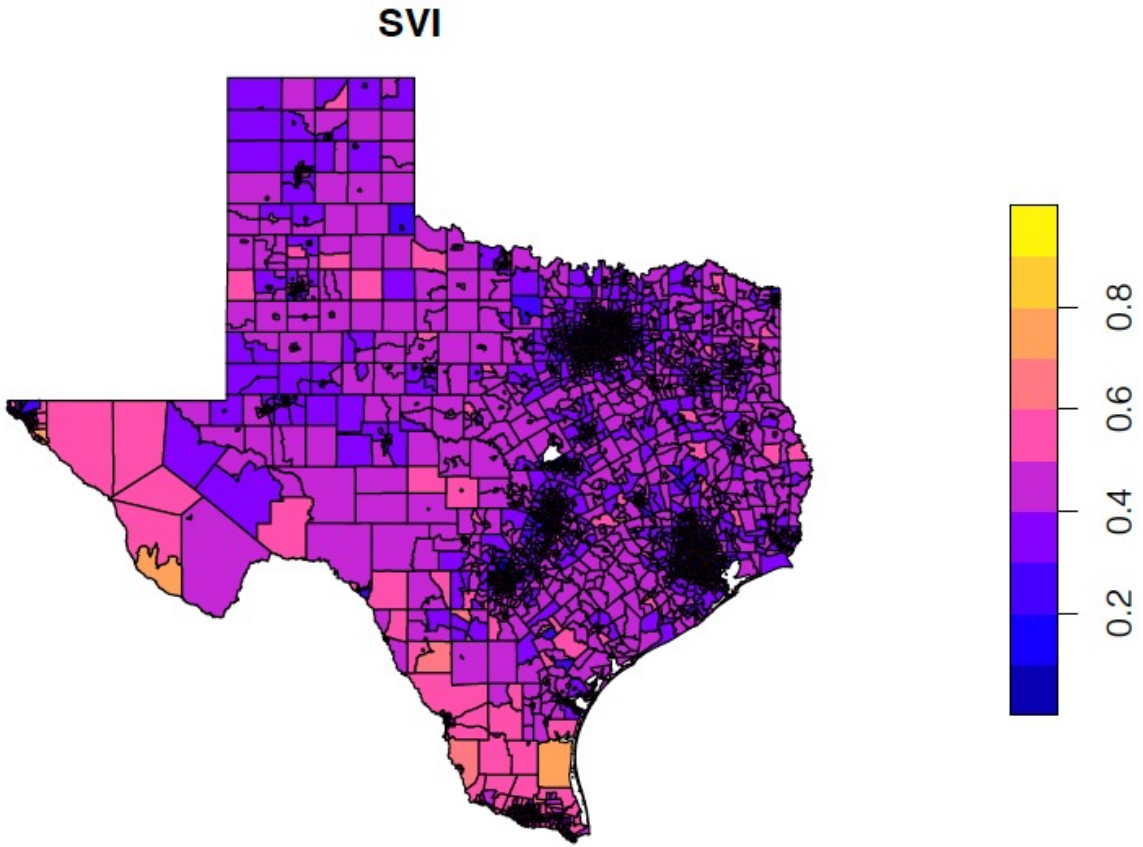
ACS Variables

In order to construct the Social Vulnerability Index, 18 variables were pulled from the 2020 ACS 5-year estimates using the `tidycensus` package. The variables are as follows:

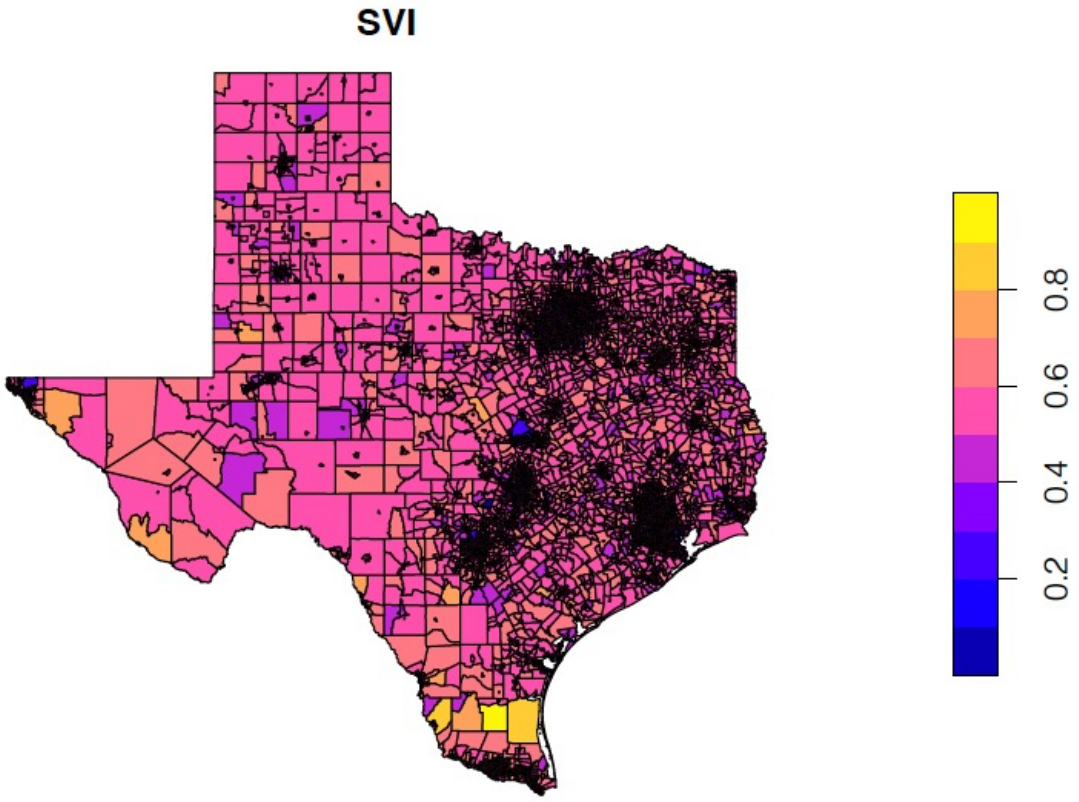
- Wealth
  - QRICH = Percent Households Earning over $200,000 annually
  - MDHSEVAL = Median Housing Value
  - PERCAP = Per Capita Income
  - MDGRENT = Median Gross Rent
- Language & Education
  - QESL = Percent Speaking English as a Second Language with Limited Proficiency
  - QSPANISH = Percent Hispanic
  - QED12LES = Percent Less than high school education for population over 25 years and older
- Elderly
  - QSSBEN = Percent Households Receiving Social Security Benefits
  - QAGEDEP = Percent Population under 5 years or 65 and over
  - MEDAGE = Median age
- Housing Status
  - PPUNIT = People per Unit (Average household size)
  - QFAM = Percent Children Living with both parents
- Social Status
  - QCVLUN = Percent Unemployment for Civilian in Labor Force 16 Years and Over
  - QBLACK = Percent Black or African American Alone
  - QNOAUTO = Percent Housing Units with No Car
  - QPOVTY = Percent Poverty
- Gender
  - QFEMALE = Percent Female
  - QFEMLBR = Percent Female Participation in Labor Force

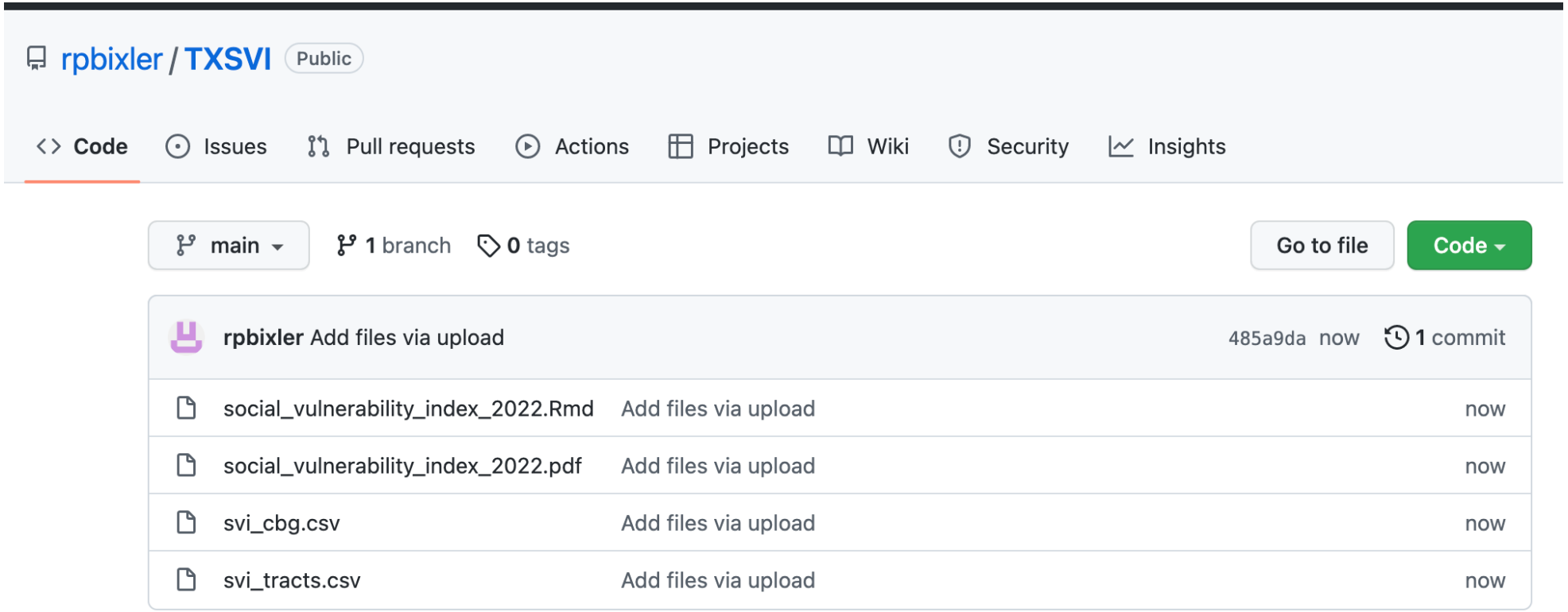


2020 Census Tract



2020 Census Block Group





https://github.com/rpbixler/TXSVI

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