Florida Housing Coalition Hurricane Member Update Webinar

January 14, 2022
Sponsored by Fannie Mae

AGENDA

- Announcements
- Flood recovery outcomes and disaster assistance barriers for vulnerable populations

Training Announcement

Design Your Housing RFP Process for Quality Responses

January 18 at 10:00 am

Register at
https://attendee.gotowebinar.com/register/2585926420576766220

Fannie Mae

THE FLORIDA HOUSING COALITION

Training Announcement

Best Practices in Homelessness Prevention

January 20 at 10:00 am

Register at
https://attendee.gotowebinar.com/register/7951665209915165199

Fannie Mae

THE FLORIDA HOUSING COALITION

Training Announcement

Planning to Shelter in Place

January 26 at 10:00 am

Register at
https://attendee.gotowebinar.com/register/2632188372316368399

Flood Recovery Outcomes and Disaster Assistance Barriers for Vulnerable Populations

Dr. Christopher Emrich

University of Central Florida

Christopher.emrich@ucf.edu

Fannie Mae

THE FLORI

Disaster Equity: Linking Social Vulnerabilities to Disaster Outcomes

Florida Housing Coalition Hurricane Member Update January 14 2022

Dr. Christopher T. Emrich
Boardman Endowed Associate Professor of Environmental Science and Public Administration
School of Public Administration & National Center for Integrated Coastal Research
and Core Member, Sustainable Coastal Systems Cluster

UCF

Dr. Chris Emrich, Ph.D. GISP

- **Received Ph.D. in 2005 (UofSC)**
- **Currently Endowed Associate Professor of Environmental Science and Public Administration**
- **Founding Member of UCF Coastal**
- **Creator of www.vulnerabilitymap.org**
- **Formerly**
  - **FEMA Long Term Recovery GIS Unit Leader**
- **Research Interests:**
  - Social vulnerability measurement and application
  - Assessing social equity in disaster response and recovery
  - Developing innovative emergency management solutions

VMAP
VULNERABILITY MAPPING ANALYSIS PLATFORM

UCF

Short History of my Career (to date)

Through this process, I have been fortunate enough to:
- Lead and partner on > 40 extramurally funded projects (> $8 million),
- Author 80+ peer reviewed pubs, grey literature pieces, book chapters
- Continue to teach the next generation both in/out of the classroom

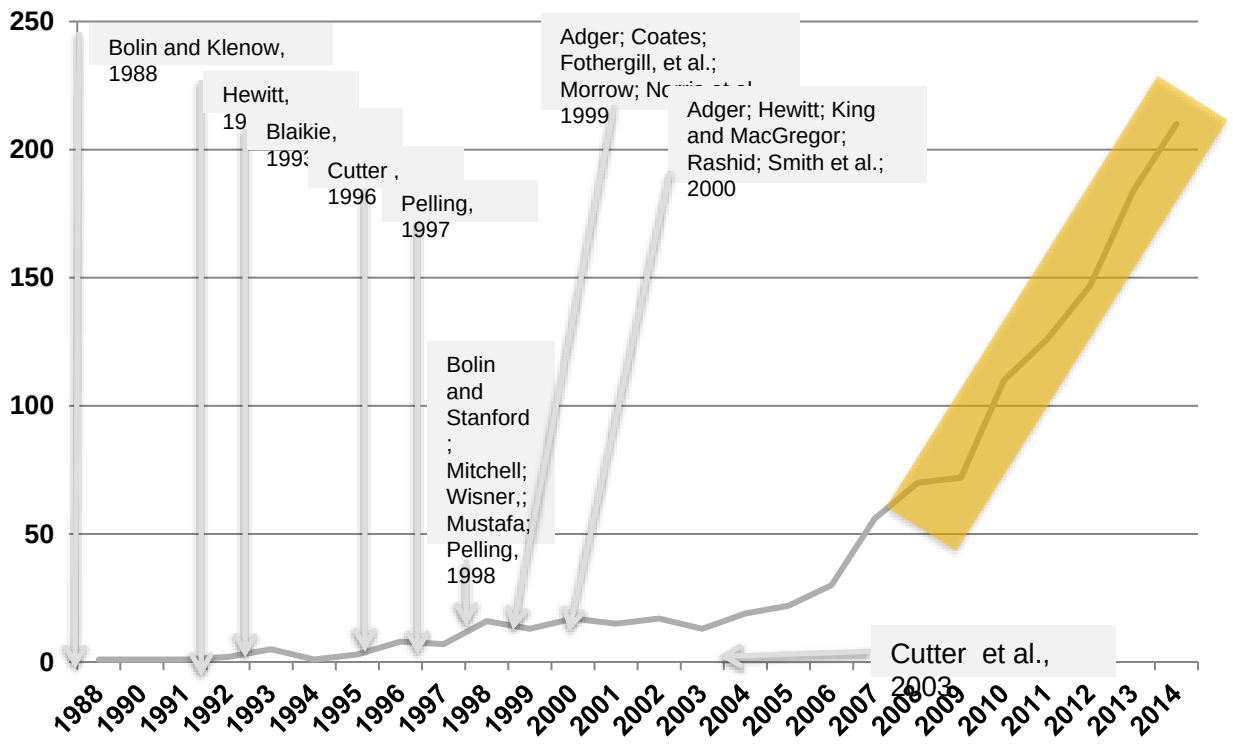
Building Resilience Against Climate Effects (BRACE)

How Do I Approach Equity Research?

Social Vulnerability

Measuring the Concept

The rise of social vulnerability in literature



Since 2003 there have been more than 1,050 case studies identifying vulnerable populations

What do we know about social vulnerability?

Special needs populations

difficult to identify (infirm, transient) let alone measure; invariably left out of recovery efforts; often invisible in communities

Age (elderly and children)

affect mobility out of harm's way; need special care; more susceptible to harm

Socioeconomic status (rich; poor)

ability to absorb losses and recover (insurance, social safety nets), but more material goods to lose

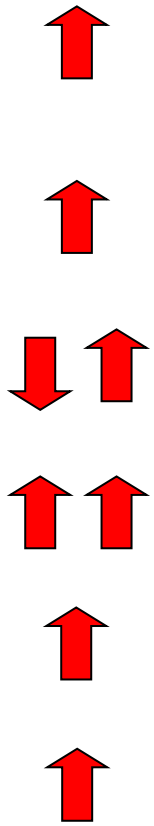
Race and ethnicity (non-white; non-Anglo)

impose language and cultural barriers; affect access to post-disaster recovery funding; tend to occupy high hazard zones

Gender (women)

gender-specific employment, lower wages, care-giving role

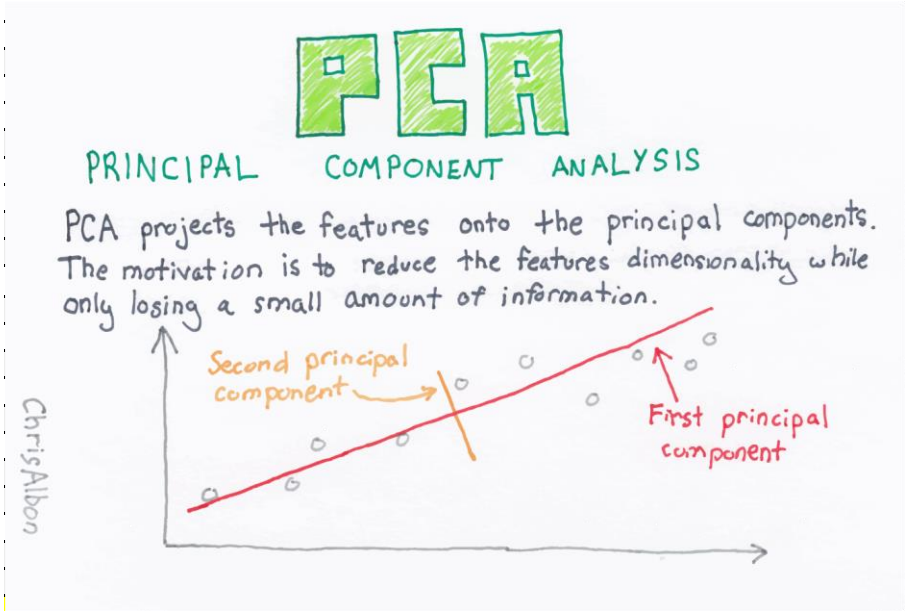
Housing type and tenure (mobile homes, renters)



Heinz Center, 2002. *Human Links to Coastal Disasters*. Washington D.C.: The H. John Heinz III Center for Science, Economics and the Environment.

Turning data into metrics – SoVI inputs and methods

PILLAR	DESCRIPTION
Employment Structure	Percent Civilian Unemployment
	Percent Employment in Extractive Industries
	Percent Employment in Service Industry
	Percent Female Participation in Labor Force
Housing	Percent Renters
	Percent Mobile Homes
	Percent Unoccupied Housing Units
Population structure	Percent Population under 5 years or 65 and over
	Percent of Children Living in 2-parent families
	Median Age
	Percent Female
	Percent Female Headed Households
	People per Unit
Race/Ethnicity	Percent Asian
	Percent Black
	Percent Hispanic
	Percent Native American
Socioeconomic Status	Percent Poverty
	Percent Households Earning over $200,000 annually
	Per Capita Income
	Percent with Less than 12th Grade Education
	Median Housing Value
	Median Gross Rent
Special Needs	Percent Households Receiving Social Security Benefits
	Percent Speaking English as a Second Language with Limited English Proficiency
	Nursing Home Residents Per Capita
	Percent of population without health insurance
	Percent of Housing Units with No Car



What Does SoVI Look Like?

As a Table

US Tract-Level 2006-2010 Social Vulnerability Component Summary

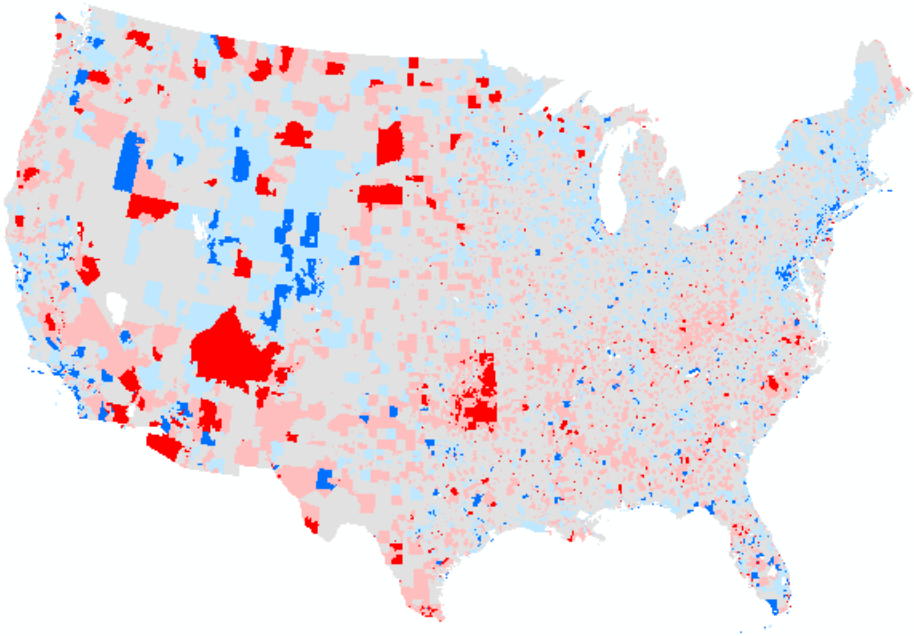
Component	*Cardinality*	*Name*	*% Variance Explained*	*Dominant Variables*	*Component Loading*
1	+	Class (Poverty) and Race (Black)	17.644	QPOVTY	0.777
				QNOAUTO	0.761
				QFHH	0.688
				QBLACK	0.677
				QRENTER	0.641
				QCVLUN	0.613
				QSERV	0.610
				QED12LES	0.506
				QFAM	-0.747
2	-	Wealth	13.048	MDHSVAL	0.895
				QRICH200K	0.779
				MDGRENT	0.756
				PERCAP	0.705
				QASIAN	0.554
3	+	Age (Old)	11.298	QSSBEN	0.874
				QAGEDEP	0.866
				MEDAGE	0.787
4	+	Ethnicity (Hispanic)	10.459	QHISP	0.795
				QED12LES	0.690
				QESL	0.591
5	+	Gender (Female)	6.934	QFEMALE	0.755
				QFEMLBR	0.647
6	+	Nursing Home Residents	4.933	QNRRES	0.571
7	+	Ethnicity (Native American)	4.151	QNATAM	0.932
		Cumulative Variance Explained	**68.467**		

Influence on SoVI Score +/-

Driving variables explaining component

Correlation with component

As a Map



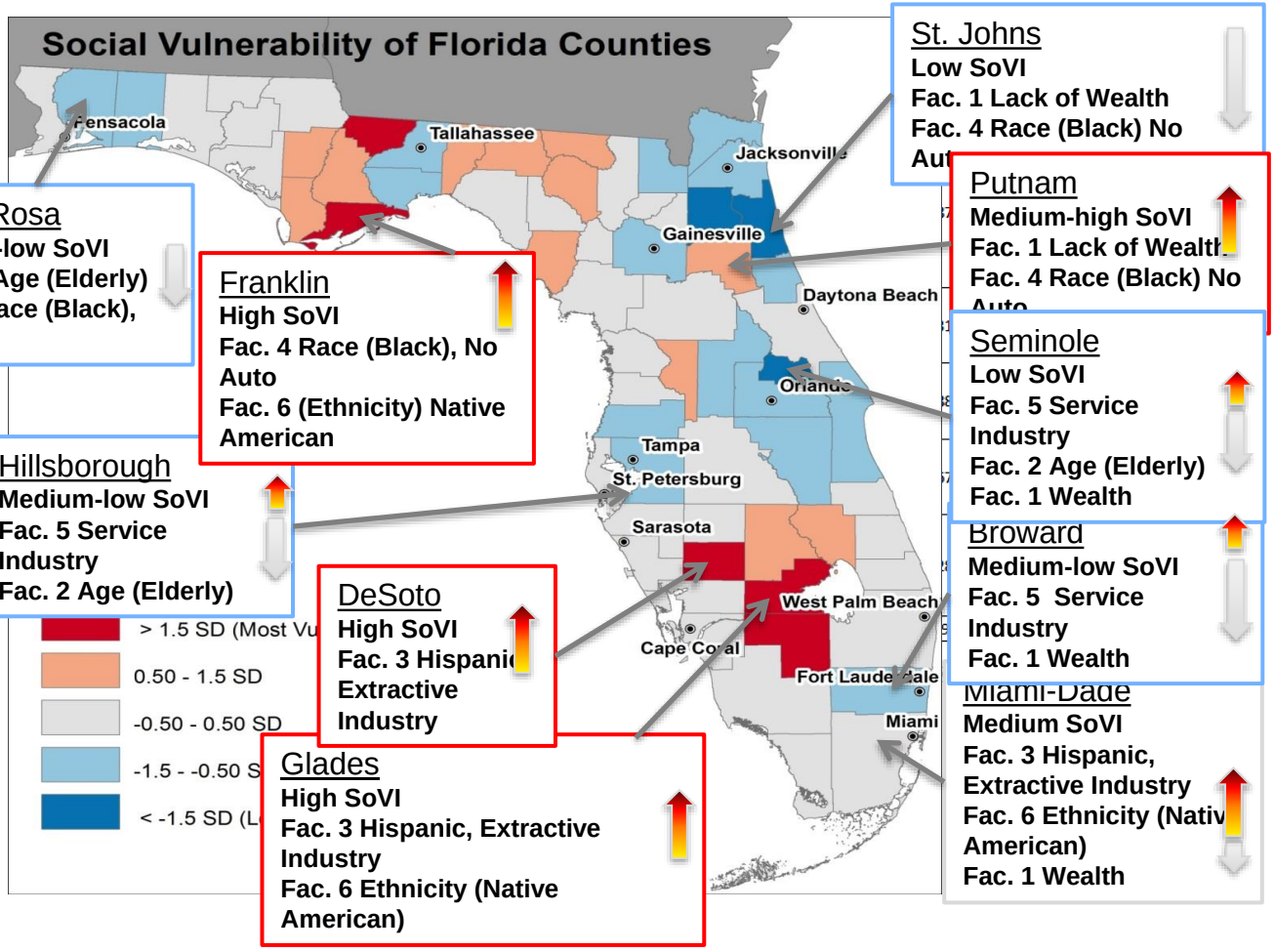
For any place on a map, users can

- See what drives SoVI up or down
- Overlay other spatial data to understand interactions

Social Vulnerability

Time and Space Considerations

Social Vulnerability in Florida



Santa Rosa
Medium-low SoVI
Fac. 2 Age (Elderly)
Fac. 4 Race (Black), No Auto

Franklin
High SoVI
Fac. 4 Race (Black), No Auto
Fac. 6 (Ethnicity) Native American

Hillsborough
Medium-low SoVI
Fac. 5 Service Industry
Fac. 2 Age (Elderly)

DeSoto
High SoVI
Fac. 3 Hispanic Extractive Industry

Glades
High SoVI
Fac. 3 Hispanic, Extractive Industry
Fac. 6 Ethnicity (Native American)

St. Johns
Low SoVI
Fac. 1 Lack of Wealth
Fac. 4 Race (Black) No Aut

Putnam
Medium-high SoVI
Fac. 1 Lack of Wealth
Fac. 4 Race (Black) No Auto

Seminole
Low SoVI
Fac. 5 Service Industry
Fac. 2 Age (Elderly)
Fac. 1 Wealth

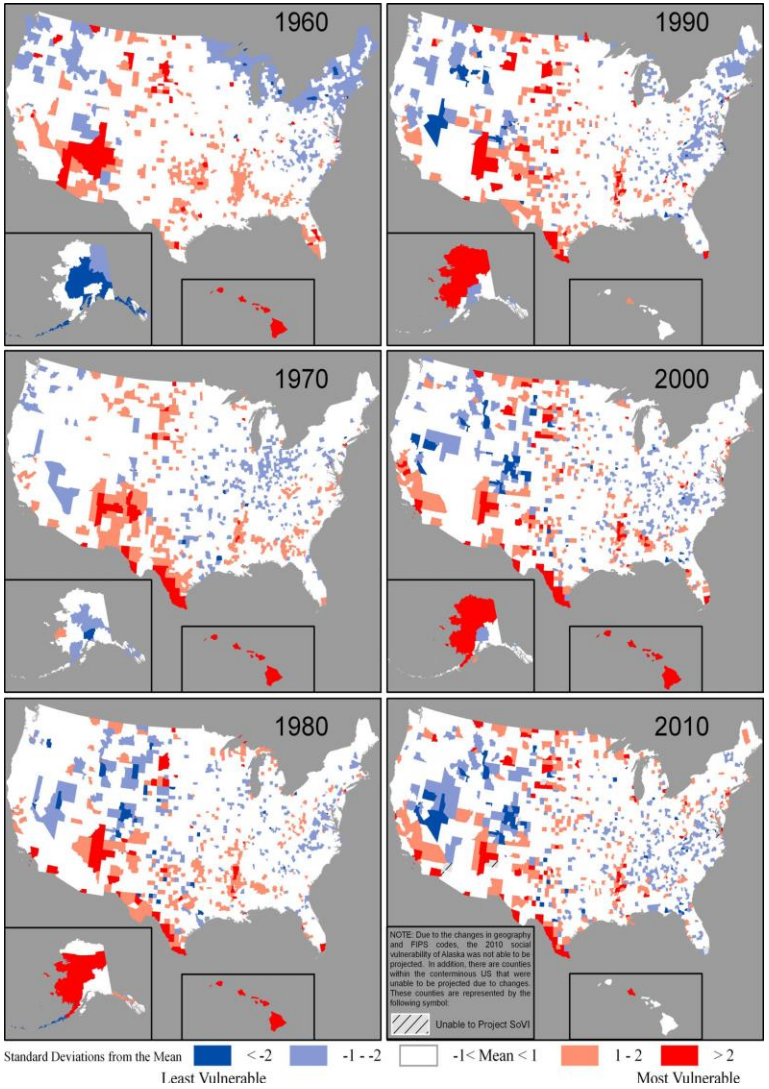
Broward
Medium-low SoVI
Fac. 5 Service Industry
Fac. 1 Wealth

Miami-Dade
Medium SoVI
Fac. 3 Hispanic, Extractive Industry
Fac. 6 Ethnicity (Native American)
Fac. 1 Wealth

SoVI's Robustness Over Time

Changes in Social Vulnerability

1960-2010



Cutter, S.L. and C. Finch, 2008. Temporal and spatial changes in social vulnerability to natural hazards. *PNAS* 105 (7): 2301-2306.

SoVI's Scalability

Components:

Race/ethnicity & class

Age & ethnicity (Hispanic kids)

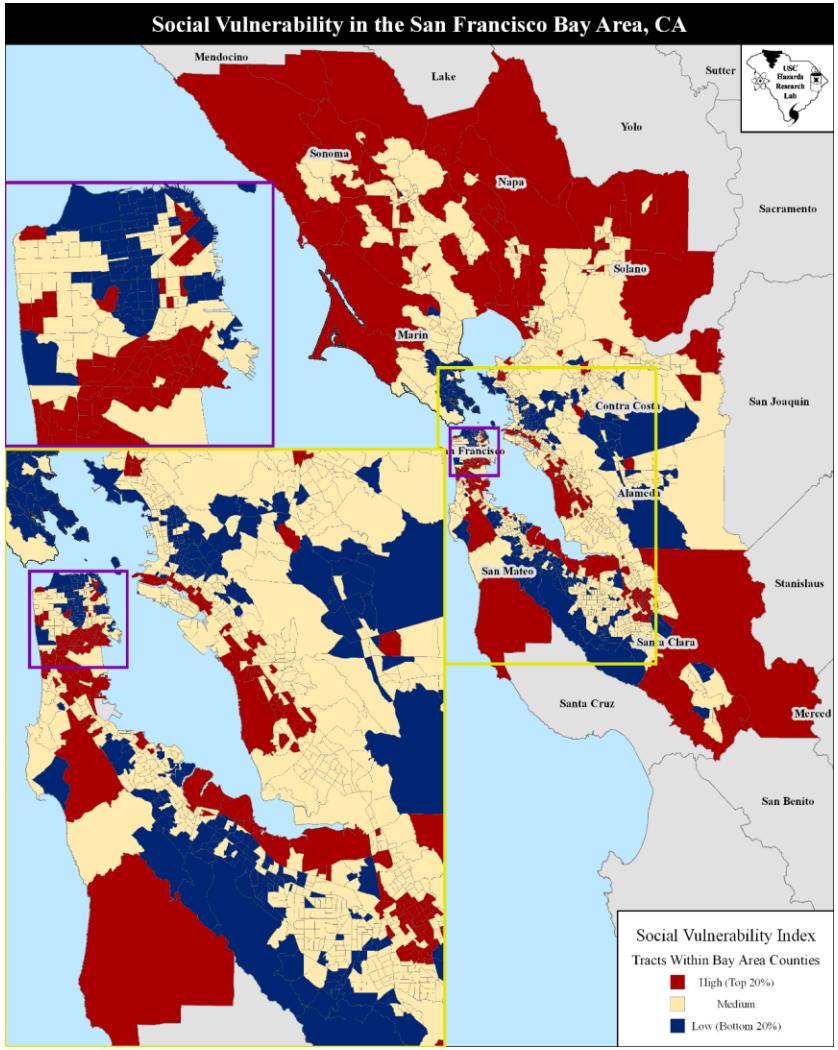
Urban/rural

Elderly

% Variance explained = 75.2%

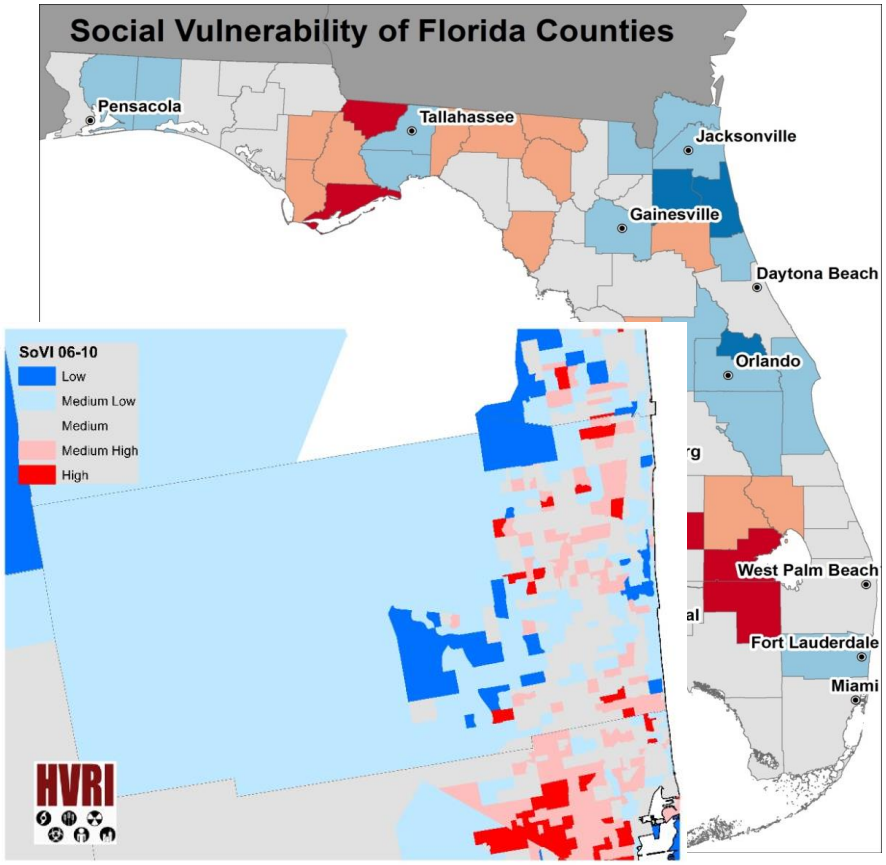
8 factors

N=1404



Fritz Institute

SoVI in Finer Detail



Just because a county is characterized by one level of vulnerability does not mean that all parts of the said county exhibit the same characteristics.

Social Vulnerability	Tract Count	Housing Units	2010 Population
High	14	49,476	65,980
Medium High	62	140,578	261,646
Medium	152	339,128	747,580
Medium Low	103	216,956	512,144
Low	30	64,250	160,716

Zooming in or downscaling enables a more comprehensive understanding of the driving forces of vulnerability

Social Vulnerability

Links to Disaster Outcomes

Social Vulnerability and Sandy Recovery

At the tract level for the NY Hurricane Sandy impact area, several social indicators were linked with impact, damage, and receipt of federal (IA funds). Found that **not all social measures perform the same** in predicting impact or receipt of aid

How to improve:

- **Perform more of the same sort of analyses for different disasters.**
- **Collect more socio-economic and demographic data about applicants**
- **Enable researchers to link point level IHP data with census data so that we do not have to aggregate to different geographies**

Sandy outcomes. SoVI was positively and significantly related to applicants and housing unit damage. The SVI had negative relationships with housing damage, property loss, and renters, contrary to our hypotheses. The SVI had the weakest explanatory power of the social vulnerability assessments. At the other end, the SVP is the only model with significant positive relationships with all of the Sandy outcomes, even in the case of a Bonferroni correction. The ANOVA and the Kruskal–Wallis

https://doi.org/10.1080/24694452.2018.1535887

Social Vulnerability and Flood Recovery

At the tract level for the SC (2015) CDBG-DR Counties, several selected social indicators (aligned with SBA, IA, NFIP, and CDBG programs) were linked with impact, damage, and receipt of federal.

How to improve:

- **Perform more of the same sort of analyses for different disasters.**
- **Collect more socio-economic and demographic data about applicants**
- **Enable researchers to link point level outcome data with census data so that we do not have to aggregate to different geographies**

Table 6. Significant regression results for each recovery programme and the composite Federal disaster safety net†.

	Influence on Prgram Specific Federal Disaster Recovery Support				
	FEMA IA Grants	SBA Loans	NFIP Payouts	CDBG-DR Grants	Federal Disaster Safety Net
Univariate Drivers of Disaster Losses and Funding					
Programme Specific Loss† Per Capita	1.04*** (0.08)	−0.29*** (0.11)	0.96*** (0.05)	1.07*** (0.07)	
Per Capita Income	0.02*** (0.00)	0.74** (0.34)			
% Renters			−20,486.9** (9975.40)		
% Black		−61,082.98*** (20,907.17)			
% Service Sector Employment				82,196.59*** (24,141.02)	
Compounded (Multi-Variate Drivers of Disaster Losses and Funding)					
Programme Specific Loss† and Per Capita Income	−0.00*** (0.00)	0.00*** (0.00)	−0.00** (0.00)		0.00** (0.00)
Programme Specific Loss† and % Renters			−0.38*** (0.04)	0.22** (0.09)	0.32** (0.12)
Programme Specific Loss† and % Black		1.04*** (0.15)	0.23** (0.04)		
Per Capita Income and % Under 5 or over 65	−0.03** (0.01)				
% Renters and % Under 5 or over 65	2054.70** (1024.9)				
% Speaking English Not Well or Not at All and % Renters			15,307.17** (7541.10)		
% Speaking English Not Well or Not at All and % Black			−10,385.07** (5051.74)		
% Speaking English Not Well or Not at All and % Black				−51,146.43*** (19,237.80)	
Per Capita Income and % Renters				−1.02** (0.51)	
% Black and % Mobile Homes					26,318.00*** (12,712.00)
Constant	−566.95** (268.15)	51,057.08*** (12,988.78)	4324.52 (4634.83)	−18,780.85 (11,339.62)	7833.40 (9554.00)
Observations	764	586	437	230	582
Log Likelihood	−5500.93	−6340.23	−4226.94	−2161.00	−6134.07
Adjusted *R2* /(*ρ*)	(0.147***)	0.393	0.985	0.972	(0.439***)

***$p < 0.01$, **$p < 0.05$, †SBA losses used for safety net loss models.

https://doi.org/10.1080/17477891.2019.1675578

Social Vulnerability and Flood Exposure

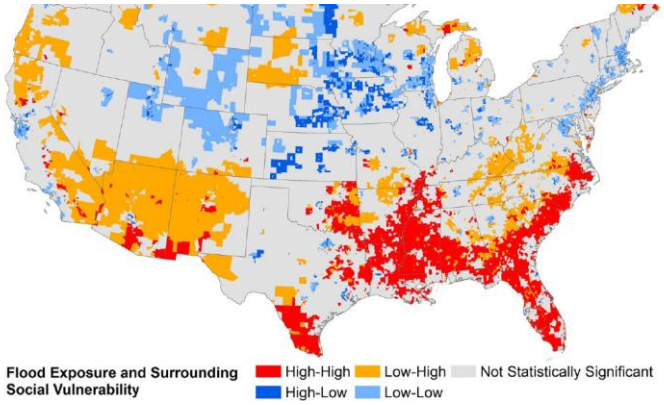
- At the tract level for the entire US, the patterns of links between social vulnerability and flooding were evident. Several priority social indicators were linked with higher flood exposure.

How to improve:

- **Collect more socio-economic and demographic data about NFIP and other program applicants**
- **Enable researchers to link point level outcome data with census data so that we do not have to aggregate to different geographies**

Table 6 Priority indicators of social vulnerability to flood exposure in the CONUS

Mean % change	Indicator	Relationship with social vulnerability	Social vulnerability dimension
156.7	Mobile homes (%)	+	Housing
115.3	Asian (%)	–	Race
102.4	Black (%)	+	Race
95.0	Households earning > $200,000 annually (%)	–	Income
84.0	Native American (%)	+	Race
64.8	Less than 12th grade education (%)	+	Education
53.7	Median housing value	–	Wealth
50.6	Female-headed households (%)	+	Family structure
50.5	Poverty (%)	+	Income
48.6	Employment in extractive industries (%)	+	Employment
44.4	Per capita income	–	Income
42.6	Population without health insurance (%)	+	Health



https://doi.org/10.1007/s11069-020-04470-2

Social Vulnerability and FEMA IA

- At the zip code level for the entire US, clusters of social vulnerability and FEMA IHP were scattered. Regression models found that several social vulnerability variables were linked with IHP receipt.

Variable	Homeowners					Renters				
	HH (Error)	LL (Error)	LH (Error)	HL (Error)	All ZCTAs (Lag)	HH (Lag)	LL (Error)	LH (Lag)	HL (Lag)	A
Median Rent	0.156*			0.172*						
People per Unit					-0.018*				1.74**	
Asian				-0.099*						
Black	-0.082*			-0.206*						
Low Educational Attainment					0.034**					
Extractive Industry		-0.003*								
Married Couple Family							-0.006*	-0.005*		
Female Labor Force									0.661*	
Renter Population									1.046*	
High Income								-0.005*		
Service Industry						0.312*				
Social Security Benefits							0.006*			
Unoccupied Housing			0.002*							
Total Damage	0.872**	0.107**	0.727**	1.350**	0.536**					
Pseudo R squared	0.67	0.22	0.61	0.97	0.51	0.16	0.06	0.05	0.14	
Log Likelihood	-355.83	2,824.37	2,862.17	-347.24	-18,862	- 557.52	2,048.50	1,638.95		-
n	350	1,614	1,405	268	17,667	250	1,270	1,115	190	

* p≤0.05, ** p≤0.01

Table 5. IHP and Social Vulnerability Indicators for Homeowners and Renters

How to improve:

- **Collect more socio-economic and demographic data about FEMA and other program applicants**
- **Provide researchers access to point level data so that this type of assessment can be completed at finer geographic scales**

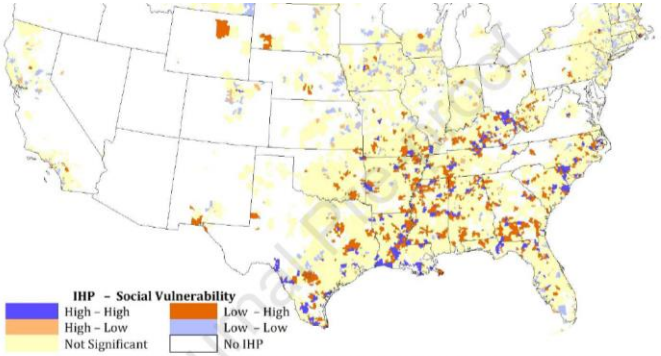
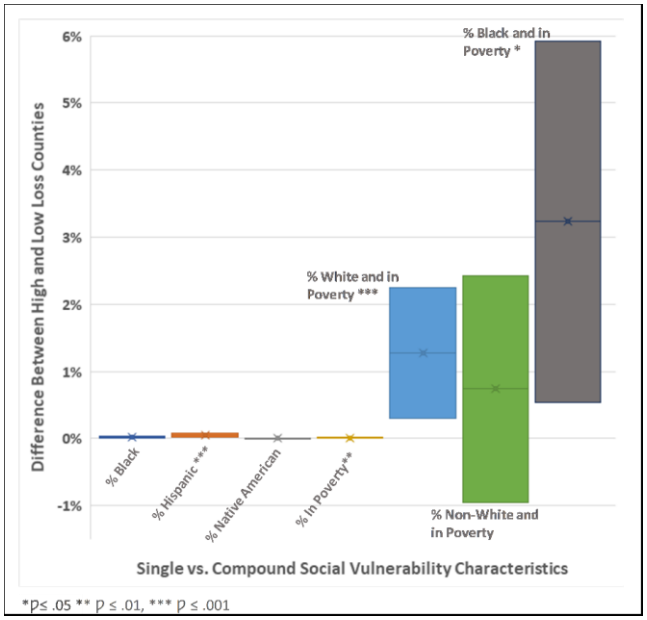


Figure 2. IHP Association with Social Vulnerability in surrounding ZCTAs for Homeowners

https://doi.org/10.1016/j.ijdrr.2020.102010

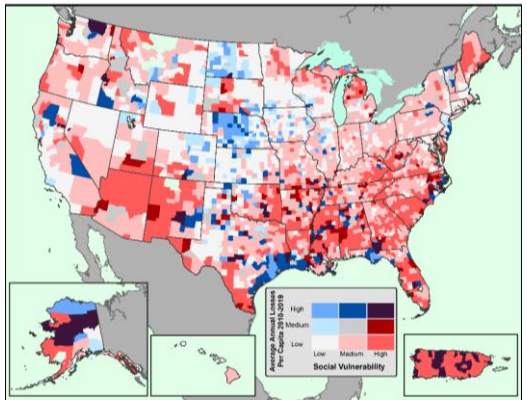
Assessing Social Equity in Disasters

- At the county scale, indications of in-equity in disaster losses point to the need to expand such research.



- **How to Improve:**
  - **Collect finer resolution social data**
  - **Linking census data to geographic representations of exposure and impact**

https://eos.org/science-updates/assessing-social-equity-in-disasters



Identify vulnerable populations: Research Objectives

1. Identify characteristics of flood vulnerable populations, assess state of evidence for adverse recovery outcomes within and across these populations
2. Understand how federal recovery programs help shape long-term recovery trajectories for flood vulnerable populations

Table 1. Summary of Research Questions and Analyses

Question Number	Research Question	Data	Methods
RQ 1	What characteristics distinguish flood vulnerable populations?	Peer-reviewed and grey literature, books, reports	Meta-analysis

Identify vulnerable populations: Key Findings

REVIEW article
Front. Water, 07 December 2021 |
https://doi.org/10.3389/frwa.2021.752307

Open Access

Flood Recovery Outcomes and Disaster Assistance Barriers for Vulnerable Populations

Bradley Wilson[1*], Eric Tate[2] and Christopher T. Emrich[3]

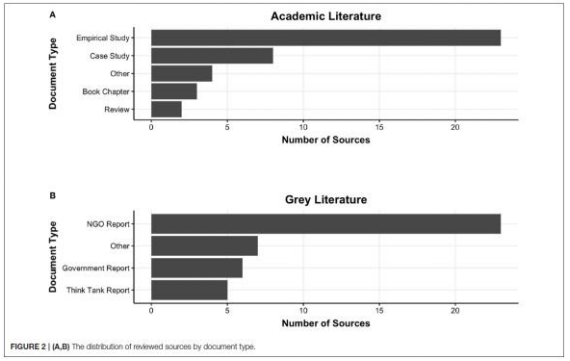


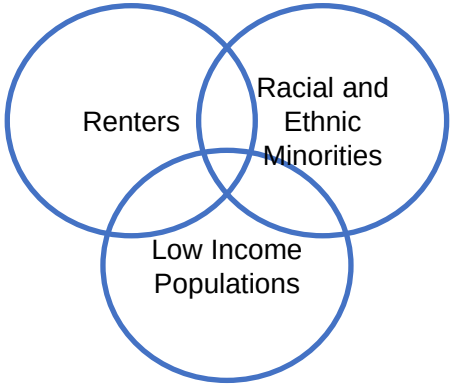
FIGURE 2 | (A,B) The distribution of reviewed sources by document type.

1. We identified the most flood vulnerable to include

- Low Income Populations
- Renters
- Racial and Ethnic Minorities

Identify vulnerable populations: Discussion & Future Work

- Intersectionality important, yet understudied due mainly to lack of data availability (census and recovery entity)
- May be other important indicators (e.g., disability) not as prevalent in the literature/understudied
- Continued work empirically linking social indicators to disaster outcomes is needed to build evidentiary basis for which effective interventions
- Research brief and accessible data being developed (early 2022)



The Opportunity

What can be measured can be improved

- Call for and support more of these types of studies
- Call for and support collection of more and better individual data on disaster victims and in healthcare. If we cannot measure it we cannot improve it!
- Learn from these (and other) disaster equity studies
- Implement every “little thing” that you can to improve equity.
  - It is not an “all or nothing” enterprise.
  - Small changes can make a big difference.

VMAP
VULNERABILITY MAPPING ANALYSIS PLATFORM

Dr. Chris Emrich

Boardman Endowed Associate Professor of Environmental Science and Public Administration

School of Public Administration

National Center for Integrated Coastal Research

Sustainable Coastal Systems Cluster

University of Central Florida

Christopher.emrich@ucf.edu

VMAP
VULNERABILITY MAPPING ANALYSIS PLATFORM

UCF

Next Week's Training

Janet McIlvaine, Florida Solar Energy Center: 'Horror Stories' about Manufactured Housing and how to fix them.

FEATURING "THE CASE OF THE MOIST MELTING HOUSE"

January 21 at 1:30 pm

Register at

https://attendee.gotowebinar.com/register/1458688411914984718

Technical Assistance is Available

Available Daily: **1 (800) 677-4548**

Options for Further Assistance Include:
Phone and Email consultation
Site Visits

Register at www.flhousing.org for:
Workshops
Webinars

Thank You!

Gladys Cook
cook@flhousing.org

Michael Chaney
chaney@flhousing.org