Community Resilience Indicators in RAPT

The Resilience Analysis and Planning Tool (RAPT) includes 20 community resilience indicators identified through analysis by the Federal Emergency Management Agency (FEMA) and Argonne National Laboratory. The research methodology and findings of this analysis are provided in the full report, *Community Resilience Indicator Analysis: County-level Analysis of Commonly Used Indicators from Peer-Reviewed Research: 2019 Update* (CRIA). All 20 CRIA indicators are included in RAPT with county data. In addition, 12 indicators also have census tract data.

The Connection to Resilience sections in this research summary provide the rationale for why researchers identified the indicator as an effective measure of community resilience. The lowercase letter citations refer to the specific source methodology. The eight community resilience assessment methodologies examined in CRIA were:

a. Australian National Disaster Resilience Index (ANDRI)
b. Baseline Resilience Indicators for Communities (BRIC)
c. Community Disaster Resilience Index (CDRI)
d. Community Resilience Index (CRI2)
e. Disaster Resilience of Place (DROP)
f. Resilient Capacity Index (RCI)
g. Social Vulnerability Index (SVI)
h. The Composite Resilience Index (TCRI)

This research summary also includes a description of the different binning methods used in CRIA and the methodology used to create the aggregate indicator.

RAPT is available at FEMA.gov/RAPT.

Population Indicators

Educational Attainment – Lack of High School Diploma: Census Tract and County Data

Metric	Data Source
Percentage of population over age 25 without a high school diploma (including GED)	U.S. Census American Community Survey (ACS) 2015–2019 five-year estimates, Table S1501

National Average	Binning Methods	
12% over age 25 without a high school diploma	Census Tract: Jenks Caspall	County: Jenks Caspall

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
7	X	X	X	X	X	X	X	

Connection to Resilience

Higher levels of education are associated with health, as well as an improved ability to communicate and comprehend information.[b,g]

Education is included as an input to economic resilience as higher levels of education is a characteristic of a strong labor force and supports individuals' ability to access community resources.[c,f]

Higher levels of education can improve the capacity to prepare for, and respond to, the stress of disasters.[a,e,h]

For individuals with lower levels of education, the practical and bureaucratic hurdles to assist in coping with, and recovering from, a disaster are much more difficult to navigate.[g]

Unemployment Rate: Census Tract and County Data

Metric	Data Source
Percentage of the labor force unemployed	ACS 2015–2019 five-year estimates, Table S2301

National Average	Binning Methods	
5.3% unemployment rate	Census Tract: Fisher Jenks	County: Fisher Jenks

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
7	X	X	X	X	X		X	X

Connection to Resilience

High levels of employment contribute to a healthy community economy, which supports community resilience.[a,b,d,e,h]

Employment also provides residents with financial resources that contribute to their livelihoods.[c]

Unemployed persons do not have the employee benefit plans that provide income and health cost assistance in the event of injury or death.[g]

Counties with higher levels of unemployment may have fewer community resources to support residents' needs and a population that is both less prepared for a disaster and less able to cope with the aftermath.[h]

Disability: Census Tract and County Data

Metric	Data Source
Percentage of the non-institutionalized population with a disability[1]	ACS 2015–2019 five-year estimates, Table S1810

National Average	Binning Methods	
12.6% with a disability	Census Tract: Jenks Caspall	County: Jenks Caspall

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
6	X	X			X	X	X	X

Connection to Resilience
Individuals with disabilities tend to be more vulnerable to physical, social, and economic challenges.[b,f]
Having functional, mobility, or access needs can make responding to disasters more challenging, including adapting to extreme circumstances and dealing with the increased stress.[a,f,h]
During an emergency, family members, neighbors, or a caretaker may be less able to provide support to individuals with special needs that require the assistance of others.[g]

Limited English Language Proficiency: Census Tract and County Data

Metric	Data Source
Percentage of limited English-speaking households[2]	ACS 2015–2019 five-year estimates, Table S1602

National Average	Binning Methods	
4.4% limited English-speaking households	Census Tract: Jenks Caspall	County: Jenks Caspall

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
6	X	X	X		X		X	X

Connection to Resilience
Proficiency in English supports community resilience because of improved ability to communicate between individuals, as well as allowing individuals to better access community resources.[a,c,g]
Greater numbers of proficient English speakers can be vital for effective communication interactions in the event of a disaster.[b,h]
In communities where the first language is neither English nor Spanish, accurate translations of advisories may be scarce.[g]
Communities with fewer English-speaking residents may demonstrate lower levels of resilience.[e]

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[1] Per the American Community Survey (ACS) question wording, this definition would include individuals with the following conditions: serious difficulty hearing, seeing, walking, and/or dressing; serious difficulty because of a physical, mental, or emotional condition; serious difficulty concentrating, remembering, making decisions, or doing errands alone.

[2] A "limited English-speaking household" is one in which no member 14 years and older speaks only English or speaks a non-English language and speaks English "very well." In other words, all members 14 years and older have at least some difficulty with English (https://census.gov/library/visualizations/2017/comm/english-speaking.html.html, accessed August 7, 2018).

Home Ownership: Census Tract and County-Level Data

Metric	Data Source
Percentage of owner-occupied housing units	ACS 2015–2019 five-year estimates, Table DP04

National Average	Binning Methods	
63.8% of housing units are owner-occupied	Census Tract: Jenks Caspall	County: Jenks Caspall

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
6	X	X	X		X	X		X

Connection to Resilience

Home ownership is often included as a measure of a community's economic strength and thus is a marker of community resilience.[b,c,e,h]

Home ownership is also used to reflect residents' levels of place attachment to their communities.[c,f]

Low levels of home ownership can indicate a community with a faltering economy and a population with less long-term commitment to the community, which could hamper both individual and community mitigation actions to prepare for disaster as well as recovery efforts.[a,f]

Mobility – Lack of Vehicle: Census Tract and County Data

Metric	Data Source
Percentage of occupied housing units with no vehicles available	ACS 2015–2019 five-year estimates, Table B08201

National Average	Binning Methods	
8.6% of households are without a vehicle	Census Tract: Jenks Caspall	County: Head Tail Breaks

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
6	X	X	X		X		X	X

Connection to Resilience

Access to transportation helps individuals support their livelihoods and provides critical mobility to adapt to the extreme circumstances of a disaster.[c,e,h]

Communities where fewer individuals have access to a vehicle may have less resilience to a disaster.[b]

Lack of access to vehicle can be especially problematic in terms of evacuation in urban areas where automobile ownership is lower, especially among inner city poor populations.[g]

Age 65 and Older: Census Tract and County Data

Metric	Data Source	
Percentage of the population 65 years and older	ACS 2015–2019 five-year estimates, Table S0101	
National Average	**Binning Methods**	
15.6% of population 65 years and older	Census Tract: Fisher Jenks	County: Jenks Caspall

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
5	X	X			X		X	X

Connection to Resilience

Several methodologies noted that the percentage of elderly adults in the population could affect resilience.[a,b,e]

Those over 65 tend to be less mobile.[h]

Those over 65 may find it more difficult to prepare for disasters and to adapt to extreme circumstances.[h]

Many people over 65 require assistance from family, neighbors, and others, which might not be available during a disaster.[g]

Household Income: Census Tract and County Data

Metric	Data Source	
Median household income	ACS 2015–2019 five-year estimates, Table S1903	
National Average	**Binning Methods**	
$ 62,843	Census Tract: Manual	County: Manual

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
5	X		X	X			X	X

Connection to Resilience

Research has shown that there is a strong relationship between individuals' financial resources and their resilience to a disaster.[b,c]

Low-income households are at greater risk because they tend to live in lower-quality housing situated in higher risk areas, are less likely to have prepared for a disaster, and have fewer resources to support recovery.[c]

The median household income of a community may also reflect its economic resilience and the community resources available to support recovery.[h]

Income Inequality: County Data

Metric				Data Source			
Gini Index[3]				ACS 2015–2019 five-year estimates, Table B19083			

National Average				Binning Method			
.48				Jenks Caspall			

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4		X		X	X	X		

Connection to Resilience

The economic environment is a major factor in a community's resilience; and when income inequality is present, earnings tend to be distributed in a way that does not support broader community goals.[b,d,e]

In addition, a skewed distribution of economic resources may negatively affect the cohesiveness of the residents' response to a disaster.[f]

Lack of Health Insurance: Census Tract and County Data

Metric	Data Source
Percentage of the population without health insurance coverage	ACS 2015–2019 five-year estimates, Table S2701

National Average	Binning Methods	
8.8% without health insurance	Census Tract: Fisher Jenks	County: Fisher Jenks

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4		X	X		X	X		

Connection to Resilience

Health is a critical component of community well-being as an unhealthy population has more difficulty accessing community support, or engaging in the process of building disaster resilience.[c,e]

Communities with more individuals covered by health insurance tend to have higher measures of physical and mental health.[b,e]

Health insurance coverage is one indication of individuals' capacity to effectively respond to and recover from a crisis, both mentally and physically.[f]

Communities with lower percentages of individuals with health insurance may have lower levels of resilience.[e]

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[3] The Gini Index or coefficient uses a scale of 0–1 to measure the difference between the ideal distribution of income (perfect equality [0] where 50 percent of the population would receive 50 percent of the available income) and the actual distribution.[g] The closer the number is to 1, the greater the income inequality.

Single-Parent Households: Census Tract and County Data

Metric	Data Source	
Percentage of single-parent households	ACS 2015–2019 five-year estimates, Table DP02[4]	
National Average	**Binning Method**	
21.3% of family households are single-parent	Census Tract: Jenks Caspall	County: Jenks Caspall

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
3	X			X			X	

Connection to Resilience

Single-parent households are more vulnerable to a disaster because they tend to have lower socioeconomic status and fewer sources of social support than that of two-parent families.[d,g]

Single-parent households are also vulnerable as all daily responsibilities fall to one parent, making recovery more difficult.[g]

Community Indicators

Connection to Civic and Social Organizations: County Data

Metric	Data Source
Number of civic and social organizations per 10,000 people	U.S. Census Bureau, 2017 County Business Patterns[5], Table 00A1, NAICS Code 8134
National Average	**Binning Method**
.82 civic and social organizations per 10,000 people	Head Tail Breaks

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
6		X	X	X	X	X		X

Connection to Resilience

This measure indicates the level of community engagement by looking at the level of civic infrastructure through which residents support their communities.[b,d,e,f]

Participation in civic organizations provides a mechanism for residents to invest in and take from their community and also increases networking and trusted relationships.[c,f]

The availability of formal social networks can be critical during response and recovery to quickly mobilize resources and disseminate information.[b,c,d]

Residents who participate in local civic organizations can use them for help and provide mutually beneficial cooperation during a crisis.[b,d]

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[4] The 2021 RAPT update includes Single Parent Household data from Table DP02 because it provides both census tract and county-level data. Table B09005 was used in the original version but only provides county-level data.

[5] While U.S. Census County Business Patterns (CBP) has 2017 data, the dataset has significantly fewer records available and therefore this update to RAPT will continue to use the CBP 2016 dataset in order to provide the most comprehensive data possible.

Hospital Capacity: County Data

Metric				Data Source			
The number of hospitals per 10,000 people				U.S. Census Bureau, 2017 County Business Patterns[5], Table 00A1, NAICS code 622110			
National Average				Binning Method			
.17 hospitals per 10,000 people				Jenks Caspall			
Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
5	X	X	X		X			X
Connection to Resilience							
This measure represents essential community infrastructure, both because it represents the capacity of the healthcare system to support residents' overall health and to provide critical emergency medical care.[a,b,c,e,h]							
Lack of this critical capacity negatively affects a community's ability to respond to and recover from disasters.[c]							

Medical Professional Capacity: County Data

Metric				Data Source			
The number of health-diagnosing and treating practitioners per 1,000 population				ACS 2015–2019 five-year estimates, Table S2401			
National Average				Binning Method			
19health diagnosing and treating practitioners per 1,000 population				Jenks Caspall			
Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
5	X	X	X	X	X			
Connection to Resilience							
Availability of physicians is linked with the overall physical and mental health of community residents.[b,c,d,e]							
Lack of access to physicians is related to lower levels of overall community resilience as indicated by low birthweight and premature mortality.[d]							
Physicians are a critical emergency resource in the response to and recovery from a disaster.[a]							

Affiliation with a Religion: County Data

Metric		Data Source					
Percentage of the population that are religious adherents		Association of Statisticians of American Religious Bodies. 2010 U.S. Religion Census. http://www.usreligioncensus.org/index.php					

National Average		Binning Method					
51.25% of the population are religious adherents		Jenks Caspall					

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4		X	X	X	X			

Connection to Resilience

Affiliation with a religious organization or civic organization can be used as a proxy measure for social connectedness, and how much a community may be able to rely on the good will of other local citizens, leading to reciprocity and mutually beneficial cooperation.[b,d,e]

Religious adherents can access additional support beyond their family and neighbors. Religious organizations are often organized to actively provide physical and social support to their congregations and communities during times of individual and community crisis.[b,c,d]

Presence of Mobile Homes: Census Tract and County Data

Metric		Data Source	
Percentage of mobile homes		ACS 2015–2019 five-year estimates, Table DP04	

National Average		Binning Methods	
6.2% of housing units are mobile homes		Census Tract: Fisher Jenks	County: Jenks Caspall

Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4	X	X			X		X	

Connection to Resilience

Higher numbers of mobile homes in a community are related to lower levels of resilience because of the lower-quality construction of these homes and lack of basements, which makes them particularly susceptible to damage from hazards.[b,e,g]

Mobile homes are frequently found outside of metropolitan areas that may not be readily accessible by interstate highways or public transportation.[g]

Public School Capacity: County Data

Metric	Data Source
The number of public schools per 5,000 population	U.S. Department of Education. National Center for Education Statistics. Elementary/Secondary Information System. 2018-2019 school year. https://nces.ed.gov/ccd/elsi/

National Average	Binning Method
1.53 schools per 5,000 population	Head Tail Breaks

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4		X	X		X			X

Connection to Resilience

Public schools are a measure of response and recovery capacity, as they represent the community's ability to provide safe shelter for individuals and facilitate evacuations.[b,c,e,h]

More availability of schools can increase the ability to maintain schooling after a disaster.[b]

Population Change: County Data

Metric	Data Source
The net migration (international and domestic) of individuals.	U.S. Census Bureau, Population Division. Table: Population, Population Change, and Estimated Components of Population Change: April 1, 2010 to July 1, 2019 (CO-EST2019-alldata)

National Average	Binning Method
The average county population has grown by 274 people due to migration from July 2015 to July 2019	Jenks Caspall

Community Resilience Methodologies

# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
4	X	X		X		X		

Connection to Resilience

Communities where large numbers of residents have lived for extended periods are likely to have strong place attachment, be invested in the well-being of the community before a disaster, and willing to respond to revitalize a community after a disaster.[b,f]

Familiarity can help individuals navigate a community during an acute crisis, as well as know how to access services after the crisis has passed.[f]

A rapid influx of new residents may result in lower levels of attachment to the community, less familiarity with local hazards and how to prepare for them, and fewer community connections that can provide support during a crisis.[b,d,f]

A reduction in population will reduce local tax income and community resources to respond to a disaster.[b]

Hotel/Motel Capacity: County Data

Metric				Data Source			
The number of hotels/motels/casinos per 5,000 population				U.S. Census Bureau, 2017 County Business Patterns[5], Table 00A1, NAICS Codes 72111 and 721120			
National Average				**Binning Method**			
.90 hotels/motels/casinos per 5,000 population				Head Tail Breaks			
Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
3		X	X			X		
Connection to Resilience							
Hotels and motels can provide important capacity to house individuals who have to leave their homes, either to find safe shelter from the disaster or as temporary housing during the recovery phase.[b,e]							
Fewer local hotels and motels may mean that individuals have to leave an area, making recovery from a disaster more difficult.[a]							

Rental Property Capacity: Census Tract and County Data

Metric				Data Source			
Rental Vacancy Rate of Total Housing Units				ACS 2015–2019 five-year estimates, Table DP04[6]			
National Average				**Binning Methods**			
6% rental vacancy rate				Census Tract: Fisher Jenks		County: Fisher Jenks	
Community Resilience Methodologies							
# of 8	ANDRI	BRIC	CDRI	CRI2	DROP	RCI	SVI	TCRI
3		X	X		X			
Connection to Resilience							
While low numbers of vacant housing units may seem to be a positive indicator of economic resilience, it does denote a lack of physical capacity to house individuals who have been displaced by a disaster.[b,e]							
A greater presence of vacant housing units provides immediately available housing stock so residents do not need to leave their communities because of a lack of housing stock.[b,e]							

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[6] The 2020 RAPT update includes Rental Vacancy Rate data from Table DP02 because it provides both census tract and county-level data. Table B25004 was used in previous versions but only provides county-level data.

Connection to Resilience Key:

a   ANDRI: Phil Morley, Melissa Parsons, and Sarb Johal, 2017, "The Australian Natural Disaster Resilience Index: A System for Assessing the Resilience of Australian Communities to Natural Hazards," *Bushfire & Natural Hazards CRC*. Available at https://www.bnhcrc.com.au/research/hazard-resilience/251, accessed Match 27, 2018.

b   BRIC: Susan L. Cutter, Kevin D. Ash, and Christopher T. Emrich, 2014, "The Geographies of Community Disaster Resilience," *Global Environmental Change* 29, 65–77.

c   CDRI: Walter Gillis Peacock, et al., 2010, "Advancing Resilience of Coastal Localities: Developing, Implementing, and Sustaining the Use of Coastal Resilience Indicators: A Final Report," *Hazard Reduction and Recovery Center*, December. Available at https://pdfs.semanticscholar.org/ea56/1b67fb9fa11964a32e99c4da14ad32dd39de.pdf, accessed April 6, 2018.

d   CRI2: Kathleen Sherrieb, Fran H. Norris, and Sandro Galea, 2010, "Measuring Capacities for Community Resilience," *Social Indicators Research* 99: 227–247.

e   DROP: Susan L. Cutter, Christopher G. Burton, and Christopher T. Emrich, 2010, "Disaster Resilience Indicators for Benchmarking Baseline Conditions," *Journal of Homeland Security and Emergency Management* 7. Available at http://resiliencesystem.com/sites/default/files/Cutter_jhsem.2010.7.1.1732.pdf, accessed April 6, 2018.

f   RCI: Kathryn A. Foster, 2014, "Resilience Capacity Index," *Disaster Resilience Measurements: Stocktaking of Ongoing Efforts in Developing Systems for Measuring Resilience, United Nations Development Programme*, 38. Available at https://www.preventionweb.net/files/37916_disasterresiliencemeasurementsundpt.pdf, accessed April 6, 2018.

g   SVI: Barry E. Flanagan, et al., 2011, "A Social Vulnerability Index for Disaster Management," *Journal of Homeland Security and Emergency Management* 8. Available at https://svi.cdc.gov/Documents/Data/A%20Social%20Vulnerability%20Index%20for%20Disaster%20Management.pdf, accessed April 6, 2018.

h   TCRI: T. Perfrement and T. Lloyd, 2015, "The Resilience Index: The Modelling Tool to Measure and Improve Community Resilience to Natural Hazards," *The Resilience Index*. Available at https://theresilienceindex.weebly.com/our-solution.html, accessed April 6, 2018.

Individual Indicator Binning Methodology

To map the data for each indicator, the research team used the Python Spatial Analysis Library, PySAL, and its Exploratory Spatial Data Analysis sub-package. Python is an open-source, high-level programming language that is used in social science research. The package includes nine potential binning methods.[7]

Many classification methods group the data into bins based on mathematically determined "breaks" in the data. Instead of making arbitrary cuts in the data, these methods allowed the research team to group counties and census tracts that are close in value to each other and maximize the variance between bins. The team evaluated which binning method best fit the relationships of the breaks to that indicator's means and medians and could be consistently replicated. This analysis identified three binning methods as the best fit for the resilience indicators.

For the county-level datasets, the research team binned the dataset into 5 bins. For the indicators with census tract data, the research team binned the dataset into 7 bins to allow greater differentiation for this much larger dataset. For three of the 12 indicators with both county and census tract data, a different binning methodology was used to bin the county data and the census tract data.

Fisher–Jenks Breaks
The method aims to return class breaks such that classes are "internally homogenous while assuring heterogeneity among classes." The Python toolkit calculates squared deviations against class means.

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[7]   The Python Exploratory Spatial Data Analysis package includes the following nine binning methods: Jenks Natural Breaks, Fisher-Jenks Breaks, Jenks-Caspall Breaks, Head/Tail Breaks, Maximum Breaks, Equal Intervals, Quantile, Percentiles, and Standard Deviation from the Mean.

Jenks–Caspall Breaks
The method aims to minimize the absolute deviation from within-class medians. Python's calculation focuses on within-class absolute deviations from the median.

Head/Tail Breaks
Algorithmically optimal breaks and the number of classes are based on the dataset itself. The Head/Tails Breaks method[8] works well with heavily tailed datasets, iterating through the data to minimize around the mean.

Other
In specific cases, the team used alternative criteria to select binning methodologies.

- Income: a convention for displaying income data already exists: $0–20,000, $20,001–$40,000, etc. (an intuitive methodology that is similar to equal intervals).
- Population change: The population change dataset is provided by the U.S. Census as "net migration,"[9] which provides a positive (increase in population) or negative (decrease in population) number. Large population changes in either direction could cause challenges to resilience. The team chose to represent the population change data as standard deviations from zero, where less change is preferred to more change (regardless of whether the change is positive or negative).

Aggregate Indicator Binning Methodology

The team developed a process to aggregate the county data from all 20 commonly used community resilience indicators to produce a map that shows relative resilience by county. The team first oriented all of the datasets in the same direction (higher number represents higher resilience) and then converted each county's data point to a standardized score value based on how many standard deviations above or below the indicator's national mean it was (except for population change calculated as standard deviations from zero). For datasets where data for a specific county were missing, the mean for that indicator was used to ensure that the aggregate value for the country was not increased or reduced by the missing data. The team then averaged the 20 standardized score values for each county to create an aggregated indicator by county. Because there is no validated weighting scheme for resilience indicators, the research team did not weight individual indicators in developing the aggregated indicator. Finally, the team sorted the county-level aggregated indicator into five bins based on standard deviation above or below the average.

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[8] Jiang, B., 2013, *Head/tail Breaks: A New Classification Scheme for Data with a Heavy-tailed Distribution.* The Professional Geographer, 65, 482-494.

[9] *U.S. Census Bureau*. https://www.census.gov/glossary/#term_Netmigration, accessed April 6, 2018.