Community Resilience Indicator Analysis (CRIA)

The Federal Emergency Management Agency (FEMA) and Argonne National Laboratory analyzed peer-reviewed research on community resilience to provide a data-driven understanding of community resilience challenges in counties throughout the United States. This analysis identified 20 commonly used indicators, 11 with a population focus and 9 with a community focus. The methodology and findings are provided in this report: Community Resilience Indicator Analysis: County-Level Analysis of Commonly Used Indicators from Peer-Reviewed Research: 2020 Update.

Resilience Analysis and Planning Tool (RAPT)

The research team created the RAPT, a geographic information systems (GIS) tool for emergency managers and community partners to visualize and assess potential challenges to resilience. RAPT data layers include the 20 community resilience indicators identified in the CRIA as well as data layers for hazards such as seismic and flood risk and infrastructure information drawn from the Homeland Infrastructure Foundation-Level Data (HIFLD) Subcommittee. RAPT is updated periodically with the most recent available U.S. Census Bureau American Community Survey (ACS) five-year estimate (currently the 2015–2019 estimate). RAPT is available at FEMA.gov/RAPT.

Correlation Analysis

The research team conducted a correlation analysis to measure and describe the strength and direction of the relationships among the 20 commonly used community resilience indicators. Correlation analysis shows how individual indicators may be related to each other. Understanding these correlations will help communities design resilience strategies that take these relationships into account.

The Pearson Correlation Coefficient[1] is a numerical measure of linear correlation from −1 to 1.

- A coefficient closer to 1 indicates a positive correlation (variable A increases as variable B increases).
- A coefficient of 0 indicates no correlation.
- A coefficient closer to −1 indicates a negative correlation (variable A increases as variable B decreases).

As jurisdictions consider strategies to address those indicators that reveal challenges to resilience, they should consider relationships between indicators signifying populations that may face multiple challenges. For example, campaigns focusing on individuals that are unemployed should also consider that they are more likely to be single-parent households, have difficulty speaking English, lack a high school diploma, and be without access to a vehicle.

Table 1 summarizes some highlights of the correlation analysis.

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[1] Stangroom, J. "Pearson Correlation Coefficient Calculator." Social Science Statistics. http://www.socscistatistics.com/tests/pearson/.

Table 1: Highlighted Correlation Relationships

Indicator	Positively Correlates With	Negatively Correlates With
Age (adults over 65)	• Disability (r = 0.40)	• Single-Parent Households (r = -0.31).
Lack of High School Diploma	• Unemployment Rate (r = 0.48) • Lack of Health Insurance (r = 0.47) • Presence of Mobile Homes (r = 0.45) • Population with a Disability (r = 0.42) • Limited English Language Proficiency (r = 0.42) • Income Inequality (r = 0.35) • Lack of Vehicle (r = 0.32) • Single-Parent Household (r = 0.26)	• Household Income (r = -0.58) • Medical Professional Capacity (r = -0.48) (access to healthcare)
Disability	• Presence of Mobile Homes (r = 0.47) • Lack of High School Diploma (r = 0.42) • Unemployment Rate (r = 0.40) • Age (r = 0.40)	• Household Income (r = -0.65) • Medical Professional Capacity (r = -0.33) (access to healthcare)
Limited English Language Proficiency	• Unemployment Rate (r = 0.52) • Lack of High School Diploma (r = 0.42) • Lack of Vehicle (r = 0.32)	• Household Income (r = -0.31)
Lack of Health Insurance	• Lack of High School Diploma (r = 0.47) • Presence of Mobile Homes (r = 0.35)	• Medical Professional Capacity (r = -0.40) (access to healthcare) • Home Ownership (r= -0.28) • Household Income (r= -0.26)
Lack of Vehicle	• Unemployment Rate (r = 0.49) • Income Inequality (r = 0.38) • Single-Parent Households (r = 0.34) • Lack of High School Diploma (r = 0.32) • Limited English Language Proficiency (r = 0.32)	• Home Ownership (r = -0.33) • Household Income (r = -0.30) • Populations Change (r = -0.24)
Unemployment Rate	• Limited English Language Proficiency (r = 0.52) • Lack of Vehicle (r = 0.49) • Lack of High School Diploma (r = 0.48) • Disability (r = 0.40) • Income Inequality (r = 0.40) • Single-Parent Households (r = 0.35)	• Household Income (r = -0.49) • Medical Professional Capacity (r = -0.28) (access to healthcare) • Home ownership (r = -0.25)
Single-Parent Household (of all family households)	• Income Inequality (r = 0.40) • Unemployment Rates (r = 0.35) • Lack of Vehicle (r = 0.34) • Lack of High School Diploma (r = 0.26)	• Household Income (r = -0.38) • Home Ownership (r = -0.30) • Public School Capacity (r = -0.21)
Presence of Mobile Homes	• Disability (r = 0.47) • Lack of High School Diploma (r = 0.45) • Lack of Health Insurance (r = 0.35)	• Household Income (r = -0.42) • Medical Professional Capacity (r = -0.39) (access to healthcare) • Limited English Language Proficiency (r= -0.20)

In Table 2 below, the positive correlations have green shading, and the negative correlations have blue. Values that are too small to have statistical significance are marked with an asterisk.

Table 2: Pearson Correlation Coefficients

	Age 65 and Older	Lack of HS Diploma	Disability	Limited English Language Proficiency	Lack of Health Insurance	Lack of Vehicle	Unemployment Rate	Household Income	Income Inequality	Home Ownership	Single-Parent Household	Presence of Mobile Homes	Public School Capacity	Medical Professional Capacity	Hospital Capacity	Hotel/Motel Capacity	Rental Property Capacity	Affiliation with a Religion	Connection to Civic and Social Organizations	Population Change
Age 65 and Older	1.00	-0.12	0.40	-0.06	-0.16	-0.15	-0.10	-0.26	0.02*	-0.13	-0.13	0.13	0.23	-0.08	0.25	0.13	0.09	0.01*	0.20	0.12
Lack of HS Diploma	-0.12	1.00	0.42	0.42	0.47	0.32	0.48	-0.58	0.35	-0.21	0.26	0.45	-0.09	-0.48	-0.01*	-0.11	-0.01*	0.02*	-0.15	-0.19
Disability	0.40	0.42	1.00	0.10	0.08	0.16	0.40	-0.65	0.26	-0.19	0.19	0.47	-0.01*	-0.33	0.05	-0.06	0.02*	-0.07	-0.02*	-0.05
Limited English Language	-0.06	0.42	0.10	1.00	-0.01*	0.32	0.52	-0.31	0.27	-0.12	0*	-0.20	-0.01*	-0.13	-0.01*	-0.02*	0.01*	0.02*	-0.05	-0.01*
Lack of Health Insurance	-0.16	0.47	0.08	-0.01*	1.00	0.11	0.16	-0.26	0.15	-0.28	0.17	0.35	0.09	-0.40	0.07	0.10	0.13	0.09	-0.07	-0.04
Lack of Vehicle	-0.15	0.32	0.16	0.32	0.11	1.00	0.49	-0.30	0.38	-0.33	0.34	-0.05	-0.01*	-0.10	-0.08	-0.05	-0.04	-0.03*	0*	-0.24
Unemployment Rate	-0.10	0.48	0.40	0.52	0.16	0.49	1.00	-0.49	0.40	-0.25	0.35	0.16	-0.12	-0.28	-0.11	-0.08	-0.03*	-0.11	-0.12	-0.11
Household Income	-0.26	-0.58	-0.65	-0.31	-0.26	-0.30	-0.49	1.00	-0.42	0.35	-0.38	-0.42	-0.09	0.42	-0.13	0.01*	-0.06	-0.05	-0.02*	0.25
Income Inequality	0.02*	0.35	0.26	0.27	0.15	0.38	0.40	-0.42	1.00	-0.34	0.40	0.16	-0.10	-0.05	-0.06	-0.08	0.04	0.02*	-0.10	-0.05
Home Ownership	-0.13	-0.21	-0.19	-0.12	-0.28	-0.33	-0.25	0.35	-0.34	1.00	-0.30	-0.11	-0.21	0.29	-0.08	-0.31	-0.28	0.02*	-0.11	0.15
Single-Parent Household	-0.13	0.26	0.19	0*	0.17	0.34	0.35	-0.38	0.40	-0.30	1.00	0.16	-0.21	-0.11	-0.15	-0.06	0*	-0.01*	-0.09	-0.19
Presence of Mobile Homes	0.13	0.45	0.47	-0.20	0.35	-0.05	0.16	-0.42	0.16	-0.11	0.16	1.00	0*	-0.41	0.02*	0*	0.03*	-0.11	-0.08	-0.01*
Public School Capacity	0.23	-0.09	-0.01*	-0.01*	0.09	-0.01*	-0.12	-0.09	-0.10	-0.21	-0.21	0*	1.00	-0.18	0.37	0.32	0.10	0.21	0.27	-0.23
Medical Professional	-0.08	-0.48	-0.33	-0.13	-0.40	-0.10	-0.28	0.42	-0.05	0.29	-0.11	-0.41	-0.18	1.00	-0.09	-0.07	-0.06	0.01*	-0.02*	0.13
Hospital Capacity	0.25	-0.01*	0.05	-0.01*	0.07	-0.08	-0.11	-0.13	-0.06	-0.08	-0.15	0.02*	0.37	-0.09	1.00	0.21	0.10	0.26	0.29	-0.20
Hotel/Motel Capacity	0.13	-0.11	-0.06	-0.02*	0.10	-0.05	-0.08	0.01*	-0.08	-0.31	-0.06	0*	0.32	-0.07	0.21	1.00	0.25	0.05	0.24	-0.08
Rental Property Capacity	0.09	-0.01*	0.02*	0.01*	0.13	-0.04	-0.03*	-0.06	0.04	-0.28	0*	0.03*	0.10	-0.06	0.10	0.25	1.00	0.09	0.07	-0.10
Affiliation with a Religion	0.01*	0.02*	-0.07	0.02*	0.09	-0.03*	-0.11	-0.05	0.02*	0.02*	-0.01*	-0.11	0.21	0.01*	0.26	0.05	0.09	1.00	0.14	-0.23
Connection to Civic and Social	0.20	-0.15	-0.02*	-0.05	-0.07	0*	-0.12	-0.02*	-0.10	-0.11	-0.09	-0.08	0.27	-0.02*	0.29	0.24	0.07	0.14	1.00	-0.15
Population Change	0.12	-0.19	-0.05	-0.01*	-0.04	-0.24	-0.11	0.25	-0.05	0.15	-0.19	-0.01*	-0.23	0.13	-0.20	-0.08	-0.10	-0.23	-0.15	1.00

*not statistically significant
Positive relationships have green shading (no minus sign)
Negative relationships have blue shading (with minus sign)