National Integration Center Technical Assistance

Community Resilience Indicator Analysis
County-level Analysis of Commonly Used Indicators from Peer-Reviewed Research: 2019 Update

Resilience Analysis and Planning Tool (RAPT)
2020 Update

June 2020
Support FEMA Goal 1: Build a Culture of Preparedness

Community Resilience Indicator Analysis:

- Provides a data-driven basis to prioritize locations for technical assistance investment, and
- Informs community resilience, response, recovery planning
5-Step Methodology to Identify and Map Commonly Used Indicators of Community Resilience

1. Conduct Literature Review of Meta-Analyses
2. Catalog Distinct Methodologies
3. Create and Apply Inclusion Criteria
   - County-level
   - Generalized hazard risk
   - Pre-disaster focus
   - Quantitative
   - Public methodology
   - Public data
4. Identify Commonly Used Indicators
5. Sort Indicator Data into 5 Bins and Map

Analysis and Recommendation

The National Integration Center (NIC) develops doctrine and tools to lead the whole community implementation of the National Preparedness System (NPS) and the National Incident Management System (NIMS).
Limitations of Analysis

• **Open Source Data**: more specific data may be available from proprietary sources; this methodology used open, easily available, no cost datasets

• **Incomplete National Datasets**: U.S. Census primary datasets do not include results for many of the U.S. territories

• **No Assessment of Community Capacity**: this analysis does not include data on a community’s capacity to respond to hazards relative to these indicators
Benefits of Analysis

• **Existing Peer-reviewed Research:** peer-review process provides greater validity

• **Commonly Used Indicators:** suggest some research agreement

• **Attention to Individual Indicators:** (vs domains comprised of multiple indicators) may help users pinpoint specific areas for improvement

• **Relative Assessment:** identifies priority areas while acknowledging all communities can take steps to improve resilience

• **Broad Application of Findings:** offers national perspective and local baseline; useful for FEMA programs and SLTT partners
Community Resilience Methodologies

- Baseline Resilience Indicators for Communities (BRIC)
- Community Disaster Resilience Index (CDRI)
- Community Resilience Index (CRI2)
- Disaster Resilience of Place (DROP)
- Resilient Capacity Index (RCI)
- Social Vulnerability Index (SVI)
- The Composite Resilience Index (TCRI)
### Commonly Used Community Resilience Indicators

#### 11 Population-Focused Indicators and Metric Used

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Educational Attainment</td>
<td>% population over 25 without high school diploma</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>% of labor force unemployed</td>
</tr>
<tr>
<td>Disability</td>
<td>% of population with a disability</td>
</tr>
<tr>
<td>English Language Proficiency</td>
<td>% limited-English-speaking households</td>
</tr>
<tr>
<td>Mobility</td>
<td>% of occupied housing units with no vehicles available</td>
</tr>
<tr>
<td>Home Ownership</td>
<td>% owner-occupied housing units</td>
</tr>
<tr>
<td>Age</td>
<td>% of population 65 years and over</td>
</tr>
<tr>
<td>Household Income</td>
<td>median household income</td>
</tr>
<tr>
<td>Income Inequality</td>
<td>Gini Index</td>
</tr>
<tr>
<td>Health Insurance</td>
<td>% of population with no health insurance coverage (private or public)</td>
</tr>
<tr>
<td>Single-parent Households</td>
<td>% of single-parent households</td>
</tr>
</tbody>
</table>
Commonly Used Community Resilience Indicators

9 Community-Focused Indicators and Metric Used

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Connection to Civic and Social Organizations</td>
<td># of organizations per 10,000 people</td>
</tr>
<tr>
<td>Hospital Capacity</td>
<td># of hospitals per 10,000 people</td>
</tr>
<tr>
<td>Medical Professional Capacity</td>
<td># of health diagnosing and treating practitioners per 1,000 people</td>
</tr>
<tr>
<td>Affiliation with a Religion</td>
<td>% of population that are religious adherents</td>
</tr>
<tr>
<td>Mobile Homes</td>
<td>% of mobile homes</td>
</tr>
<tr>
<td>Population Change</td>
<td>% change in residents who have lived in same county for more than 5 years</td>
</tr>
<tr>
<td>Public School Capacity</td>
<td># of public schools per 5,000 population</td>
</tr>
<tr>
<td>Hotel/Motel Capacity</td>
<td># of hotels/motels per 5,000 population</td>
</tr>
<tr>
<td>Rental Property Capacity</td>
<td>% vacant rental housing units</td>
</tr>
</tbody>
</table>
Mapping and Analysis

- **Choropleth Maps** provide high-level visual understanding of relative values of census data (county and census tract).

- **Correlation Analysis** provides greater understanding of inter-connectedness between indicators.

- **Aggregate Indicator** shows national relative standard deviation of all 20 indicators combined.

- **Analysis and Recommendations** are included in the report to highlight specific findings by indicator and by region.
Counties in the least resilient bins (darker blues) tend to be in:
Central Appalachian counties, Mississippi Delta LA/MS, Alabama, Southeastern US, South Dakota, South Texas, Puerto Rico, the western coast and interior of Alaska
Resilience Analysis and Planning Tool (RAPT)
Update 2020
Resilience Analysis and Planning Tool (RAPT)

- GIS tool to inform strategies for preparedness, response, and recovery.
- Allows **combined analysis** of Population / Community data, Infrastructure data, and Hazard data.
- **Set of 20 Community Resilience Indicators:**
  - Indicators used in multiple peer-reviewed methodologies
  - Singular datapoint analysis vs composite index
  - 12 of the 20 indicators are available at census tract level
  - Binning process provides useful visualization (county: 5 bins; census tract: 7 bins)
  - Correlation analysis
- Infrastructure data from Homeland Infrastructure Foundation-Level Data (HIFLD) includes **location and characteristics**
- Hazard layers: **historic data, risk data, and real-time severe weather forecasts**
- **Analysis Tools:** Incident Analysis Tool, Select Population Summary, Query
- **Add Data:** Temporarily upload additional GIS layers
<table>
<thead>
<tr>
<th>Population-Focused Indicators</th>
<th>Community-Focused Indicators</th>
<th>Infrastructure Data</th>
<th>Hazard Data</th>
</tr>
</thead>
<tbody>
<tr>
<td>% Population without Health Insurance*</td>
<td>Connection to Civic/Social Organizations</td>
<td>Nursing Homes</td>
<td>Flood Hazard Zones</td>
</tr>
<tr>
<td>% Population Unemployed*</td>
<td>Hospital Capacity</td>
<td>Hospitals</td>
<td>Tornado Paths</td>
</tr>
<tr>
<td>% Population without a High School Education*</td>
<td>Medical Professional Capacity</td>
<td>Urgent Care Facilities</td>
<td>Tropical Storms</td>
</tr>
<tr>
<td>% Population with a Disability*</td>
<td>Affiliation with a Religion</td>
<td>Public Health Depts.</td>
<td>Seismic Hazards</td>
</tr>
<tr>
<td>% Population without Access to a Vehicle*</td>
<td>Presence of Mobile Homes*</td>
<td>Fire Stations</td>
<td>Wildfire</td>
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<tr>
<td>% Population with Home Ownership*</td>
<td>Public School Capacity</td>
<td>Emergency Medical Services (EMS) stations</td>
<td>NOAA Layers</td>
</tr>
<tr>
<td>% Population over 65*</td>
<td>Population Change</td>
<td>Local Law Enforcement locations</td>
<td>Current Watches/Warnings</td>
</tr>
<tr>
<td>% Population Single-Parent Households*</td>
<td>Hotel/Motel Capacity</td>
<td>911 Service Area Boundaries</td>
<td></td>
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<tr>
<td>% Population with Limited English Proficiency*</td>
<td>Rental Property Capacity*</td>
<td>Mobile Home Parks</td>
<td>Hurricane Outlook: Atlantic</td>
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<tr>
<td>Median Household Income*</td>
<td></td>
<td>Places of Worship</td>
<td>Severe Weather Outlook</td>
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<tr>
<td>Gini Index: Income Inequality</td>
<td></td>
<td>Public Schools</td>
<td>Excessive Rainfall Outlook</td>
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<tr>
<td>Other Population Indicators</td>
<td></td>
<td>Private Schools</td>
<td>River Flood Outlook</td>
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<tr>
<td>At-risk electricity-dependent Medicare beneficiaries</td>
<td></td>
<td>Colleges and Universities</td>
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<td>Prison Boundaries</td>
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<td>Transmission Lines</td>
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<td></td>
<td>Electric Power Plants</td>
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<td>Solid Waste Landfills</td>
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<td></td>
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<td>Wastewater Treatment Plants</td>
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<td></td>
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<td>Pharmacies (RX Open)</td>
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* Both U.S. Census Bureau county and census tract data; ACS 2014-2018 five-year estimates.
Population Indicator: Age

Hillsborough FL with County Data

County - Age 65 and Older
- Age over 65 (Percent Pop)
  - 23.2 - 55.6% (highest value)
  - 19.6 - 23.2%
  - 17.1 - 19.5%
  - 14.3 - 17%
  - 0 - 14.2%

Population Age 65 and Older: 13.80%
15.2 percent of the U.S. population is age 65 and older.

Hillsborough FL with Census-Tract Data

Census Tract 268.14, Pinellas County, Florida
Population Age 65 and Older: 43.10%
15.2 percent of the U.S. population is age 65 and older.

Age over 65 (Percent Pop)
- 55.2 - 100%
- 34 - 55.1%
- 23.9 - 33.9%
- 18.3 - 23.8%
- 13.7 - 18.2%
- 8.3 - 13.6%
- 0 - 8.7%
Infrastructure Data - Nursing Homes

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Hazard Data

Flooding

FEMA National Flood Hazard Layer GIS
https://fema.maps.arcgis.com/home/item.html?id=cbe088e7c8704464aa0fc34eb99e7f30

NWS Severe Weather Outlook

Historic Tornado Tracks

Historic Tornado Tracks

<table>
<thead>
<tr>
<th>Historic Tornado Tracks</th>
<th>Count</th>
<th>2011</th>
<th>4</th>
<th>27</th>
<th>2011-04-27</th>
<th>16:42:00</th>
<th>MS</th>
<th>28</th>
<th>81</th>
<th>4</th>
<th>17</th>
<th>7</th>
<th>25.81</th>
<th>122.04</th>
<th>1,050</th>
</tr>
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![Map showing population indicator and infrastructure layers](image)
Incident Analysis Tool: Nursing Homes and Hospitals within 5 Miles of an Incident
Population – Summary of Selected Indicator Tool

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RAPT Benefits

- **User-friendly** research tool that highlights the interplay of population characteristics, infrastructure, and hazards.

- Basis for **community resilience profiles** highlighting the unique attributes and interplay of population characteristics, infrastructure, and hazards.

- **Multi-level analysis**: regional, state, local, tribal.

- Support to emergency managers:
  - Inform capability targets for **THIRA/SPR, exercises, and EOPs**
  - Real-time analysis of **severe weather events**
  - Prioritize **areas for evacuation**
  - Identify at risk **infrastructure assets**
  - Helps prioritize **recovery strategies**
RAPT Resources Available at www.fema.gov/rapt

How-To Videos:

- Introduction to RAPT
- Community Resilience Indicator Layers
- Attribute Table - View, Filter, and Export Data
- Infrastructure and Hazard Layers
- National Weather Service (NWS) Forecast Outlook Layers
- Basic RAPT Tools-Basemap Gallery, Toolbox, and Add Data
- Advanced RAPT Tools
  - Incident Analysis and Summarize Selected Indicators
  - Query: Census Tracts and Hospitals
  - Selection and Population County

Supporting Resources:

RAPT User Guide, RAPT Data Layers and Sources, Research Summary
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