Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being

Stephen Kasperski and Amber Himes-Cornell
Alaska Fisheries Science Center

NAAFE 2015
Ketchikan, Alaska
May 20, 2015
Overview

• Background information on the context of fishing communities in Alaska and NMFS mandates
• Defining well-being, vulnerability, and resilience
• Applications of quantitative indicators
• Challenges
Demographics (Average 2005-2009)

- Total of 578 Communities throughout Alaska
- 393 Census Designated Places

<table>
<thead>
<tr>
<th>Variable</th>
<th>N</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Population</td>
<td>366</td>
<td>1,812</td>
<td>14,834</td>
<td>0</td>
<td>279,268</td>
</tr>
<tr>
<td>Age</td>
<td>313</td>
<td>34.59</td>
<td>10.73</td>
<td>10.2</td>
<td>63.2</td>
</tr>
<tr>
<td>Household Size</td>
<td>308</td>
<td>3.16</td>
<td>1.18</td>
<td>1.32</td>
<td>11.04</td>
</tr>
<tr>
<td>Household Income</td>
<td>303</td>
<td>$47,575</td>
<td>$20,836</td>
<td>$2,499</td>
<td>$115,417</td>
</tr>
<tr>
<td>Unemployment Rate</td>
<td>314</td>
<td>16.34%</td>
<td>14.99</td>
<td>0</td>
<td>69</td>
</tr>
<tr>
<td>Home Value</td>
<td>285</td>
<td>$140,769</td>
<td>$88,396</td>
<td>$18,800</td>
<td>$1,000,001</td>
</tr>
<tr>
<td>% Native Population</td>
<td>319</td>
<td>46.12%</td>
<td>39.80</td>
<td>0</td>
<td>100</td>
</tr>
</tbody>
</table>
Overview: Alaska Population

Annual population peak

Degree population fluctuations due to fishing sector

Timing of seasonal residents
NMFS activities relating to protecting fishing communities

- National Environmental Policy Act (NEPA), 1970
  - Beginning of social impact assessments (SIAs)
- Magnuson-Stevens Act - National Standard 8, 2006
  - “Conservation and management measures shall, ...take into account the importance of fishery resources to fishing communities ... in order to (a) provide for the sustained participation of such communities, and (b) to the extent practicable, minimize adverse economic impacts on such communities.”
- Environmental Justice Initiative (Executive Order 12898), 1994
  - Achieving environmental protection for all communities (particularly minorities and low-income populations)
Community Social Indices: Project objectives

1. Determine key components of community well-being, vulnerability and resilience
2. Construct indices – Create objective measures of the social condition of communities to predict well-being, vulnerability and resilience
3. Use indices as reference points to understand how community vulnerability and resilience may change over time in response to changes in fisheries management regulations, ecosystem changes, and other external forces
Relationship between vulnerability, resilience, and well-being

• Vulnerability is about the **existing condition**
  • Easy to measure from existing data

• Resilience is about the **response to change over time**
  • More difficult to measure until after an event occurs

• **Need to track vulnerability over time to understand community resilience**

• We consider well-being to encompass both concepts of vulnerability and resilience, as well as other components.
  • Recognizing that well-being is a multi-faceted concept, made up of objective, subjective and interrelational components (Coulthard et al. 2011).
Social indicators of vulnerability and resiliency

- National and international focus on use of indicators to measure well-being in communities
- Cutter et al. (2003, 2008) – National, based on county-level data
  - Created social vulnerability index (SoVI) to environmental hazards
- Jacob and Jepson (2007) and Jacob et al (2010) - Gulf Coast fishing communities
  - Created vulnerability index to measure community sustainability and fishery dependence in the face of changing fisheries regulations
- Colburn and Jepson (2013) – Northeast and Southeast fishing communities
  - Also include indicators of gentrification
- Effort within NOAA to create nationwide database of social indicators
  - Applicability: Fisheries management program performance (e.g., catch shares), predicting social impacts of proposed management programs (and doing social impact statements), vulnerability to climate change
Understanding Alaska Fishing Community Well-being
Understanding Alaska Fishing Community Well-being

- 14 indices of community well-being in 2 categories:
  - Socioeconomic well-being indices (7)
  - Fishing involvement indices (7)
- 346 communities throughout Alaska
- Data from 2005-2009 from the U.S. Census Bureau’s American Community Survey

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Socioeconomic Well-being indices

- Personal disruption
- Population composition
- Poverty
- Labor force structure
- Housing disruption
- Housing characteristics
- Status of schools

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Fishing Involvement Indices

- Commercial processing engagement
- Commercial processing reliance
- Commercial harvesting engagement
- Commercial harvesting reliance
- Recreational fishing engagement
- Recreational fishing reliance
- Subsistence harvesting involvement

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Methods

• Identify variables that represent the well-being concepts mentioned previously
• Conduct a principal components factor analysis
  • Varimax rotation with Kaiser normalization
  • Achieve a single factor solution
• Create index scores from the rotated factor loadings using the regression method

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Data

• Fisheries data
  — Commercial landings, permits, revenue, vessels, processors, quota share allocation (NMFS, ADFG)
  — Recreational licenses, guides, charter businesses (NMFS, ADFG)
  — Subsistence permits, halibut and salmon catch, marine mammal take (ADFG, USFWS, Alaska Beluga Whale Commission)

• Socioeconomic Data
  — American Community Survey 2005-2009 (Census Bureau)
  — 2000 and 2010 decennial census (Census Bureau)
  — Alaska Local and Regional Information (ALARI) database

Overall community scores

• For each index (7 social; 7 fisheries):
  • Each community is given a score of 1 if they are +1 standard deviation above the mean index score and a 0 otherwise

• Dichotomized score is then summed for each community
  • Across all socio-economic well-being indices
  • Across all fishing involvement indices

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
<table>
<thead>
<tr>
<th>Community</th>
<th>Personal Disruption</th>
<th>Population Composition</th>
<th>Poverty</th>
<th>Labor Force Structure</th>
<th>Housing Characteristics</th>
<th>Housing Disruption</th>
<th>Status of Schools</th>
<th>Total Social Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Kokhanok</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Akutan</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Anvik</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Chevak</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Clark's Point</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>False Pass</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Gakona</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Gambell</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Goodnews Bay</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Hooper Bay</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Karluk</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Koyuk</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Koyukuk</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Mentasta Lake</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Napakiak</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Nikolai</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Northway</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Northway Village</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Platinum</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Quinhagak</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Savoonga</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Stebbins</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Takotna</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Tanacross</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td>Tuluksak</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
<tr>
<td>Tuntutuliak</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>3</td>
</tr>
</tbody>
</table>
Social indices: Top 26 communities overall

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Total sum dichotomized social scores

From Himes-Cornelband Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
## Fisheries indices

<table>
<thead>
<tr>
<th>Community</th>
<th>Commercial Processing Engagement</th>
<th>Commercial Harvesting Engagement</th>
<th>Commercial Processing Reliance</th>
<th>Commercial Harvesting Reliance</th>
<th>Recreational Engagement</th>
<th>Recreational Reliance</th>
<th>Subsistence Harvesting Involvement</th>
<th>Total Fishery Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Elfin Cove</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>5</td>
</tr>
<tr>
<td>Kasilof</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>5</td>
</tr>
<tr>
<td>Cordova</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Craig</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Dillingham</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Egegik</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Homer</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Kodiak</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Pelican</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Petersburg</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Port Alexander</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Port Lions</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>4</td>
</tr>
<tr>
<td>Soldotna</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>Wrangell</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>1</td>
<td>1</td>
<td>0</td>
<td>0</td>
<td>4</td>
</tr>
</tbody>
</table>

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, *Under Review.*
Total sum dichotomized fisheries scores

From Himes-Cornell and Kasperski, 2015 “Using Socio-Economic and Fisheries Involvement Indices to Understand Alaska Fishing Community Well-Being”, Under Review.
Groundtruthing the Indices: Can we believe any of this?

- Develop a rapid assessment methodology to test the external validity of the community well-being indices
- Compare in-person fieldwork assessments of well-being with quantitative social indicators of well-being described above

Predictive Accuracy of the indices

- One goal of indices = Predicting community vulnerability to inform decision-making
- Before making predictions, need confidence in indices
  - Ensure indices represent socio-economic realities of communities
- Lack of confidence = potential to make erroneous conclusions

Project goal:

- Test predictive accuracy of indices to identify which communities will be hardest hit by change (e.g., climate change, fisheries management)
- Understand future vulnerability by looking at the past: Crab rationalization (2005)
Predicting vulnerability to proposed management changes

- Catch share programs
  - Gulf of Alaska trawl fishery rationalization
  - BSAI crab rationalization
- Significant allocation changes
  - Halibut PSC
- Proposed endangered species listings
  - Stellar Sea Lions
Challenges in Measuring Vulnerability

• Uncooperative data
  • American Community Survey (ACS) data are based upon annual 5-year estimates
  • Not all variables, and indices, seem to be appropriate or available for all communities

• New data collections needed to say more about human dimensions of any one ecosystem being assessed (e.g., cultural ecosystem services and other non-market valuations)

• Communities access are embedded in multiple socio-economic systems and ecosystems – many external factors to consider
Thank you!

Stephen.Kasperski@noaa.gov

Amber.Himes@noaa.gov