Out on a limb: Measuring 'resilience' in natural resource-dependent communities
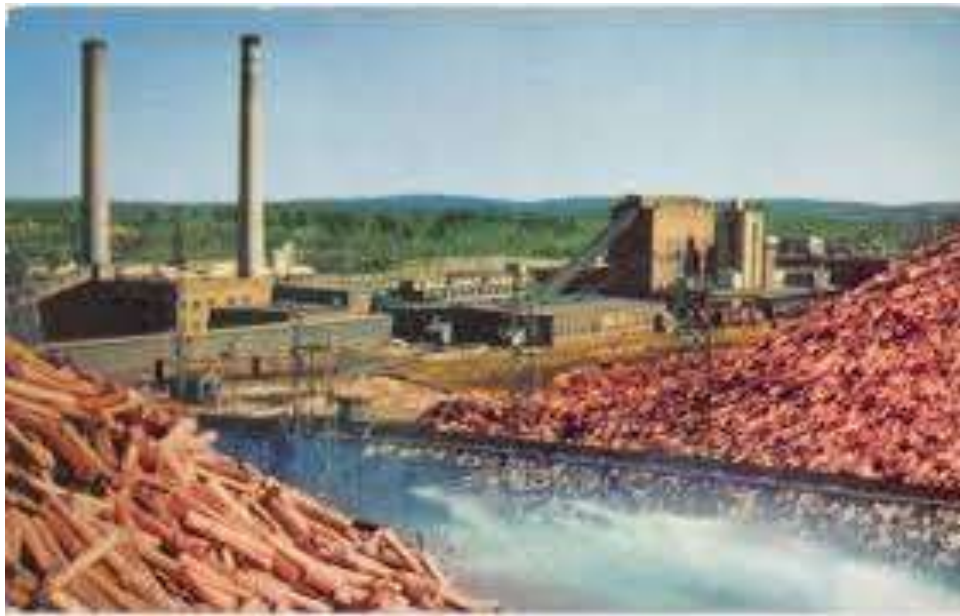
Dr. Adam Daigneault

Dr. Linda Silka

October 22, 2018

KATAHDIN
BAXTER PEAK   ELEVATION 5267 FT.
NORTHERN TERMINUS OF THE
APPALACHIAN TRAIL

PRIVATE PROPERTY — NO — TRESPASSING

Great Northern Paper

Angelo's
PIZZA - MORE
723-4767

Coffee Shop

WELCOME TO
KATAHDIN WOODS AND WATERS
RECREATION AREA

PUBLIC
WELCOME

Elliotsville
Plantation, Inc.

HUNTING
AND TRAPPING
PROHIBITED

STRICTLY
ENFORCED

Katahdin Gateway Insurance LLC

Calculations Inc
www.calculationsinc.com   207-723-1078

NATIONAL
PARK YES!

This Bridge Owner
says
NATIONAL
PARK
NO!

FLAP OVER BRIDGE TO KATAHDIN NAT'L MONUMENT

A Paper Mill Goes Quiet
and the Co...
Gropes fo...

The Great Northern Paper...
Tristan Spinski for The New Yo...

By Jess Bidgood

Aug. 2, 2014

BUSINESS ▸   Posted January 12, 2017 | Updated January 12, 2017

Nonprofit buys former Gre...
Millinocket

In purchasing the 1,400-acre mill site for $1, the group ...
redevelopment opportunities.

STAFF REPORT

Share f 🐦 🔴 in ✉ 🖨

In Aug...
Millino...

In the...
Millino...
who c...
on on...
many...
they c...
jobs a...
interio...

The former Great Northern Paper mill in Millinocket, shown here in 2011, was dismantled and sold for scrap beginning in 2013. *Press Herald File Photo/Gordon Chibroski*

AUGUST 20, 2018

FOCUS: GREATER BANGOR/NORTHERN MAINE

With its paper mill long gone, Millinocket has a new story to tell

PHOTO / MAUREEN MILLIKEN

Great Northern Paper Co. closed its paper mill in September 2008, setting in motion 10 years of change in Millinocket (though some of the manufacturing equipment is still there). Now a new future is being mapped out by the people who've taken on the real work of rebuilding the former mill town's economy from the ground up.

BY MAUREEN MILLIKEN

**WASTEWATER -
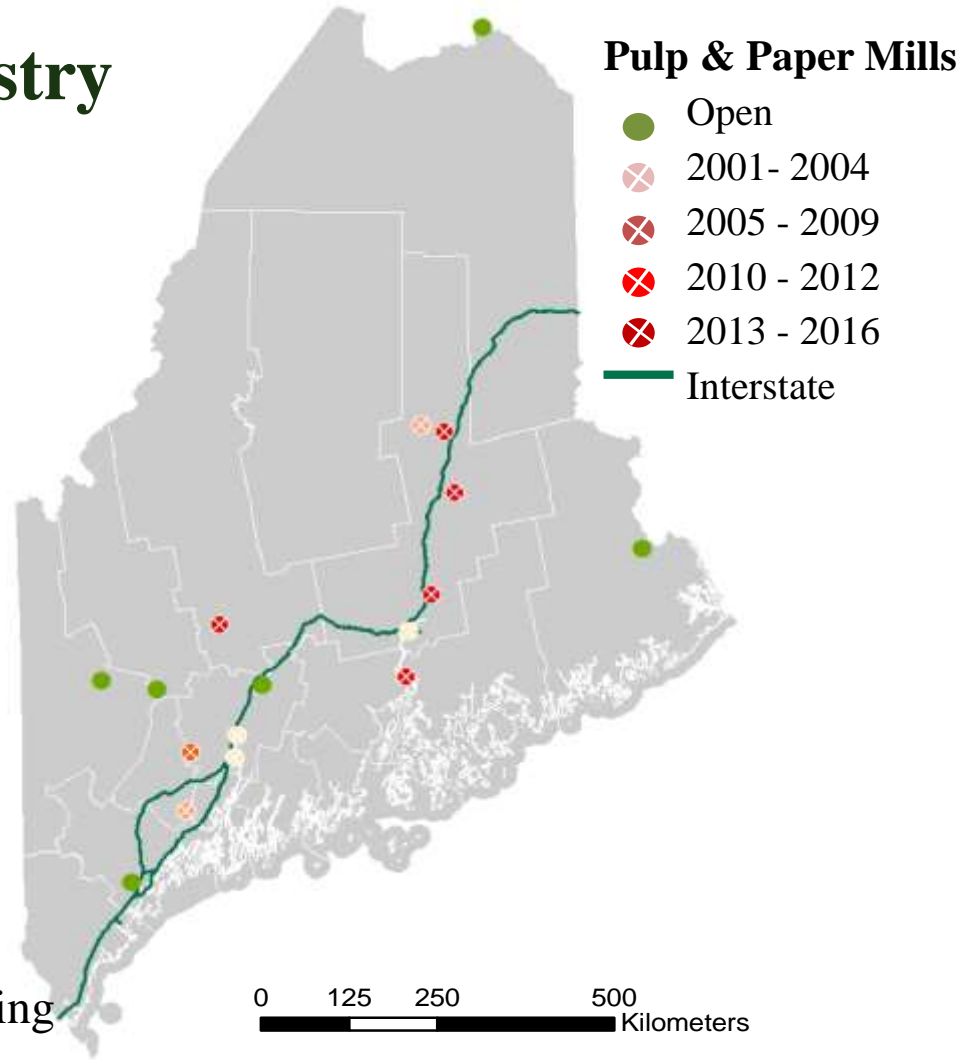ASSISTANT
OPERATOR**

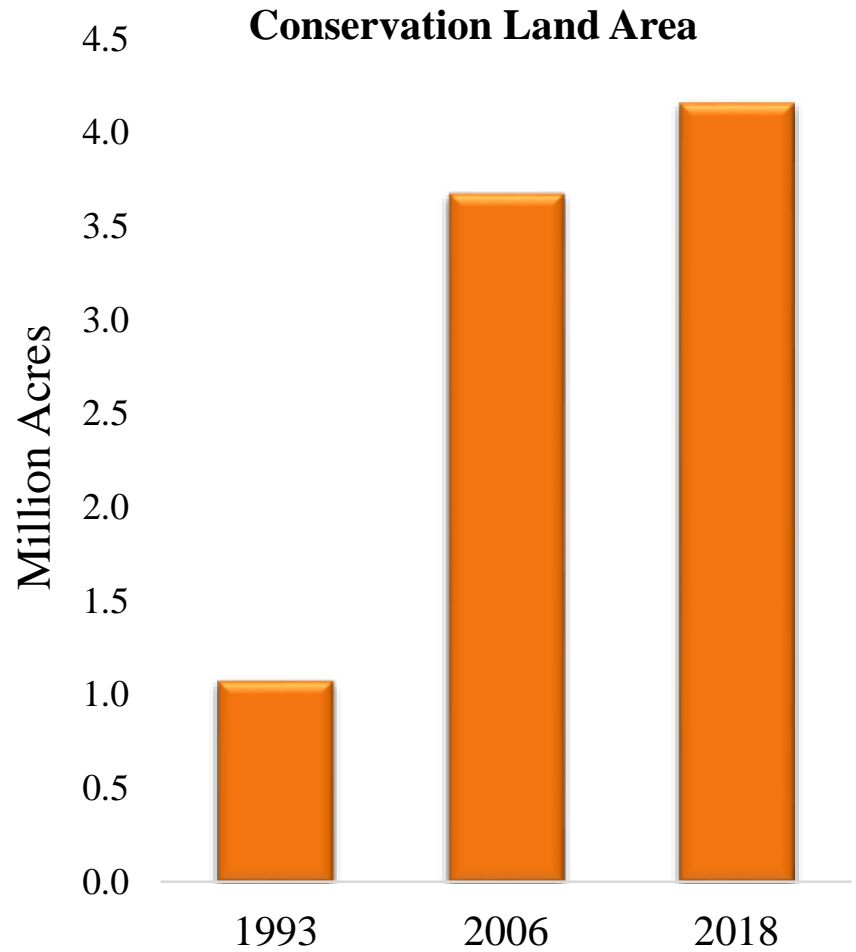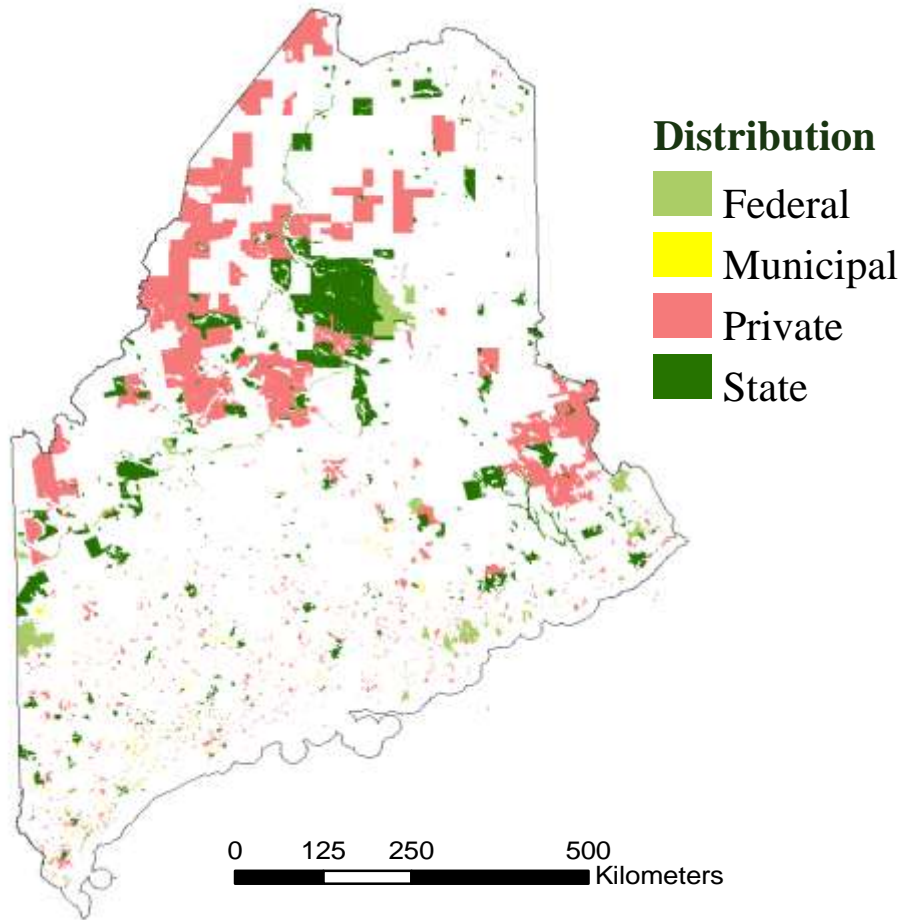# Maine Pulp and Paper Industry

Employment

- 17,400 people at the end of 1990

- 4,100 people at the end of 2015

- 75 % decline

Mills

- 28 mills operating at the end of 2006

- 18 mills operating at the end of 2007

- 12 mills operating at the end of 2013

- 6 mills operating in 2018

- Mills currently operating have been investing in new technology and/or expanding

Pulp & Paper Mills

- Open
- 2001- 2004
- 2005 - 2009
- 2010 - 2012
- 2013 - 2016
- Interstate

0   125   250   500
Kilometers

Maine Land Conservation Patterns

Distribution

- Federal
- Municipal
- Private
- State

0   125   250   500 Kilometers

Conservation Land Area

Million Acres

4.5
4.0
3.5
3.0
2.5
2.0
1.5
1.0
0.5
0.0

1993   2006   2018

Overview

- Katahdin Region has experienced **significant change**
  - Mill closures, KWWNM established, new recreational enterprises

- Region actively exploring opportunities to make it a **more resilient and robust place to live and work**

- **Socioeconomic resilience indicators** a well-regarded approach to:
  - Take a **'snapshot' of current state** of a 'community'
  - Assess if making **+** strides in socioeconomic development

- **Our approach**: develop a mix of quantitative and qualitative measures to estimate **community resilience** and identify options for how the Katahdin Region could improve theirs.

Questions to Consider

- How do we define "resilience"?

- What do we mean by "community"?

- What are the key attributes and drivers of resilient communities?

- How have other natural-resource dependent communities responded to large socio-economic shocks?

University of Maine working with stakeholder partners in Katahdin Region to:

1. Compile a socioeconomic indicators baseline for the region to help estimate community 'resilience'
2. Compare baseline to across space and time
3. Identify key indicators to identify measures of success and tipping points
4. Develop a method for stakeholders in the community to update and track these indicators into the future.

What Do We Mean By Resilience?

Resilience measures seek to evaluate a society's capacity to adapt to challenges before and after a shock or disaster.

"Community resiliency can be defined as **adaptability**…the capacity for humans to **change their behaviors**, economic relationships, and social institutions such that *economic vitality is maintained and social stresses are minimized*."
Quigley *et al* (1996)

"A community's ability to **maintain, renew, or reorganize** social system functions and ecological functions…the *robustness and buffering capacity of a community in a changing system*."
Varghese et al (2006)

What Do We Mean By Resilience?

Economic Shock:

• Event that produces a significant change within an economy

• Can be unpredictable and impact supply or demand

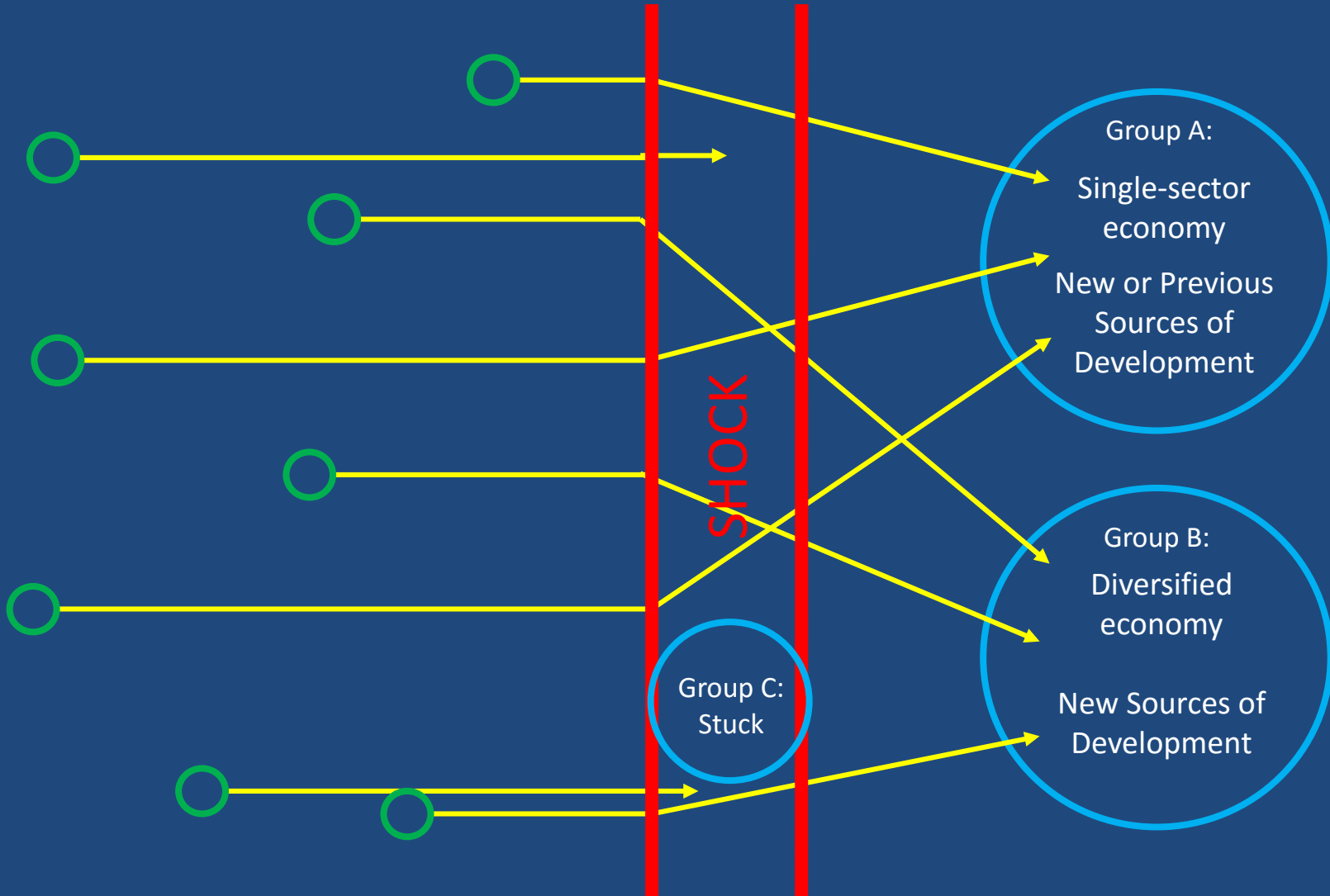<u>What happens after </u>experiencing this shock?

1. Return to 'normal'
2. Fall apart
3. Grow stronger (adapt)

(Cutter, Ash, & Emrich, 2014; Joseph & Krishnaswamy, 2010)

Communities before shock

After Shock Adaptation

SHOCK

Group A:
Single-sector economy
New or Previous Sources of Development

Group B:
Diversified economy
New Sources of Development

Group C: Stuck

Economic Resilience

- Economic development and resilience concerns include:
  - Attracting and retaining businesses and jobs,
  - Building the tax base
  - Addressing poverty and inequality
  - Enhancing local amenities
  - Economic sustainability

- Also economic indicators associated with non-economic aspects of community resilience, For example:
  - Debt ratios generally impact a community's ability to deal with change.
  - Poverty impacts the probability that people will adequately respond from an economic or natural disaster.
  - Job continuity and economic sustainability will strongly influence the continuity of social networks.

A Conceptual Framework

Trajectories

- Prod-shock-decline (T1)

- Prod-shock-amenity (T2)

- Prod-shock-"new" prod (T3)

Contingencies

- Resource base (RB)

- Connectivity (C)

- Social Adaptability (SA)

Morzillo, A. T., C.R. Colocousis, D.K. Munroe, K.P. Bell, S. Martinuzzi, . . . McGill, B. (2015). "Communities in the middle": interactions between drivers of change and place-based characteristics in rural forest-based communities. *Journal of Rural Studies*, 42(1): 79-90

Characteristic	Effect
RB: Forest use	+/-
RB: Forest aesthetic quality	+ (in-migration)
RB: Access to forest	+
C: Export dependence	- (vulnerable)
C: Proximity to urban areas	+ (work options)
C: Network infrastructure	+ (new employers)
SA: Human capital	+ (higher skills)
SA: Social networks	+/-
SA: Local institutions	+/- (inclusiveness)
SA: Community Identity	+/-

Production

T1 - DECLINE

T2 - AMENITY

T3 – NEW PRODUCTION

Contingencies influence Outcomes after a Shock

Table 3

Assessment of economic and community resilience indices.

Study	Approach	Conceptual/Empirical Support	Sample indicators	Problems
Cutter et al. [3]	Adapted vulnerability index	Success of vulnerability index several case studies	Percent employed Business size income Equality	Incomplete Some irrelevance
Bruneau et al. [23]	4 Rs framework	Systems engineering	Avoidance of losses Redundant capacity Stabilizing measures Recovery time	Incomplete Includes mitigation
Jordan et al. [24]	Content analysis	Prevalence of (sub)indicators	Employment Home ownership Income equity Single-sector dependence	Incomplete Some irrelevance
Mayunga et al. [25]	Capital-based strategies	Extension of social-capital approach	Household income Property value Employment investments	Incomplete
Fisher et al. [26]	3 Rs framework	Expert judgment	Excess capacity Inventories Input/import substitution	Partly complete Single case study
Norris et al. [1]	Literature review	Social psychology	Diversity of economic resources Equity of resource Distribution	incomplete Process-oriented
Burton [28]	Based on vulnerability	Hurricane Katrina recovery	Percent employed Household income Business size	Incomplete Some irrelevance
Rose [11]	Production theory macroeconomics	Several case studies	Inventories Excess capacity Input substitution Business relocation	Narrowly economic

Rose and Krausmann (2013)

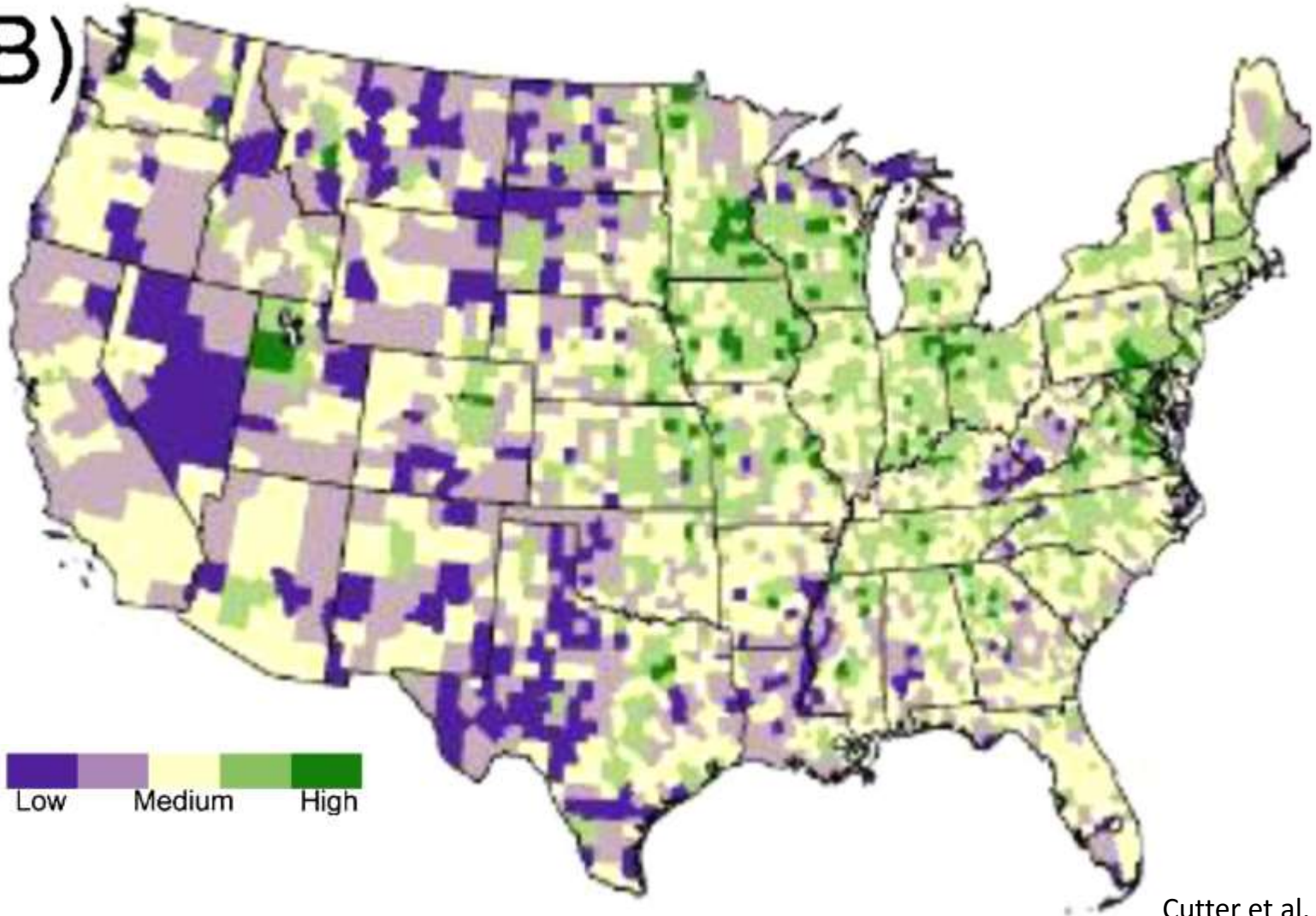# Baseline Resilience Indicators for Communities (BRIC)

- BRIC process based on empirical research with solid conceptual and theoretical underpinnings. (Cutter et al. 2014)

- Composite indicator measures overall pre-existing community resilience, and provides an empirically based resilience metric for use in a policy context.

- Using data from 30 public and freely available sources, BRIC comprises 49 indicators associated with six domains:
  - Social (10 indicators)
  - Economic (8 indicators)
  - Housing and infrastructure (9 indicators)
  - Institutional (10 indicators)
  - Community Capital (7 indicators)
  - Environmental (5 indicators)

How can we measure Socioeconomic Resilience?

Indicator	Measurement	Effect on Resilience
Population stability	% change	+
Homeowners	% total housing stock	+
Educational attainment	% with bachelor's or higher	+
Employment	% 16 and older in labor force	+
Female labor force participation	% of females 16 and older	+
Single sector employment	% employed in natural resources	-
Federal Employment	% total labor force	+
Business size	% large, > 100 employees	+
Median household income	$	+
Poverty	% total population	-
Public assistance	% total population	-
School lunch program	% total K-12 students	-
Effective tax rate	$ per $1,000 value (mill rate)	-
Change in town valuation	%/yr	+
Housing type	% mobile homes	-
Housing age	median year built	+
Housing value	median value	+/-
Health care coverage	% covered	+
High speed internet infrastructure	% with access to broadband	+

Economic Resilience by US County

Cutter et al. (GEC, 2014)

Our Approach

1. Develop Economic Resilience Indicators (ERIs) for Katahdin Region & compare to other parts of Maine

2. Conduct 'qualitative' survey to get resident perceptions on how things are and ideas on where their communities could improve

3. Identify other parts of the US have that 'rebounded' to major economic shocks

Combined, can we use this framework to guide where Katahdin could go?

Our Approach: Share drafts and thoughts with stakeholder partners and community-members at all stages of the project

Our Approach: Get behind the community efforts! Show that you really care about what you're researching

2017 Millinocket Marathon

The Katahdin 'Region'
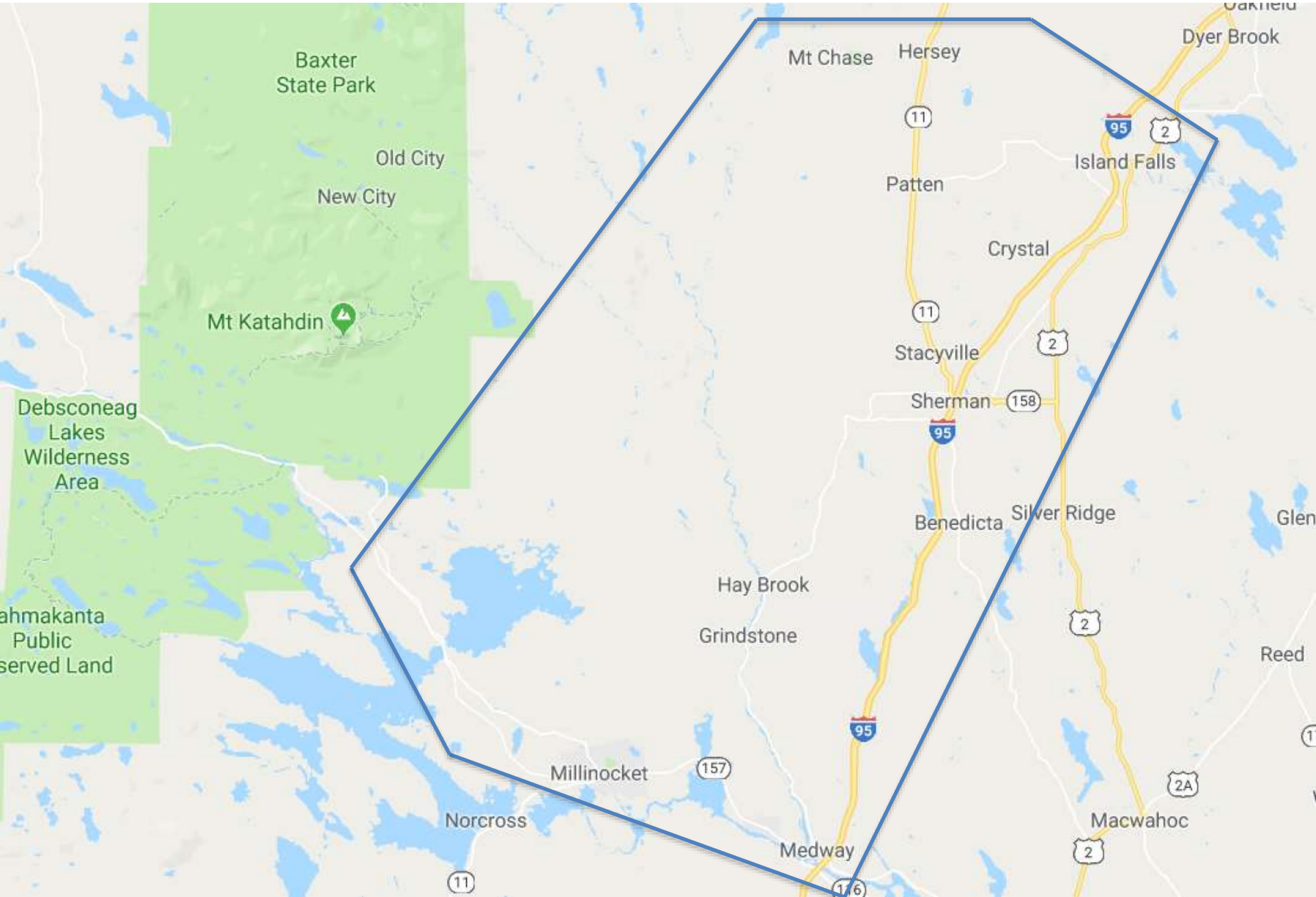
Quantitative ERIs

Estimating Economic Resilience Indicators (ERIs)
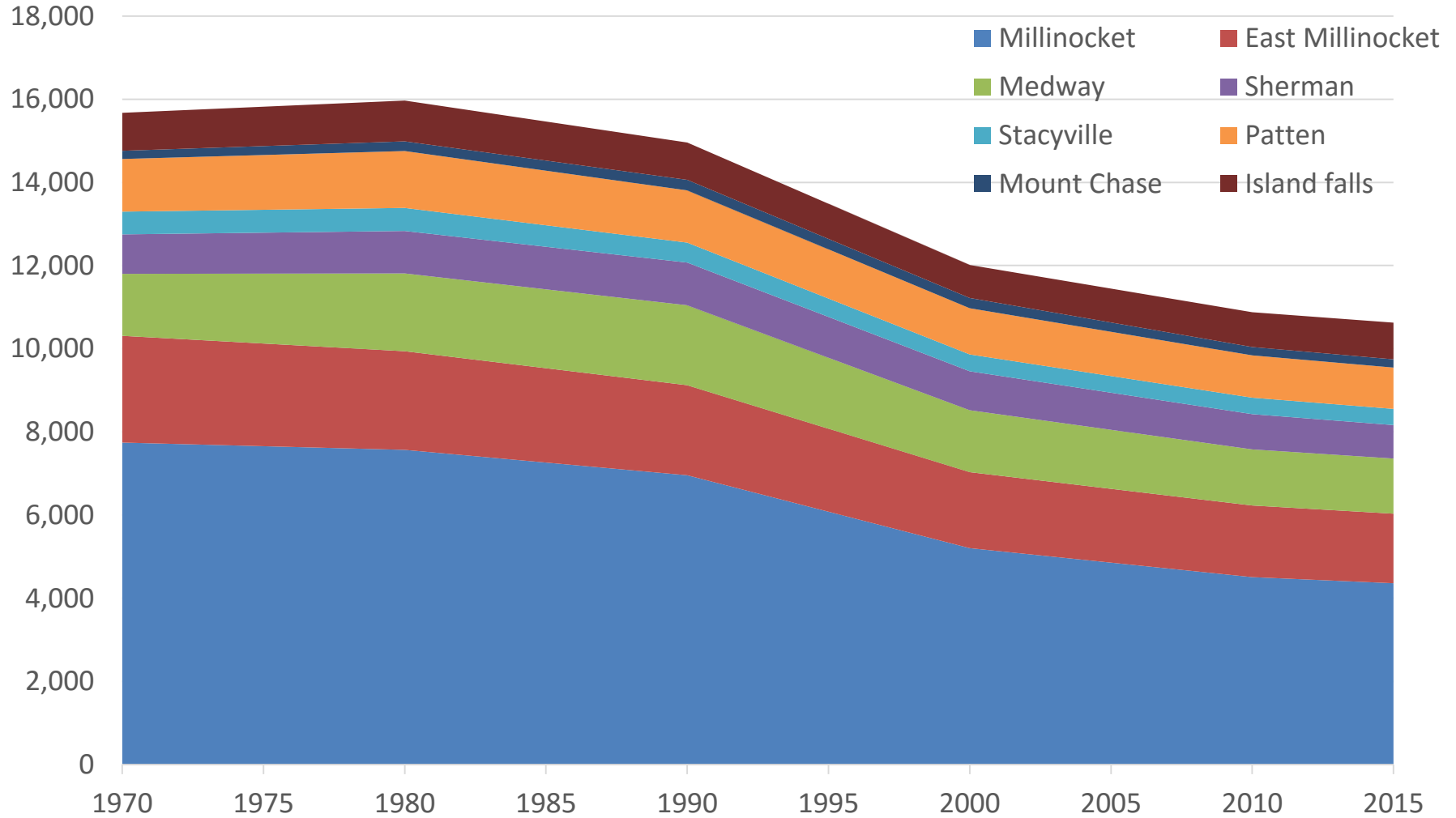
For each indicator, follow these steps...

Transformation (percentage) → Normalization [(x – minimum) / range] → Orientation (1 – normalization score)

↓

Sum factor scores = Resilience Score (0 = low, 1 = high) ← Average indicator scores to get each factor score
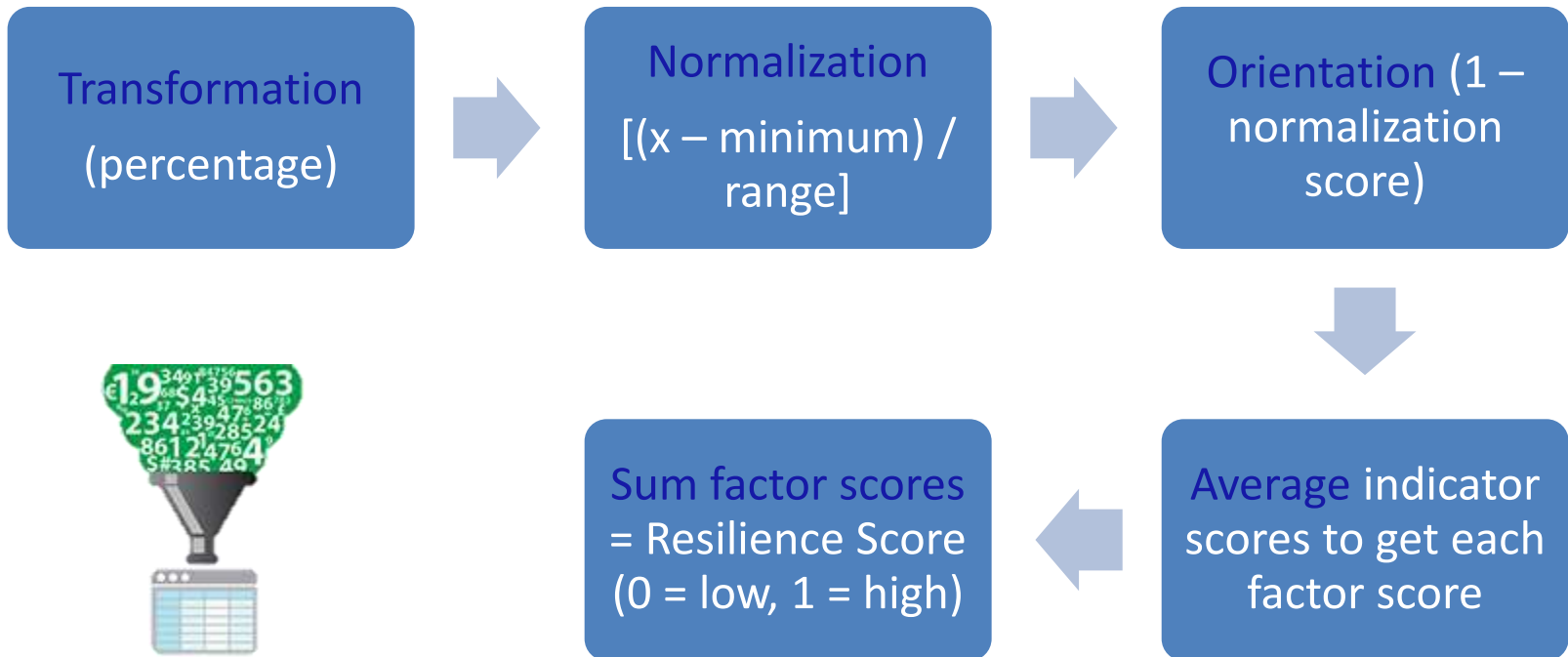
Caution. Very fast run through of several slides ahead…

…but don't worry, we'll distill it all down into just a couple of numbers at the end

Katahdin Data Sources and Limitations

- All data obtained from publicly available sources
    1. US Census Bureau, Decennial Census
    2. US Census Bureau, American Community Survey, 5-year estimates
    3. Maine Department of Labor, Center for Workforce Research and Information
    4. Maine Revenue Service, Property Tax Division
    5. Maine Department of Education Data Center

- Caveats/limitations
    - Most annual data based on surveys, not the entire population (e.g., Census)
    - Figures that segment across municipality, age, occupation, etc. have lower statistical confidence
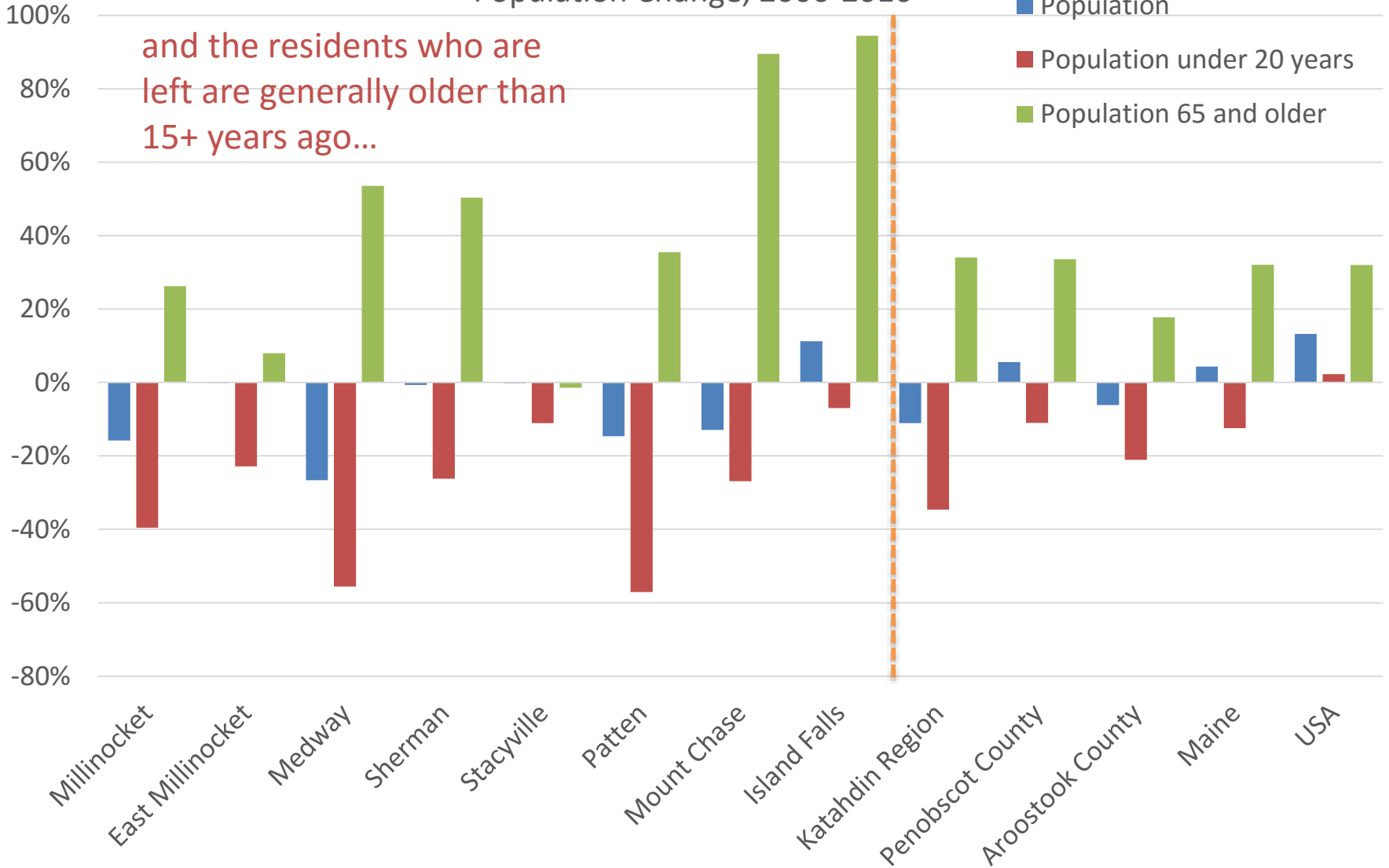   - Factsheets note the level of confidence for each indicator
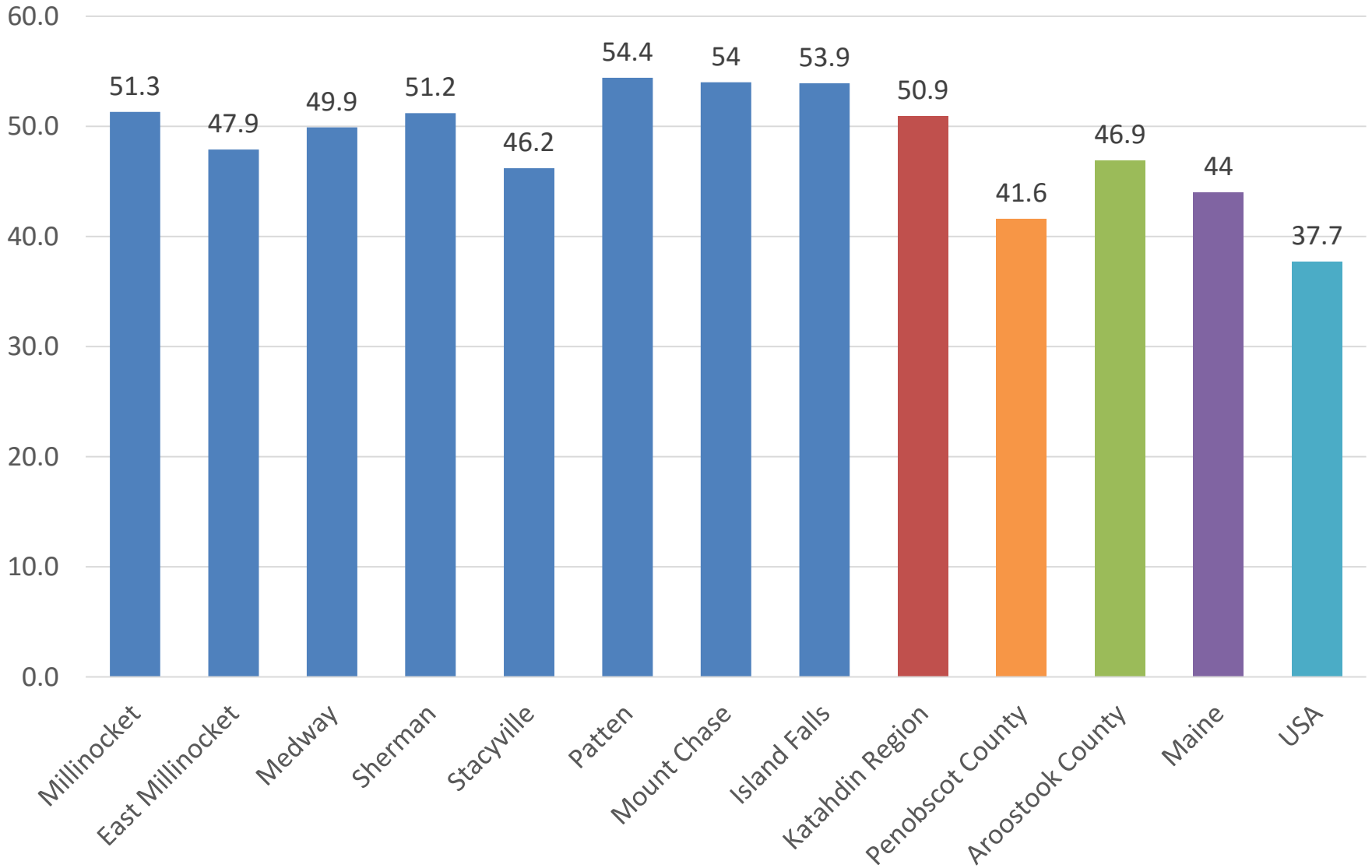
Katahdin Region Population, 1970-2015

Legend: Millinocket, East Millinocket, Medway, Sherman, Stacyville, Patten, Mount Chase, Island falls
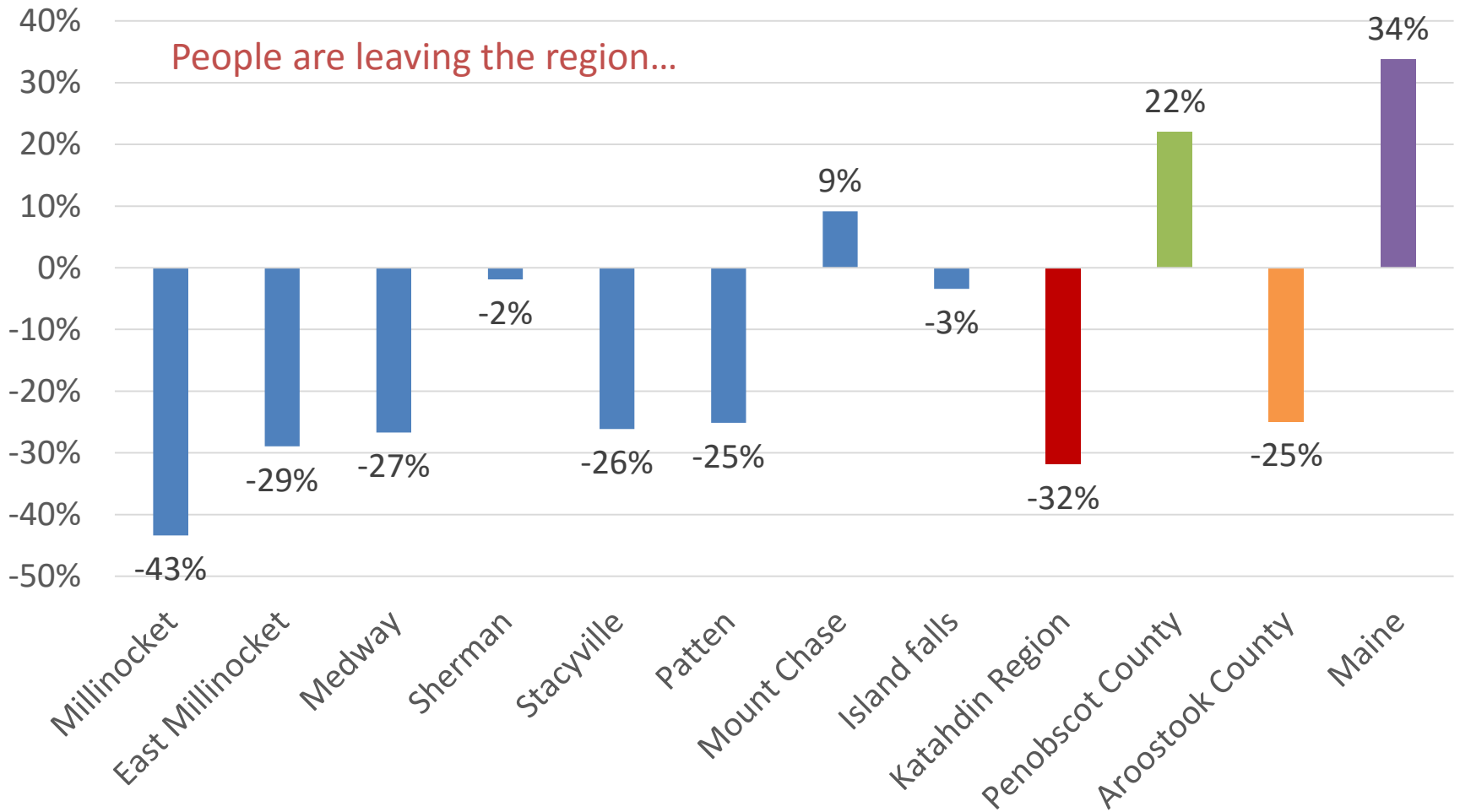
Population Change, 2000-2016

and the residents who are left are generally older than 15+ years ago…

Legend:
- Population
- Population under 20 years
- Population 65 and older

Categories: Millinocket, East Millinocket, Medway, Sherman, Stacyville, Patten, Mount Chase, Island Falls, Katahdin Region, Penobscot County, Aroostook County, Maine, USA

Median Age, 2016

Median Household Income

Regional household income is comparatively low…

Location	Median Household Income
Millinocket	$30,861
East Millinocket	$37,317
Medway	$47,423
Sherman	$41,321
Stacyville	$30,331
Patten	$33,105
Mount Chase	$29,077
Island Falls	$37,535
Katahdin Region	$35,265
Penobscot County	$44,738
Aroostook County	$37,613
Maine	$50,193
USA	$54,633
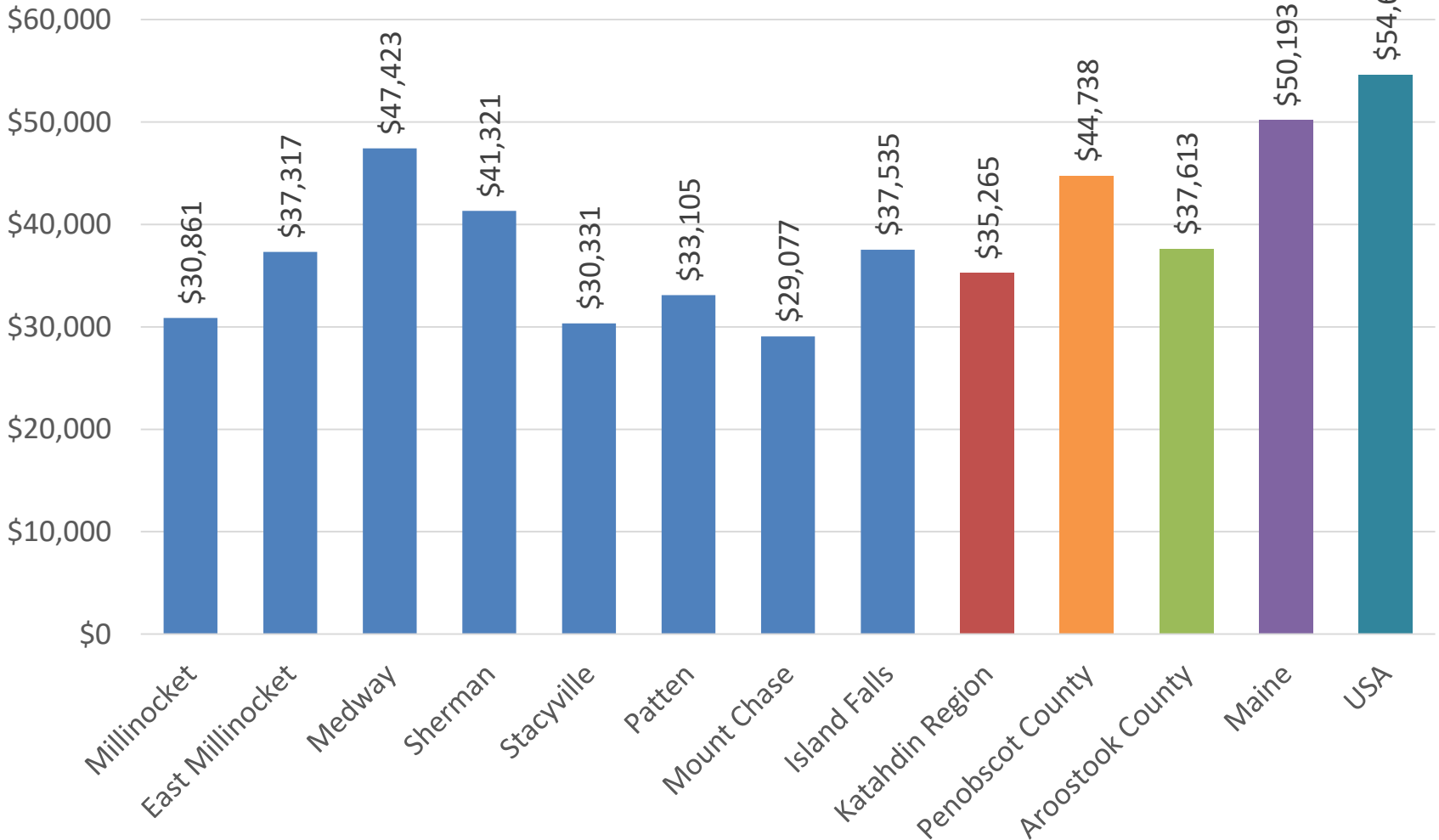
Change in Median Household Income, 2000-2016

and average real income in the region has declined more by comparison...

People Below Poverty Level, 2016

But average poverty levels are not that different than other areas…
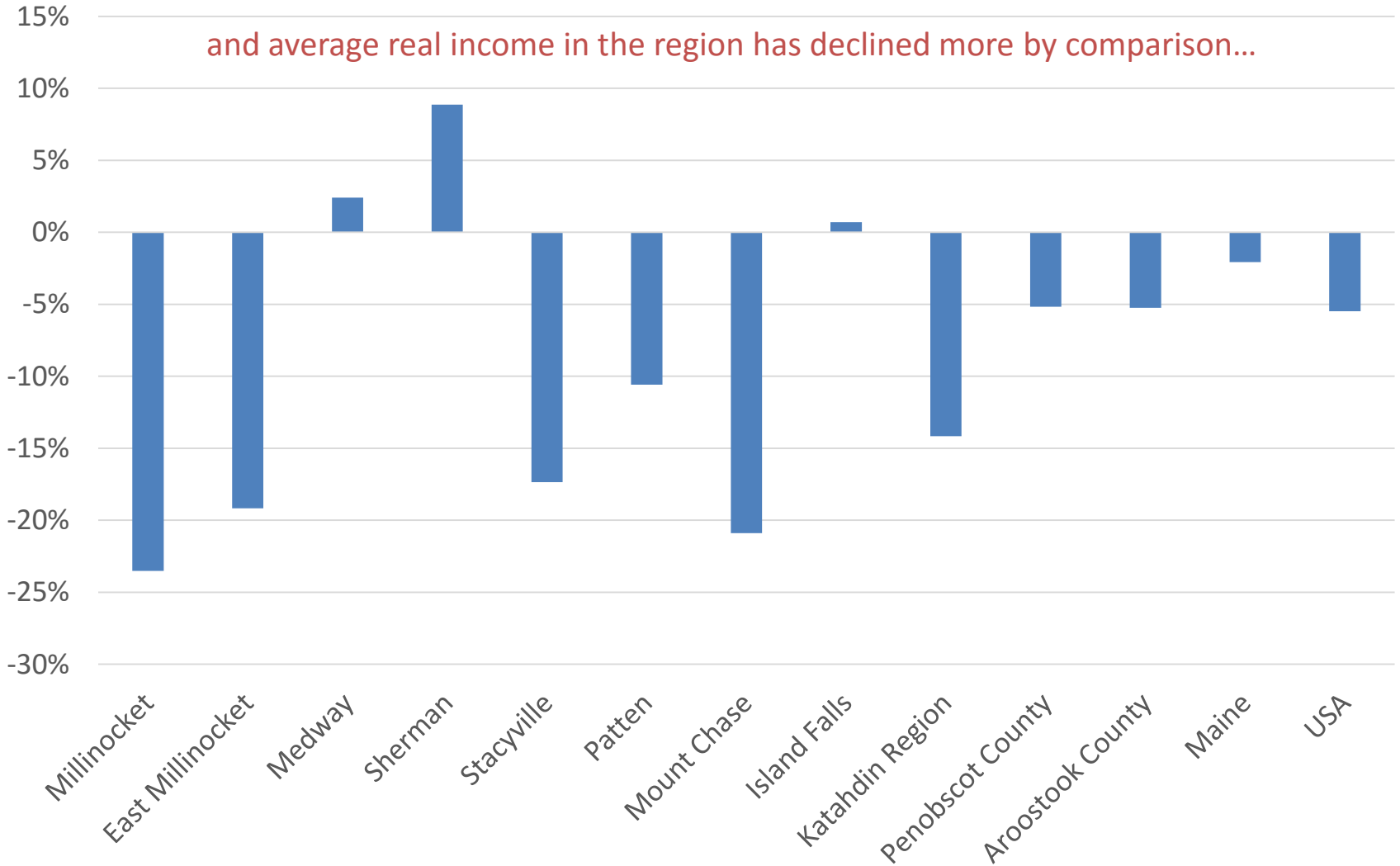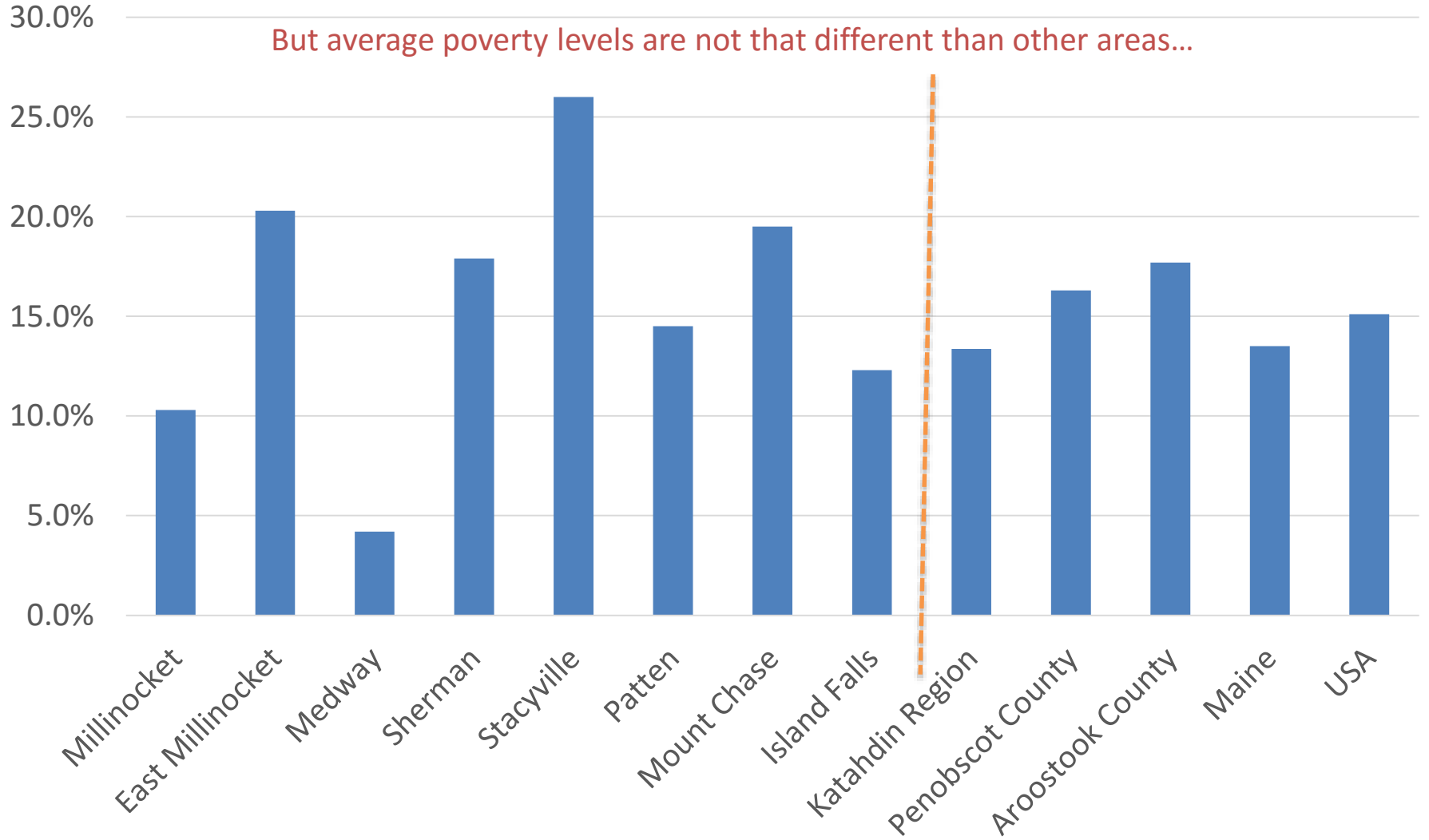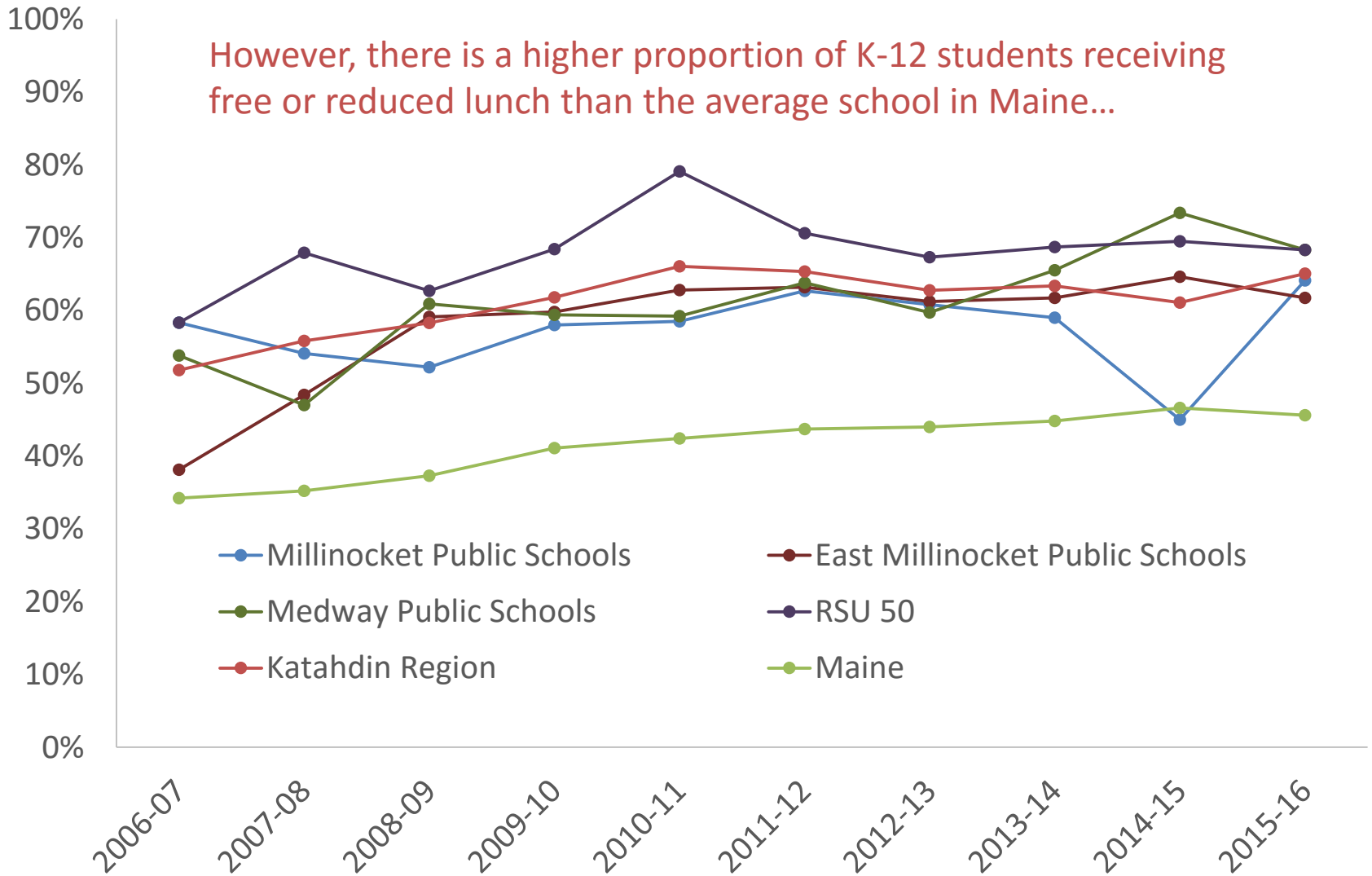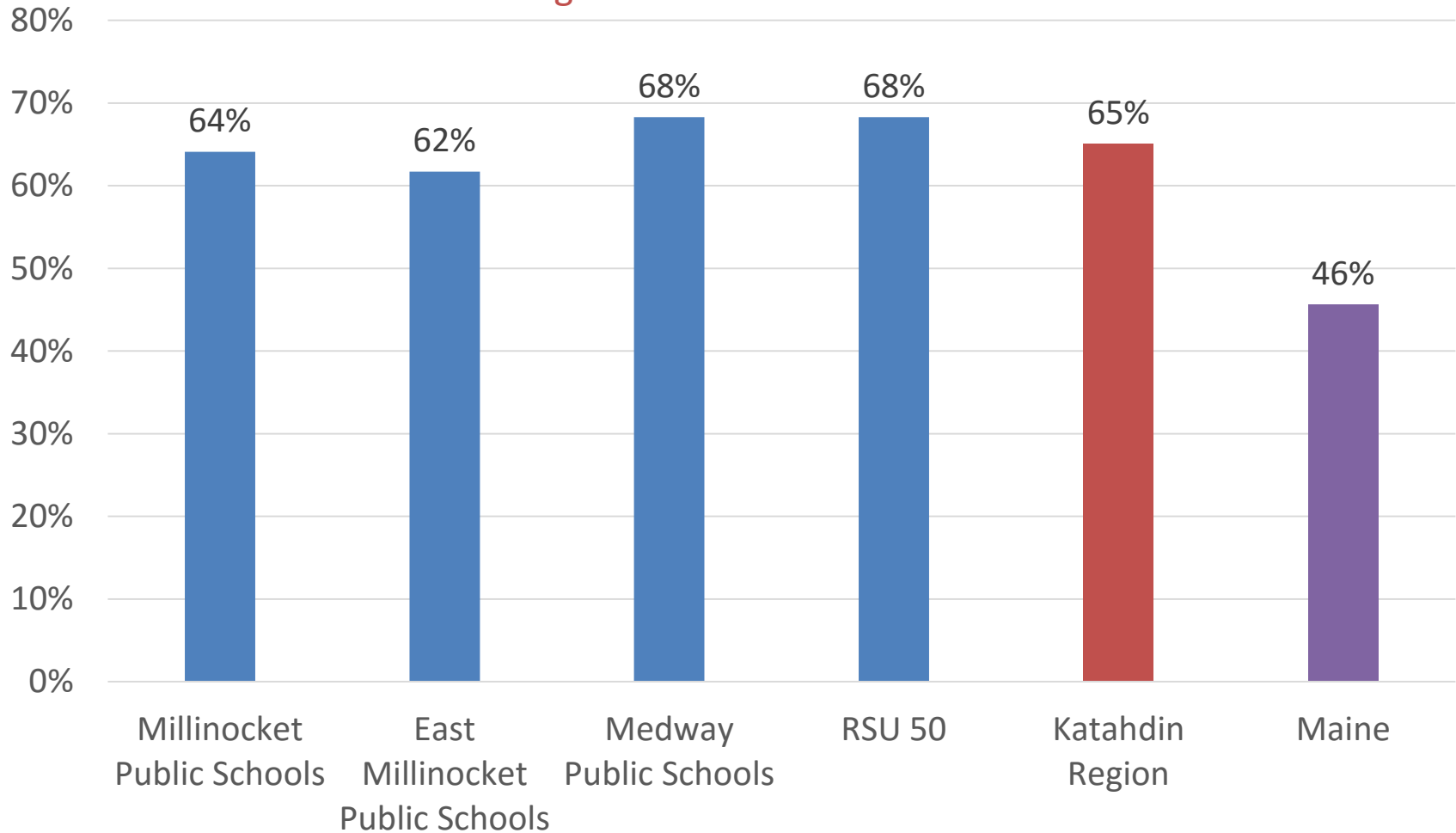
Students Enrolled in National School Lunch Program (%)

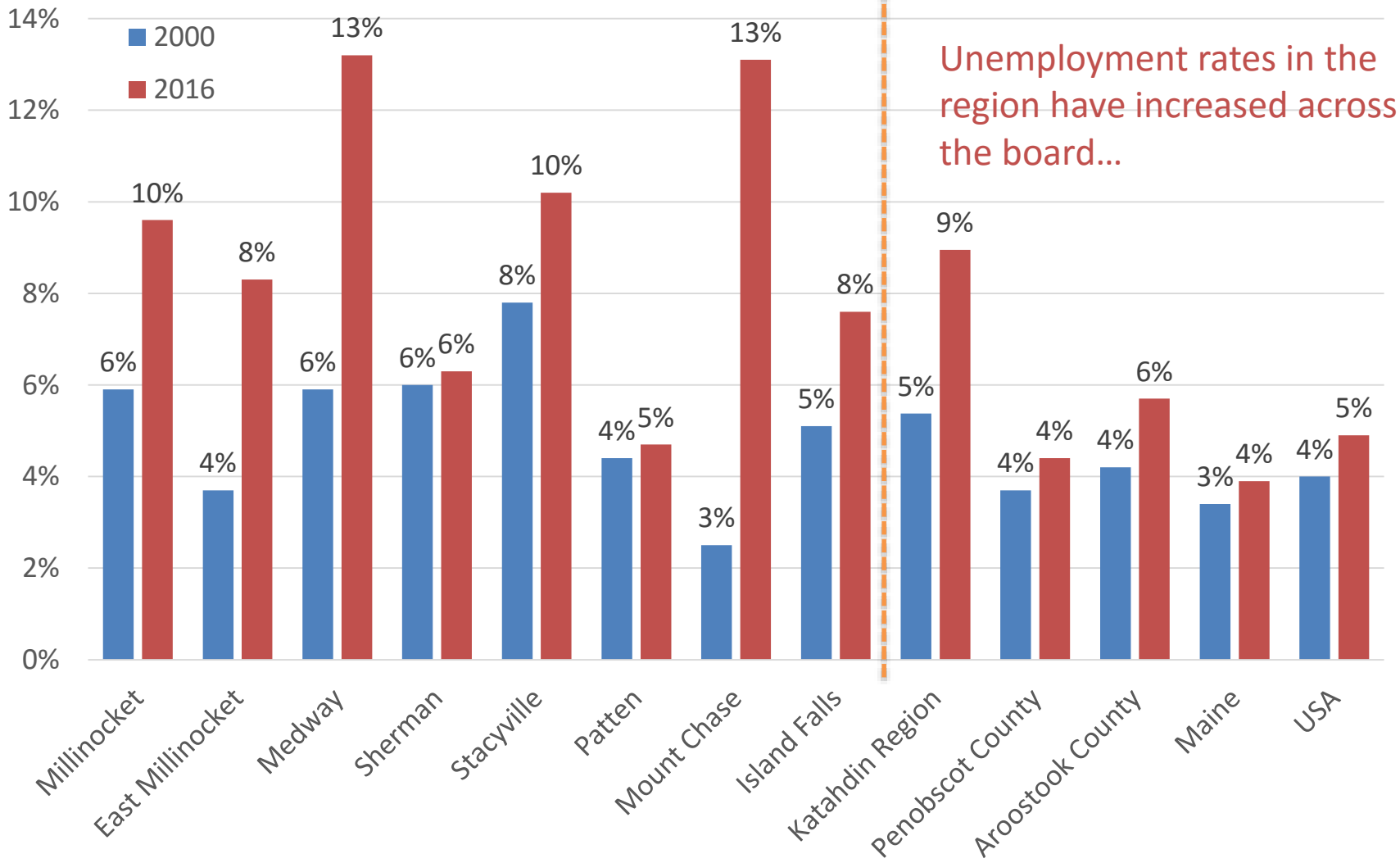However, there is a higher proportion of K-12 students receiving free or reduced lunch than the average school in Maine…

Legend:
- Millinocket Public Schools
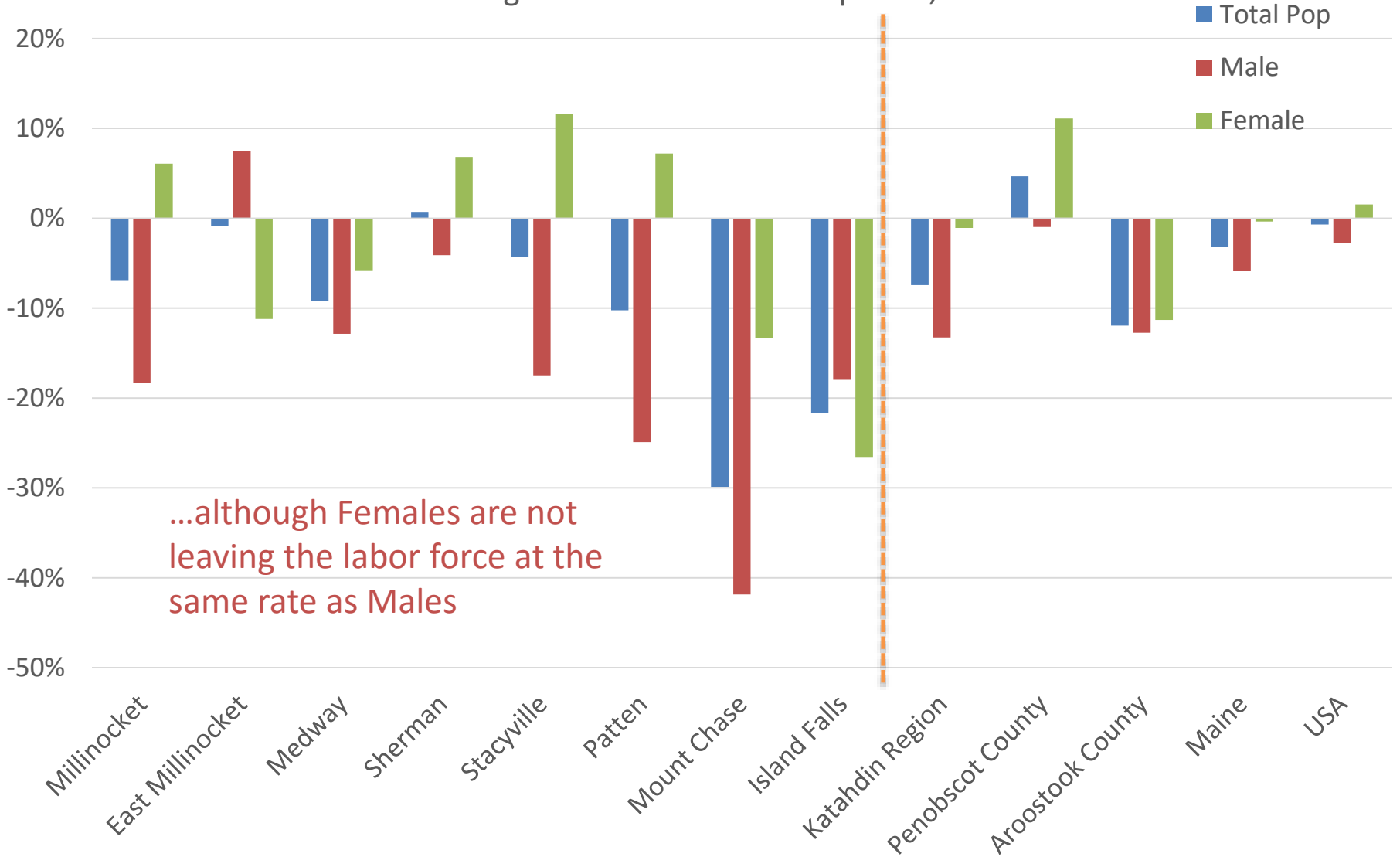- East Millinocket Public Schools
- Medway Public Schools
- RSU 50
- Katahdin Region
- Maine

Labor Force Participation
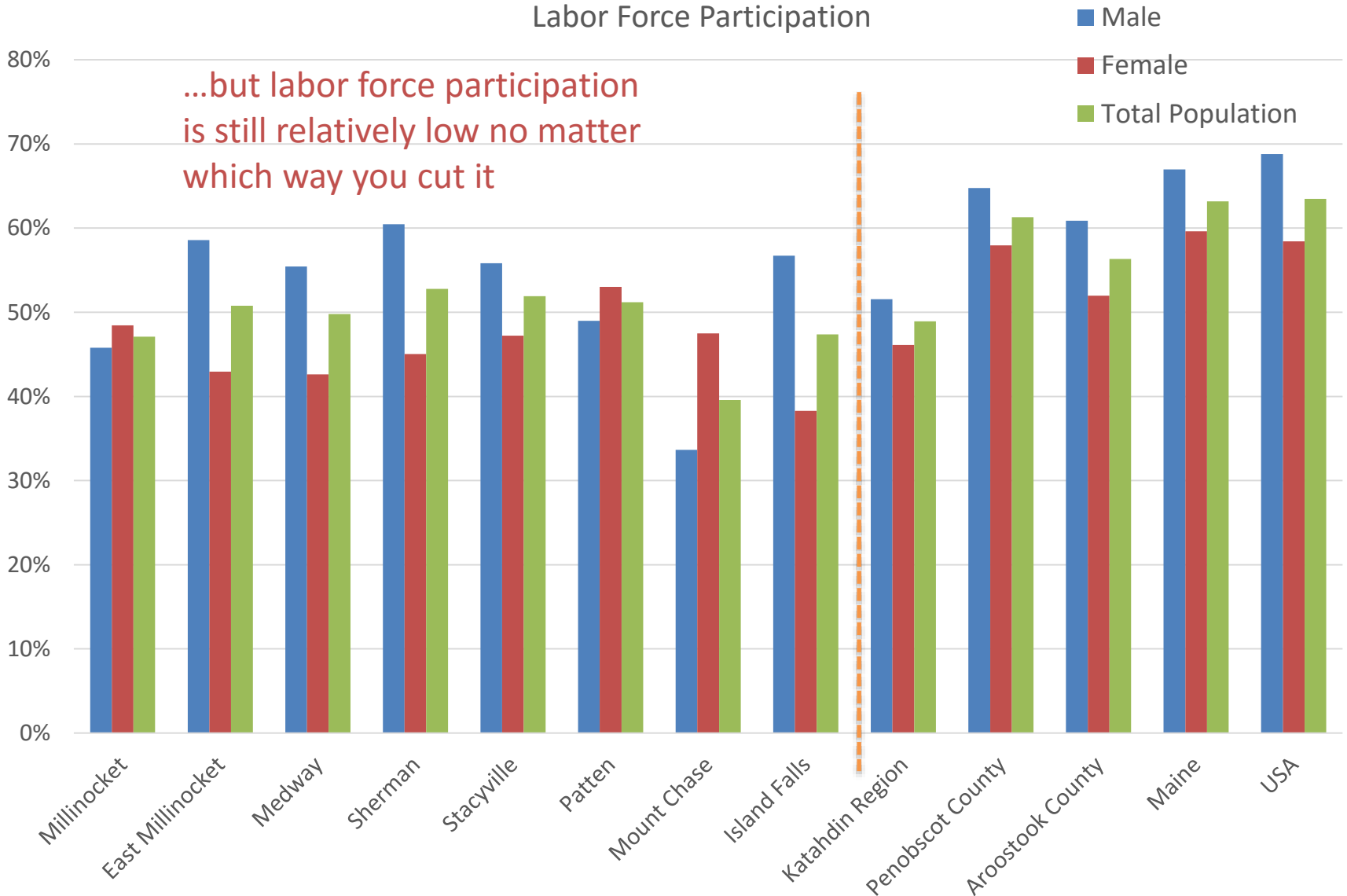
...but labor force participation is still relatively low no matter which way you cut it

Legend:
- Male (blue)
- Female (red)
- Total Population (green)

Categories (x-axis): Millinocket, East Millinocket, Medway, Sherman, Stacyville, Patten, Mount Chase, Island Falls, Katahdin Region, Penobscot County, Aroostook County, Maine, USA

Y-axis: 0% to 80%

Change in Labor Force Participation, 2000-2016

...although Females are not leaving the labor force at the same rate as Males

Median House Value, 2016

...and housing values are relatively low

Location	Value
Millinocket	$63,698
East Millinocket	$55,897
Medway	$70,414
Sherman	$94,511
Stacyville	$70,019
Patten	$78,216
Mount Chase	$118,805
Island Falls	$84,536
Katahdin Region	$70,098
Penobscot County	$135,297
Aroostook County	$94,609
Maine	$173,812
USA	$182,404
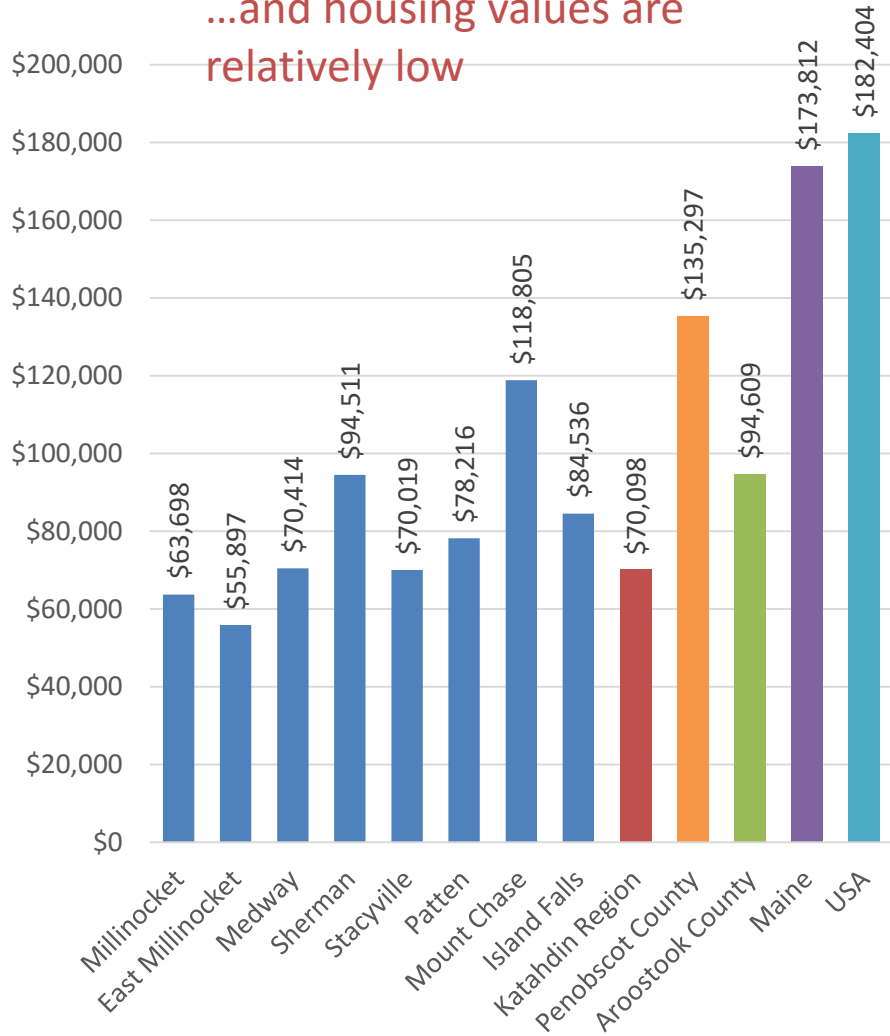
Occupied Housing %, 2016

...but occupancy rates are generally high
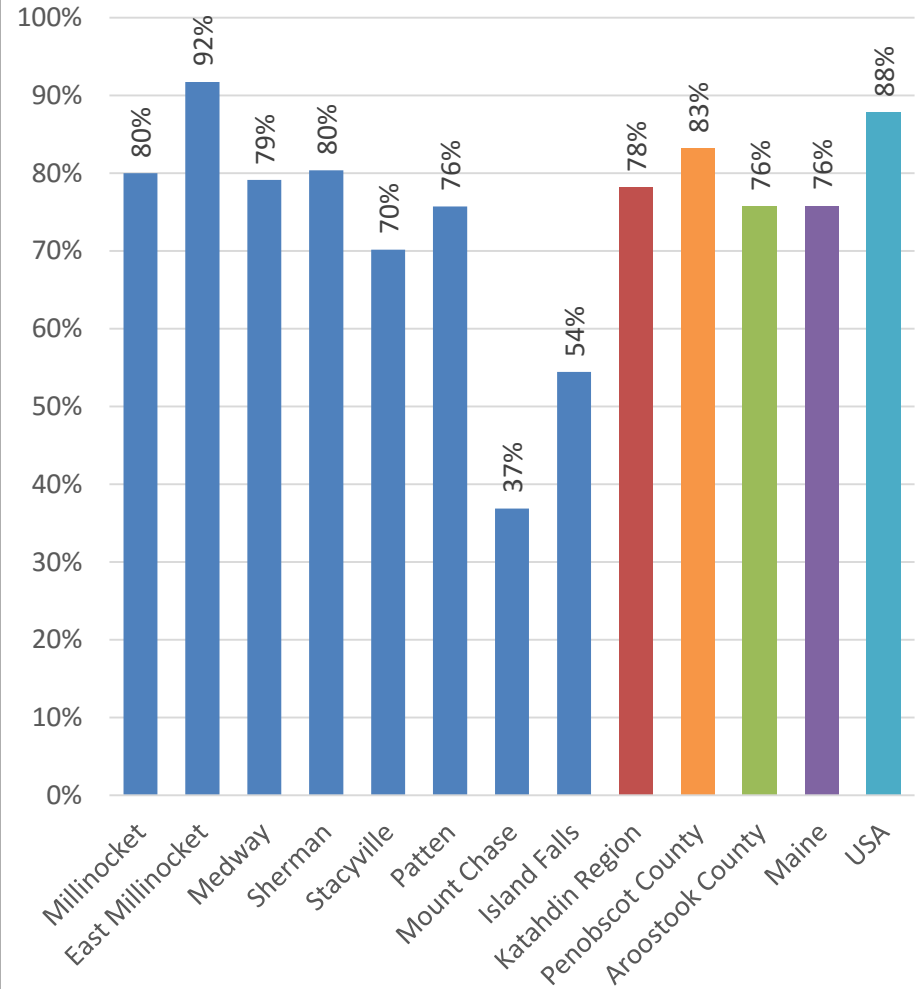
Location	Percent
Millinocket	80%
East Millinocket	92%
Medway	79%
Sherman	80%
Stacyville	70%
Patten	76%
Mount Chase	37%
Island Falls	54%
Katahdin Region	78%
Penobscot County	83%
Aroostook County	76%
Maine	76%
USA	88%
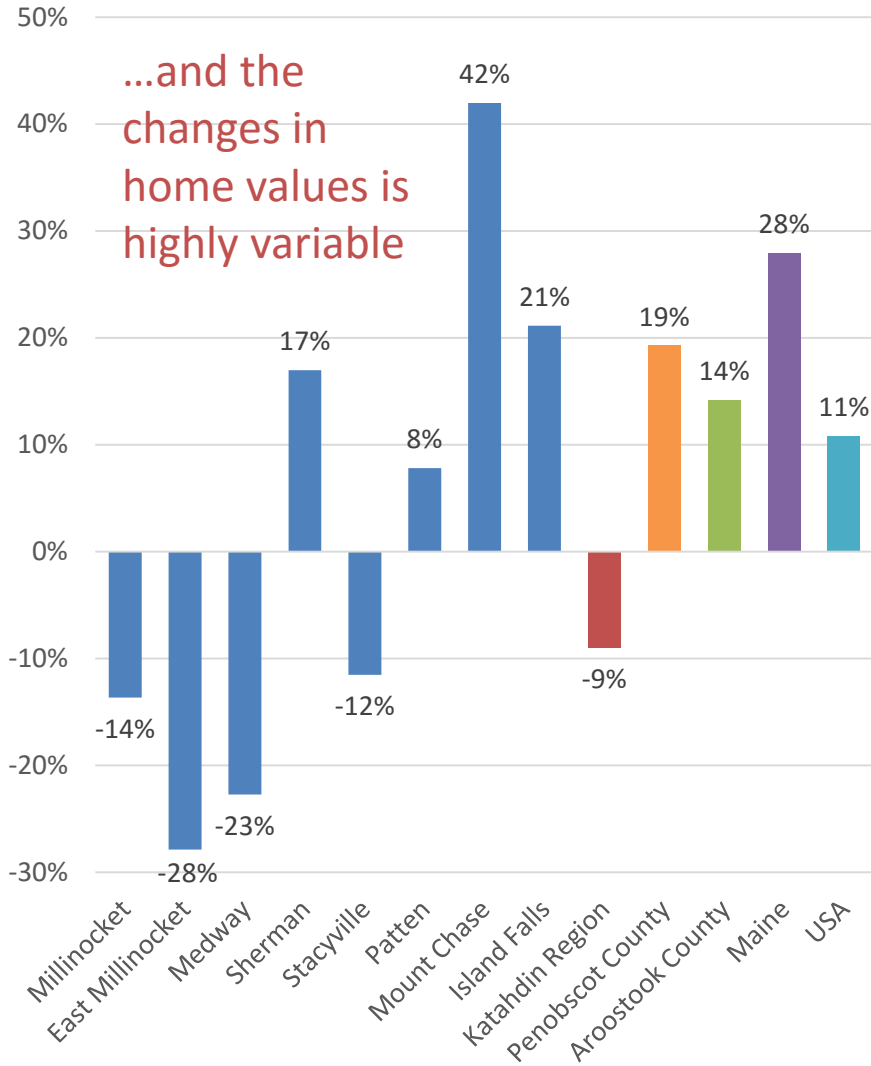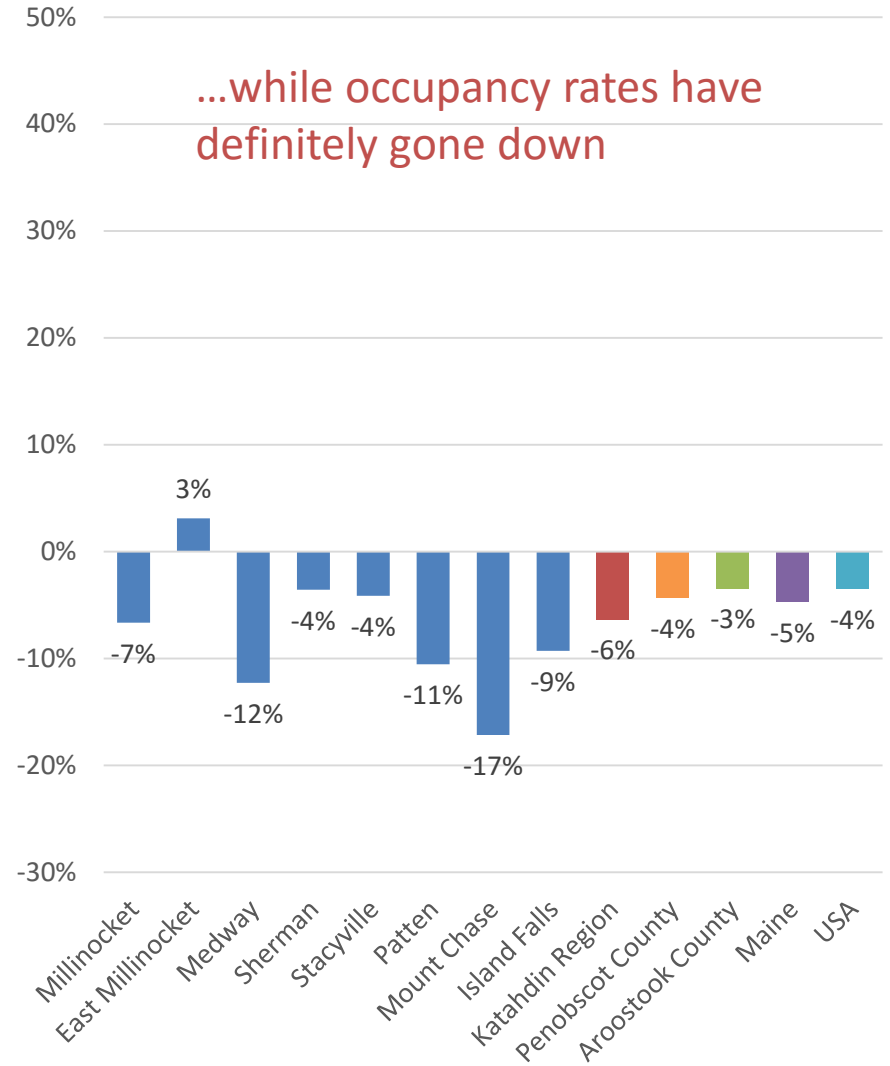
Katahdin Regional Valuation, 2006-2017

...municipal valuations have definitely gone down over the past decade

Legend:
- Island Falls
- Patten
- Sherman
- East Millinocket
- Mount Chase
- Stacyville
- Medway
- Millinocket

Y-axis: Million $ ($0 to $900)
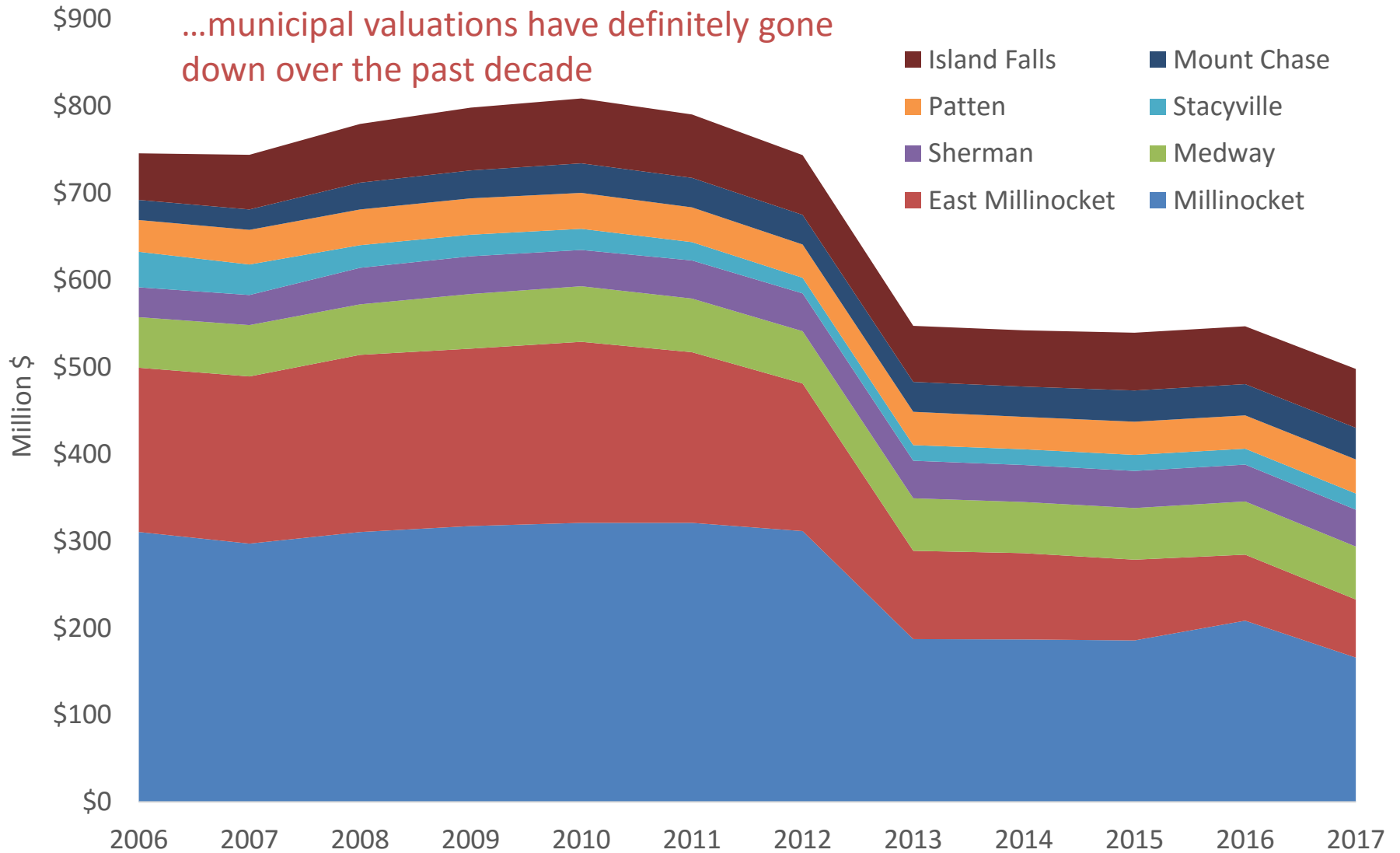
X-axis: 2006, 2007, 2008, 2009, 2010, 2011, 2012, 2013, 2014, 2015, 2016, 2017

Full Value Tax Rates

...as a result, tax rates have definitely gone up

2006   2016

	Millinocket	East Millinocket	Medway	Sherman	Stacyville	Patten	Mount Chase	Island Falls	Katahdin Region	Penobscot County	Aroostook County	Maine
2006	20	20	24	13	24	15	10	15	21	15	17	11
2016	35	38	26	22	24	24	16	22	34	19	19	15
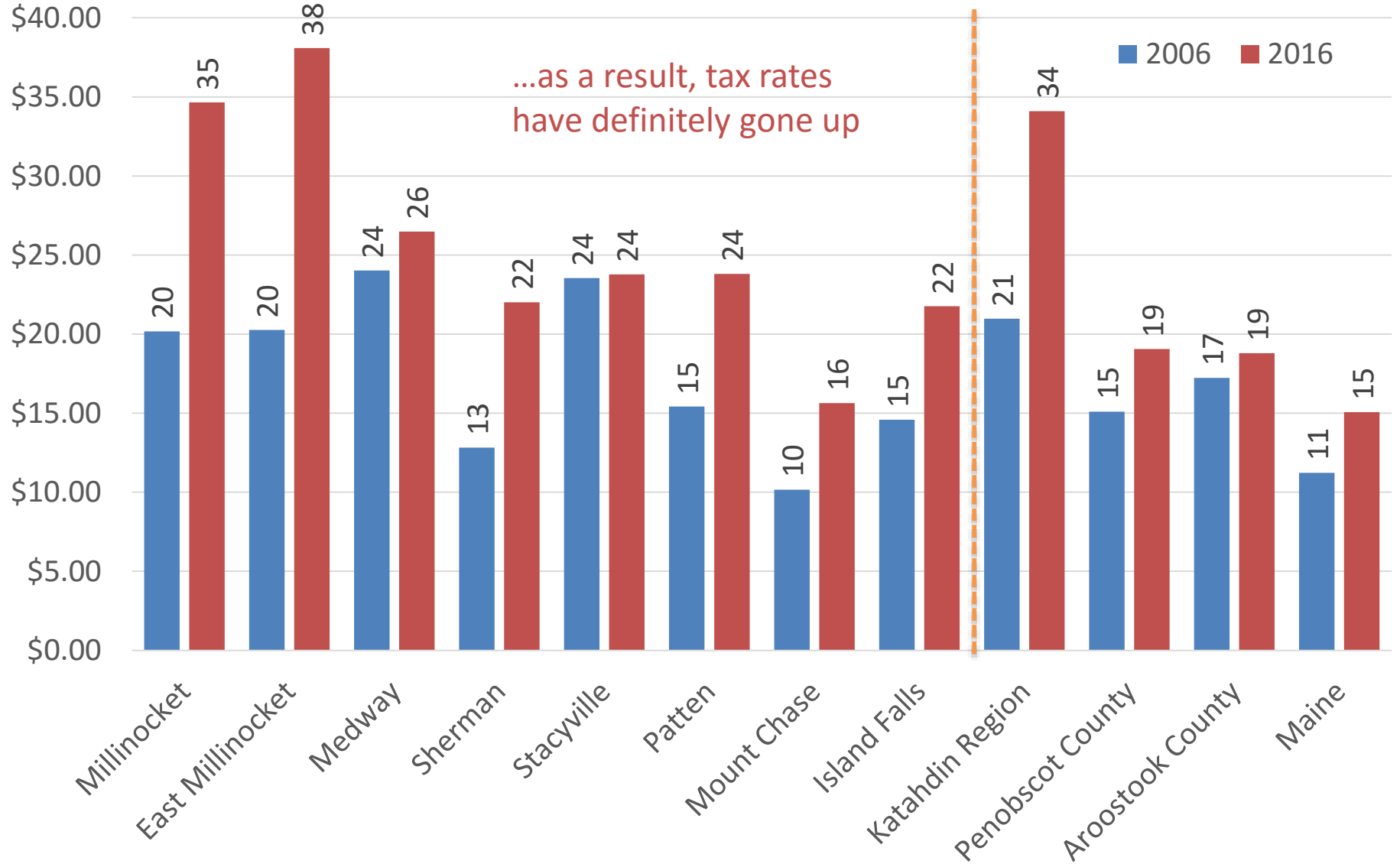
% Change in Municipal Tax Rates, 2006-2016

...although they have gone up everywhere!
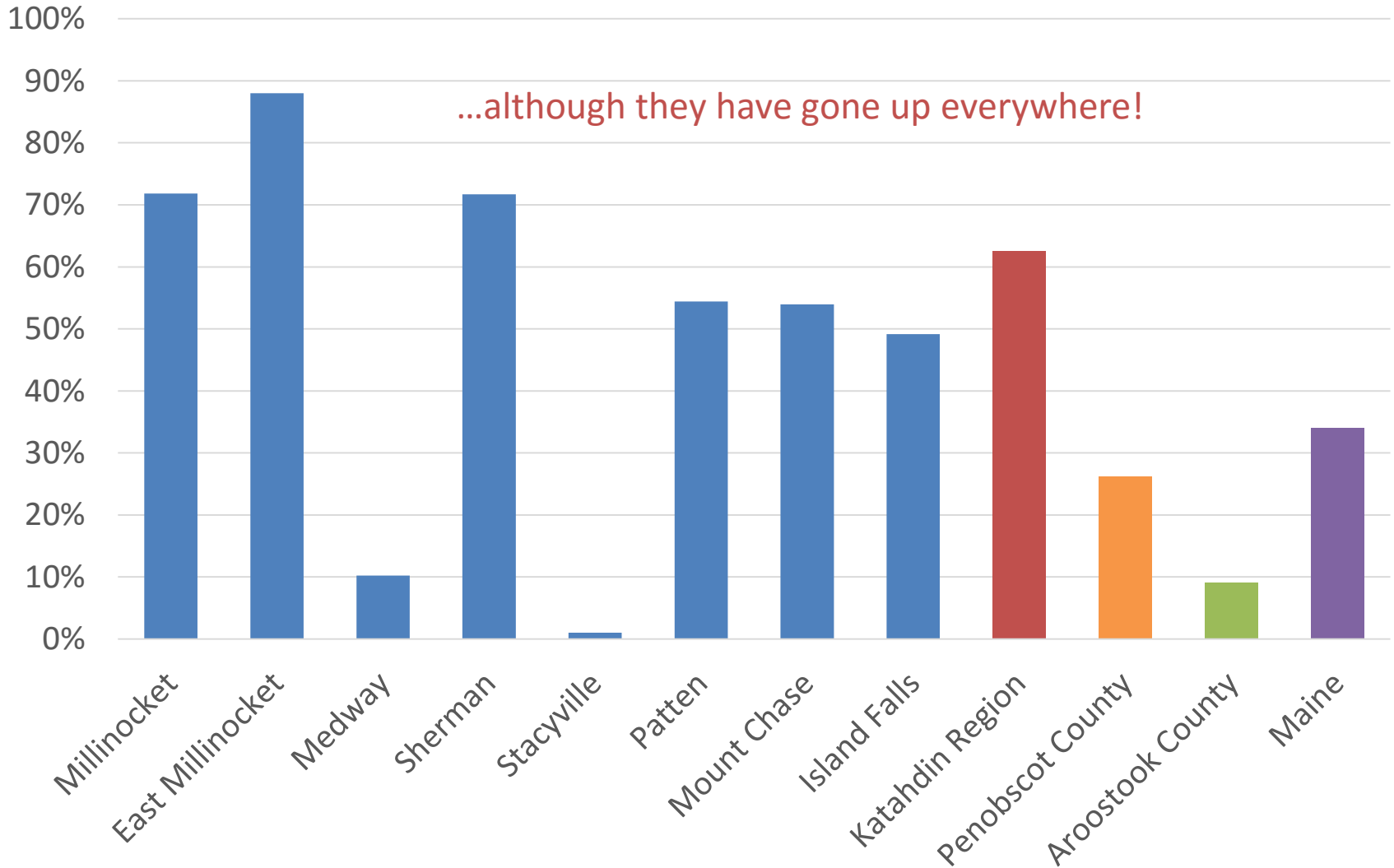
Regional Indicator Summary - 2016

Description (source)	Katahdin Region	Penobscot County	Aroostook County	Maine	USA
Change in Population, 2010-2016 (1,2)	-1.8%	-0.6%	-4.2%	0.1%	3.2%
Change in Population, 2000-2016 (1,2)	-11.1%	5.6%	-6.1%	4.3%	13.2%
Median Age (2)	50.9	41.6	46.9	44.0	37.7
Education: high school graduate or higher (2)	90%	91%	87%	92%	87%
Education: bachelor's degree or higher (2)	11%	25%	18%	29%	30%
Median Household (HH) Income (2)	$35,265	$44,738	$37,613	$50,193	$54,633
Labor Force Participation Rate (2)	49%	61%	56%	63%	63%
Unemployment Rate (3)	9.0%	4.4%	5.7%	3.9%	4.9%
Mean work commute (minutes) (2)	21	22	18	24	26
People below poverty level: Total (2)	13.4%	16.3%	17.7%	13.5%	15.1%
People below poverty level: Under 18 (2)	15.0%	19.7%	23.7%	17.9%	21.2%
People below poverty level: 65 and older (2)	9.2%	9.0%	12.1%	8.9%	9.3%
Median house age (2)	1961	1973	1972	1973	1976
Median housing value (2)	$70,098	$135,297	$94,609	$173,812	$182,404
Property Tax Rate (4)	29.3	19.1	18.8	15.1	N/A

(1) US Census Bureau, Decennial Census; (2) US Census Bureau, American Community Survey, 5-year estimates; (3) Maine Department of Labor, Center for Workforce Research and Information; (4) Maine Revenue Service, Property Tax Division
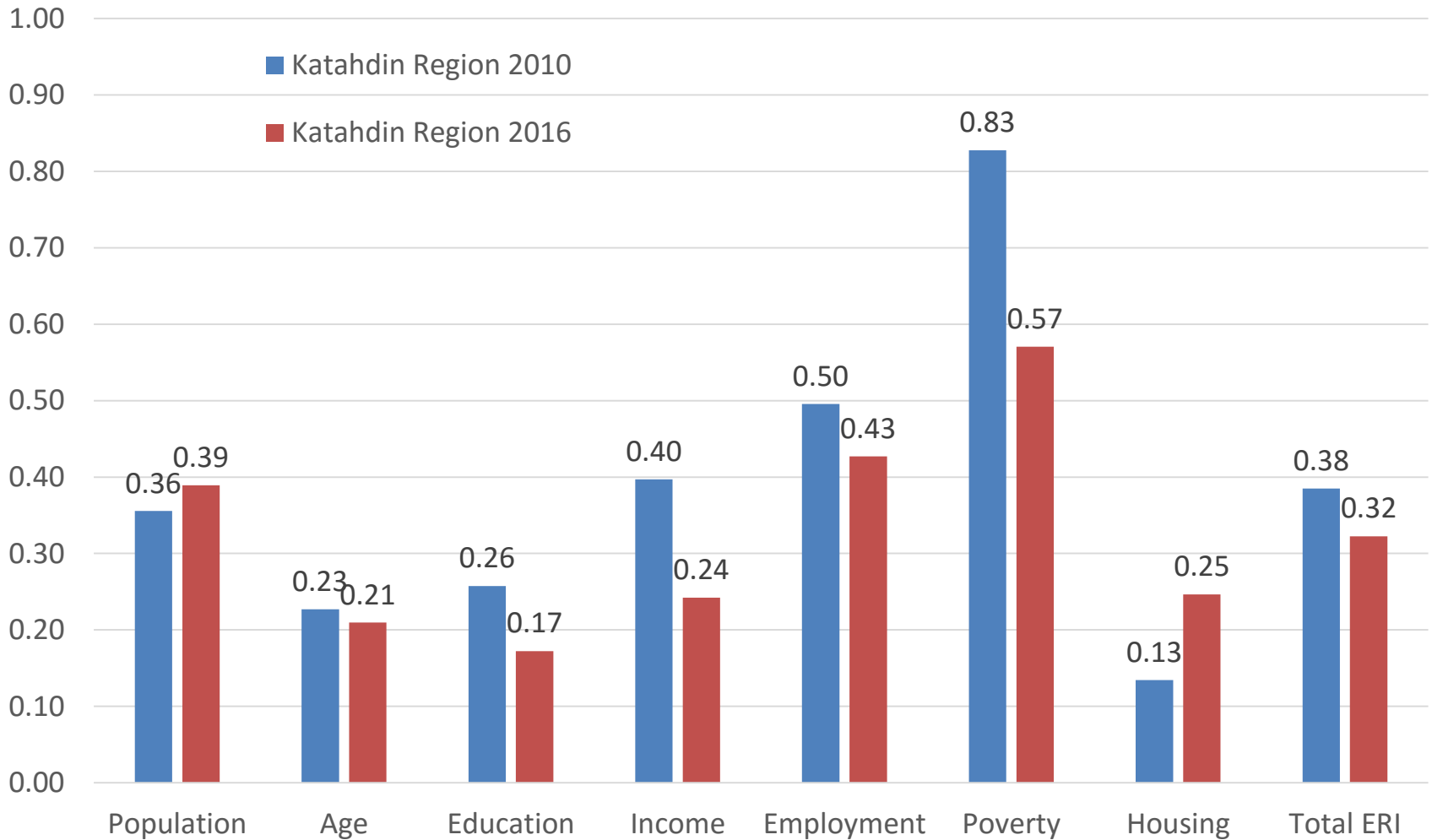
Regional Economic Resilience Indicators

2010

Description (source)	Katahdin Region	Penobscot County	Aroostook County	Maine	USA
Population Change	0.36	0.93	0.59	0.85	1.00
Median Age	0.23	0.82	0.46	0.63	1.00
Education	0.26	0.76	0.38	0.93	1.00
Income	0.40	0.65	0.42	0.81	1.00
Employment	0.50	0.86	0.91	1.00	0.93
Poverty	0.83	0.80	0.82	0.87	0.84
Housing and Property Tax	0.13	0.60	0.44	0.94	0.89
Total Economic Resilience Indicator	0.38	0.78	0.57	0.86	0.95

Regional Economic Resilience Indicators

2016

Description (source)	Katahdin Region	Penobscot County	Aroostook County	Maine	USA
Population Change	0.39	0.81	0.52	0.78	1.00
Median Age	0.21	0.77	0.45	0.62	1.00
Eductation	0.17	0.78	0.48	0.96	1.00
Income	0.24	0.61	0.33	0.83	1.00
Employment	0.43	0.93	0.75	1.00	0.95
Poverty	0.57	0.48	0.34	0.55	0.48
Housing and Property Tax	0.25	0.73	0.57	0.96	1.00
Total Economic Resilience Indicator	0.32	0.73	0.49	0.81	0.92

Katahdin Region Economic Resilience Indicators 2010 v 2016

Economic Resilience Indicators 2010 v 2016
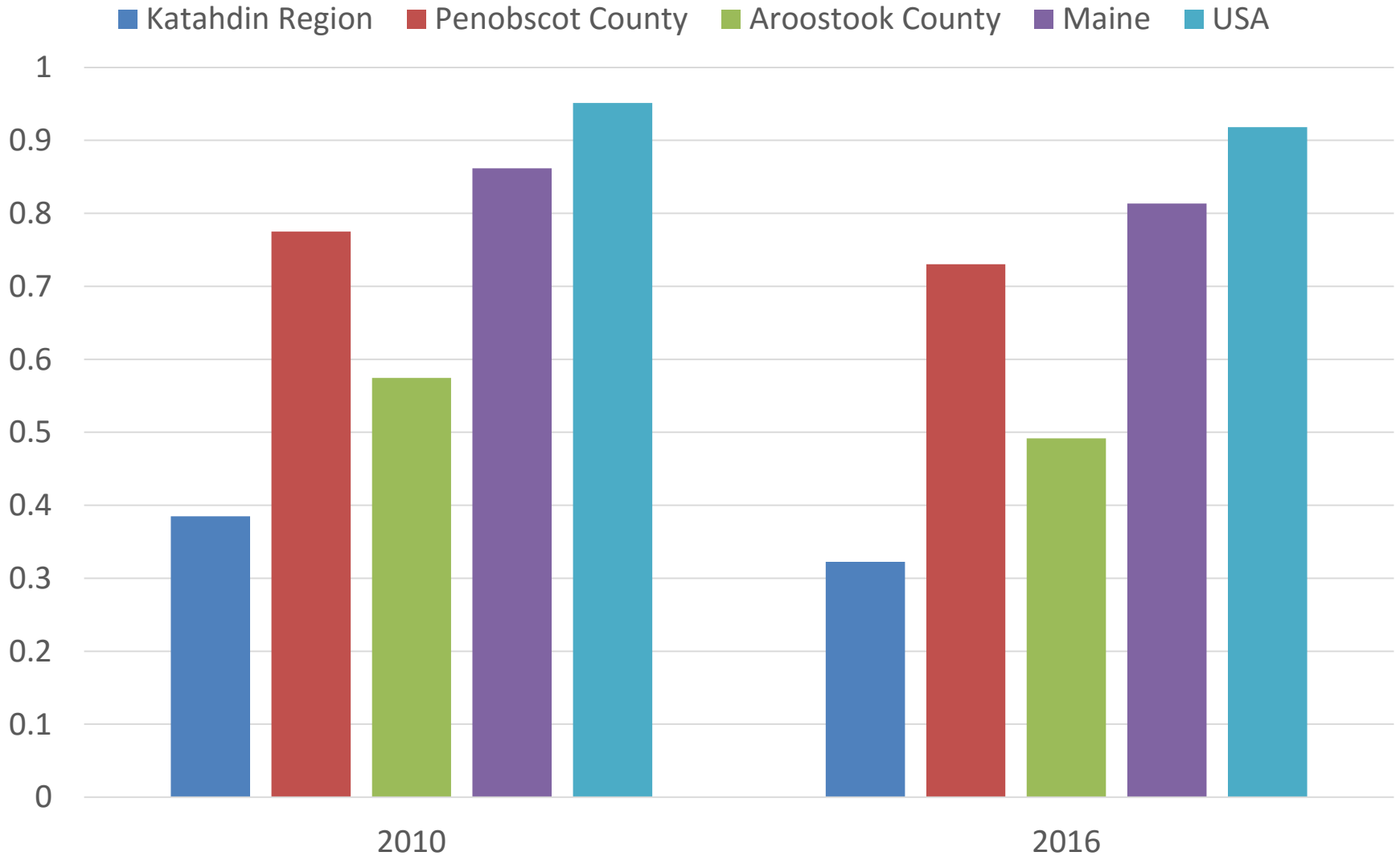
Qualitative Survey

Methods

- Administered June-Sept 2018

- Internet-based w/paper copy upon request

- Postcard with info sent to all households (~3,600)

- Approximately 15 minutes to complete

- Predominantly Likert-scale questions about community perception

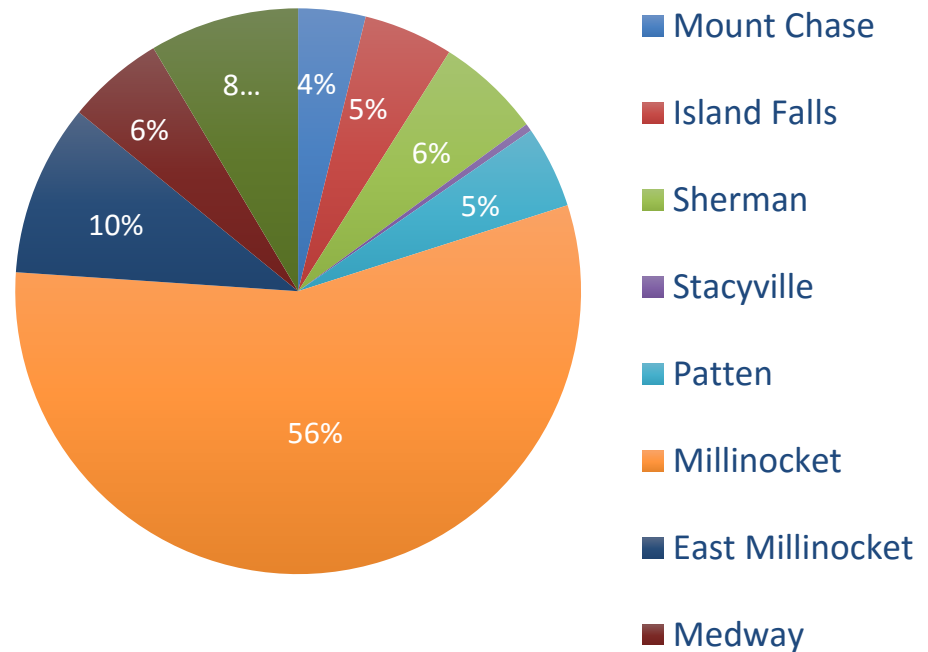- Some open ended Qs about what works and what doesn't

Key Questions

- Q1 - The following list includes community characteristics that are possible descriptions of your town…

- Q2 - The following list includes services and opportunities that are possibly available in your town…

- Q3 - The following questions are on how prepared and able you believe your town is to react to economic downturns or natural disasters…

- Q4 - There have been a number of major changes to the economic use and development of resources in the Katahdin Region over the past decade…

- Q5 - The following questions are intended to better understand how you and your family live, as well as some of your personal beliefs.

Survey Response (N = 248)

- *Median Age: 60 years*
- *Median time in Region 41.5 years*
- *56% of respondents reported that they were from Millinocket*
- *49% of respondents have at least a 4-year college degree*
- *Medan reported income of about $50,000/yr*

What town in the Region do you currently reside? (N=248)

Legend:
- Mount Chase
- Island Falls
- Sherman
- Stacyville
- Patten
- Millinocket
- East Millinocket
- Medway

Pie chart values: 4%, 5%, 6%, 5%, 56%, 10%, 6%, 8...

Statements that were overwhelmingly positive

- I will always call the Katahdin Region **my home**.
- I feel a **sense of belonging** in my town
- I am **proud to live** in my town
- People in my town **help each other**
- I am not **resistant to change** in my town.

- My town has **outstanding natural features**
- People have easy **access to natural resources**
- People have easy **access to public land**

75%+ agree or strongly agree

Statements that were overwhelmingly positive

- I am supportive of **new businesses**
- My town has **unique economic opportunities**
- Seeing more businesses and **activity in my town center** is important to me.
- **Broadband high speed internet** is instrumental to the future prosperity of my town.
- A **healthy forest products sector** in the Katahdin Region is important to my town's well-being.
- **Outdoor recreation and tourism** is important to the economic future of my town.

Statements of room for improvement

- There are **high rates of drug/alcohol abuse** in my town
- I **cannot purchase most of what I need** in my town.
- My town is **not prepared for future economic downturns**
- My town does **not have the financial resources** to solve its problems
- There are **not good work opportunities** available to people who live in my town
- I am concerned about the **quality of education available** to children in my town.
- I am concerned about my town's **ability to attract young people**
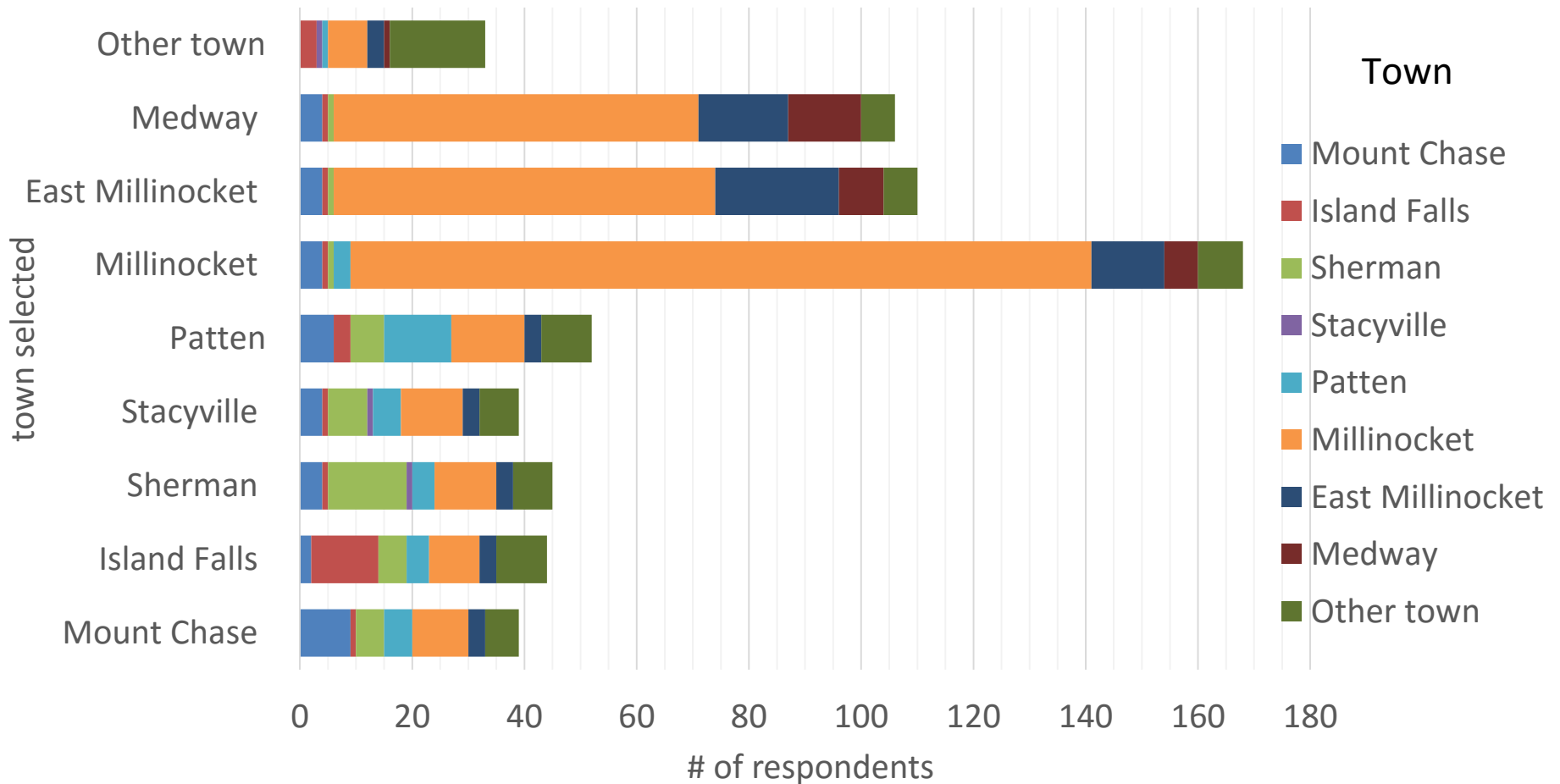- I am concerned about **people leaving my town** to live elsewhere.

- **My town is not better off today than it was 20 years ago**

Is there **potential for conflict** for some issues related to economic development?

Katahdin Region Economic Development - PCI
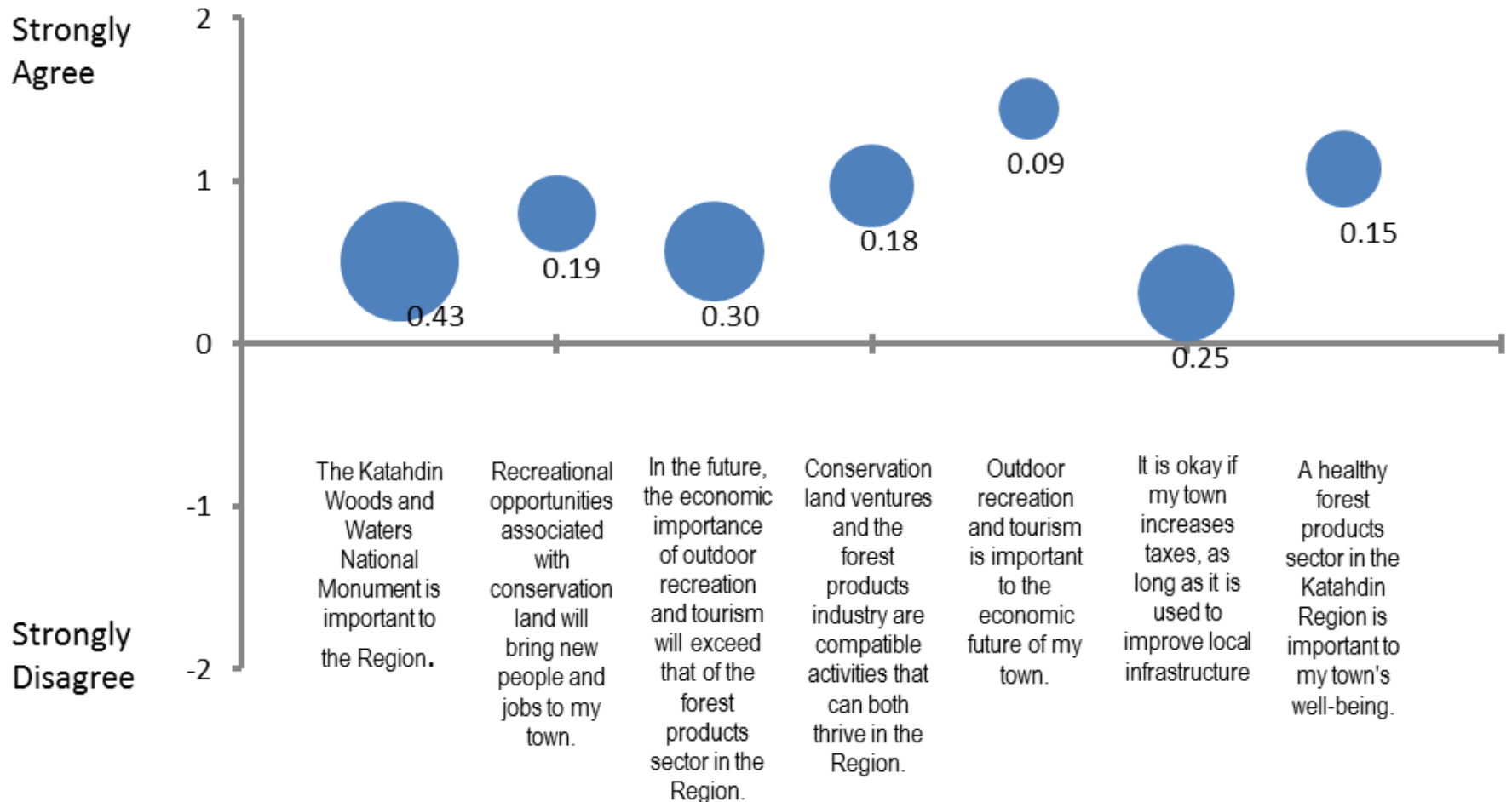
Q6 - Please select which towns in the Katahdin Region that you consider part of your 'community': (Please select all that apply):

Q6 - Please select which towns in the Katahdin Region that you consider part of your 'community': (Please select all that apply):

		Please select which towns in the Katahdin Region that you consider part of your 'community'								
		Mount Chase	Island Falls	Sherman	Stacyville	Patten	Millinocket	East Millinocket	Medway	Other town
What town in the Katahdin Region do you currently reside?	Mount Chase	100%	22%	44%	44%	67%	44%	44%	44%	0%
	Island Falls	8%	100%	8%	8%	25%	8%	8%	8%	25%
	Sherman	36%	36%	100%	50%	43%	7%	7%	7%	0%
	Stacyville	0%	0%	100%	100%	0%	0%	0%	0%	100%
	Patten	42%	33%	33%	42%	100%	25%	0%	0%	8%
	Millinocket	8%	7%	8%	8%	10%	99%	51%	49%	5%
	East Millinocket	13%	13%	13%	13%	13%	57%	96%	70%	13%
	Medway	0%	0%	0%	0%	0%	46%	62%	100%	8%
	Other town	30%	45%	35%	35%	45%	40%	30%	30%	85%
Total		16%	19%	19%	17%	22%	70%	45%	43%	14%

Results indicate there is a clear division between towns in the North and Southern areas of the Katahdin Region

What do you like most about living here?

- **Small town feel**
- **A great place to live, work and play and raise a family**
- **Natural resources, beauty, recreation, and environment**
- **The potential**

What's challenging?

- **Community division**
- **High property taxes**
- **Aging demographics**
- **Geographical location**
- **No vision**

Examples of other Communities

Bucksport, ME: Paper → Freshwater Salmon "Farm"?

Bucksport, ME: Paper → Freshwater Salmon "Farm"

Cuyana County, MN :
Mining→ Mountain Biking

Oakridge, OR:
Lumber → Mountain Biking

New River Gorge, WV: Mining → Outdoor Rec

Leavenworth, WA: Logging → Bavarian Village

Summary

- '**Resilience**' concept has been around for decades, but definitely an emerging **buzz word in the rural development space**

- Regional **quantitative indicators look poor** compared to other areas of the state or US, but residents know this

- Resident survey indicated that there are definitely some **issues in the community**, but most who are still there indicate that it is a **great place to live, work, and play**

- Options for economy to rebound and **forest products and recreation industries to co-exist**. Just need to continue having the community rally around both sectors.

What's Next?

1. **Compare indicators** with other natural-resource dependent communities of Maine and US

2. Conduct **statistical analysis** to identify which indicators have most weight for rural natural resource dependent communities

3. **Train stakeholder partners** to update indicators and administer survey for future data collection and analysis

Thanks…Want to know more?

https://umaine.edu/mitchellcenter/katahdin-indicators/