Who, where, and why?

USING EXPLORATORY FACTOR ANALYSIS TO GEOTARGET PERSONAS OF INTEREST

Our Grounding Supposition

- EE programs increasingly challenged to deliver “savings and…”
- Stakeholders want a way to understand and engage on their mission based work
- Individual customer data is legally protected, and ethically complex
- Transparent and relatable analysis results can be a powerful bridge to meet these needs.

An integration of public and utility data for descriptive, locally targeted customer archetypes can meet stakeholder needs while balancing customer and regulatory expectations for privacy.

What will you get for your time today

- Context about how our team met the needs presented on the last slide
- Orient you to types and sources of data used so you can do this with your team
- Explain why we chose the analysis path we used, what worked, and where we hit challenges
- Present broadly how we synthesized the technical results for stakeholders
- Share the feedback we received from stakeholders along the way so you can leapfrog our work!

DNV ©

Moving Beyond Monolithic Customer Groups

Benefits Include:

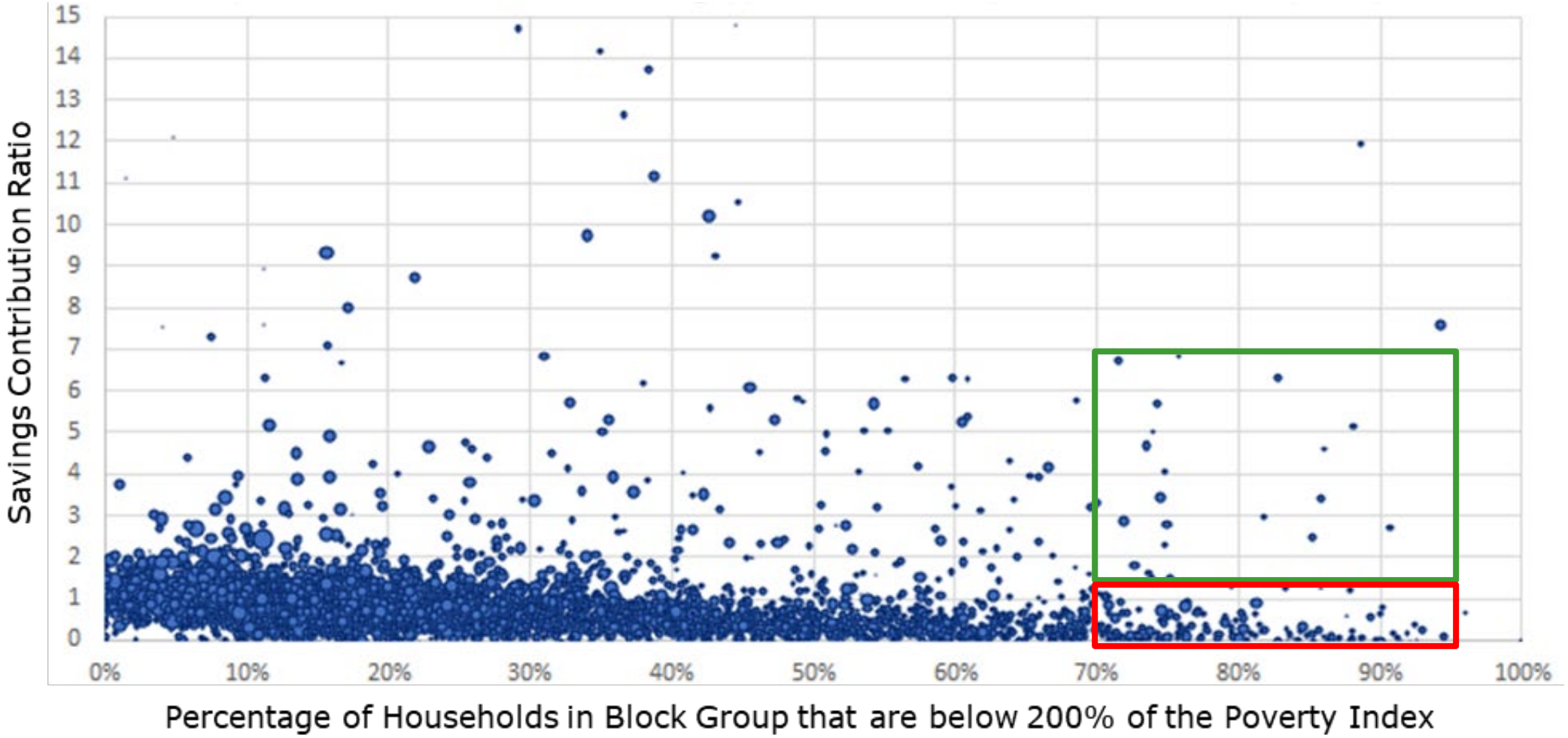
- Sense of scale
- Low cost of entry
- PII protected
- Can focus a conversation

Drawbacks can be:

- Lack of meaning
- Mask data relationships
- Disconnect from data
- “take it or leave it” feeling

DNV ©

Example: Income Eligible Customers



DNV ©

Data Sets

Utility Business Systems

- Customer CIS
- Consumption data
- Energy Efficiency Tracking Data

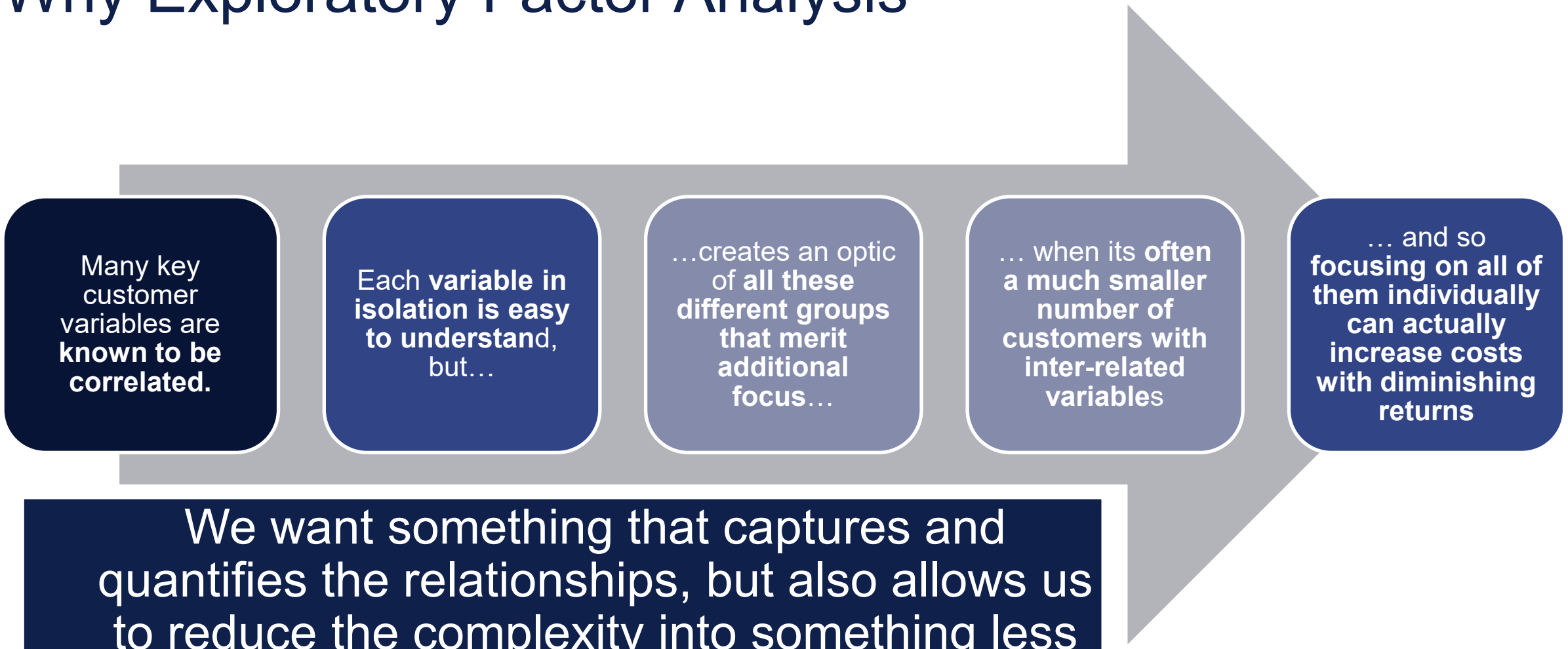
Built environment data

- Tax assessor information
- Housing and Urban Development data
- Zip Code Business Patterns Data

Demographic Data

- American Community Survey (ACS) Counts
- PUMS

Why Exploratory Factor Analysis



We want something that captures and quantifies the relationships, but also allows us to reduce the complexity into something less abstract and more relatable.

How we approached the EFA

- Data cleaning and pre-processing
- Pre-SME correlation analysis
- SME review and validation
- Factor analysis
- SME review and consolidation

DNV ©

EFA Categories and Factors

Family Dynamics

- Single and Non-family households
- Married Families

Aging Dynamics

- Retirees
- Younger, Group Living
- Old and Middle-aged Workers

Economic Dynamics

- Renters
- Income Eligible
- Minority Groups
- High Income Earners
- Education

In Depth Look:
Factor 5 – Income Qualified

Table 5-31. Factor 5: Summary participation data by clusters for the poverty factor

Cluster Description (and Cluster #)	# Block Groups	Percent of Block Groups	Minimum Rate	Max Rate	Average Rate	Median Rate
Balanced mix (C1)	1,210	28.1%	0.11%	58.43%	6.12%	5.67%
High proportion poverty line indicators (C2)	372	8.6%	0.30%	80.40%	5.40%	3.50%
Lower proportion of poverty line indicators (C3)	636	14.7%	0.08%	50.00%	9.26%	9.17%
Slightly lower proportion of poverty line indicators (C4)	1,305	30.3%	0.11%	33.33%	7.03%	7.11%
Slightly higher proportion of poverty line indicators (C5)	789	18.3%	0.08%	29.73%	4.34%	3.83%

Factor 5: Poverty

Figure 5-24. Factor 5: K-means clusters by location participation and poverty factor scores

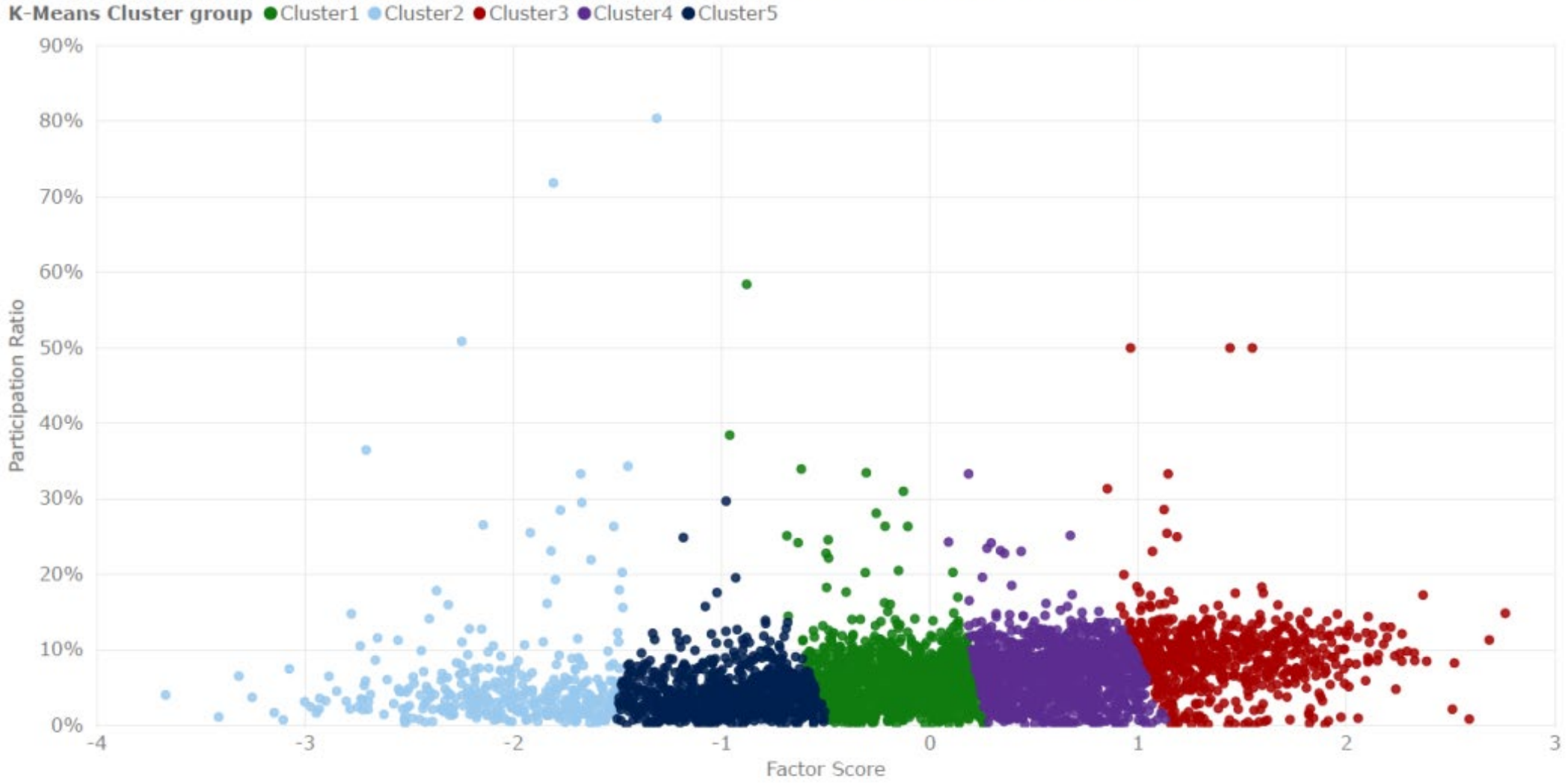
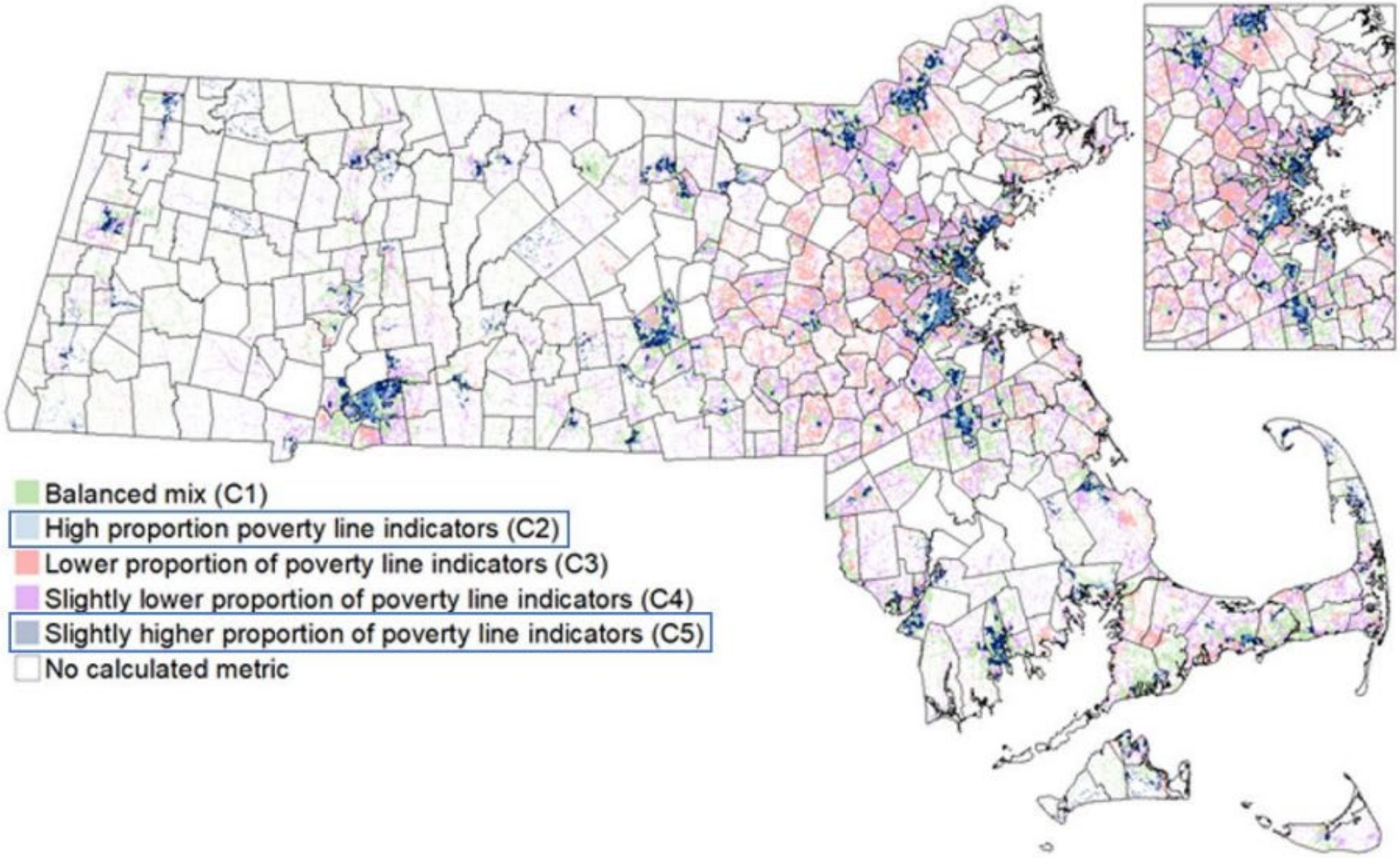


Figure 5-25. Factor 5: Block group k-means cluster geographic distribution for location participation and poverty factor scores

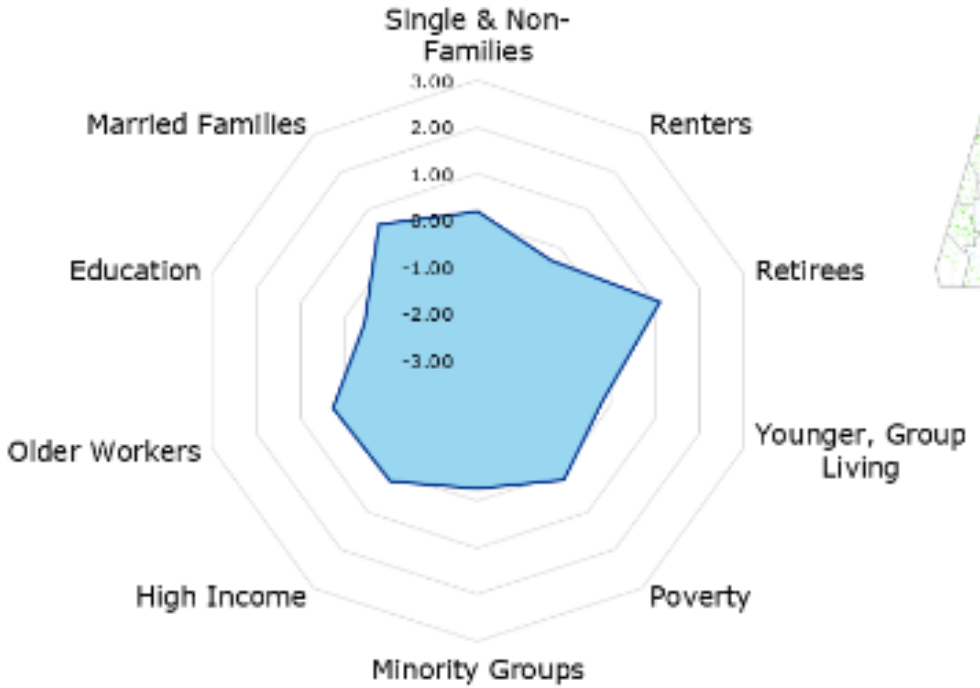


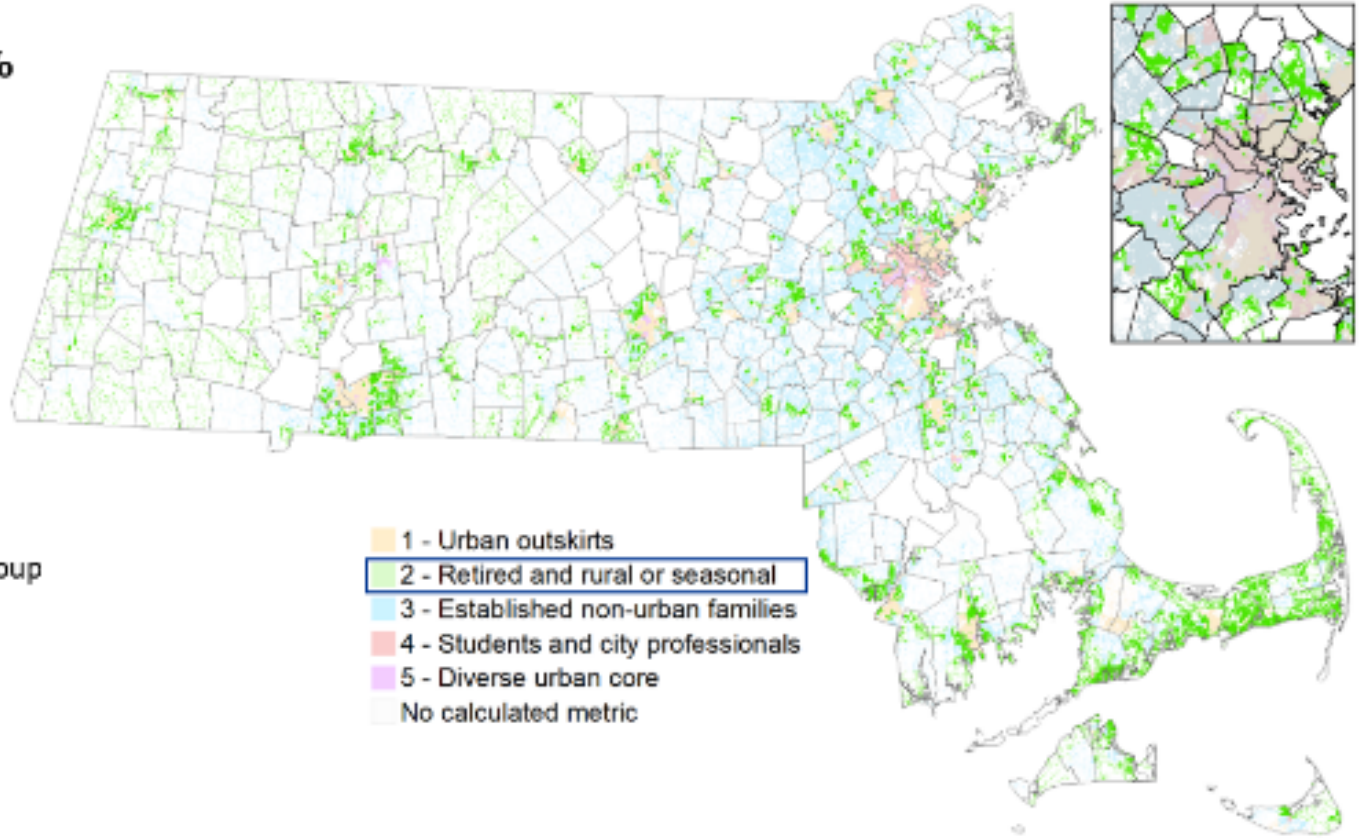
From Individual Factors to Block Group Personas

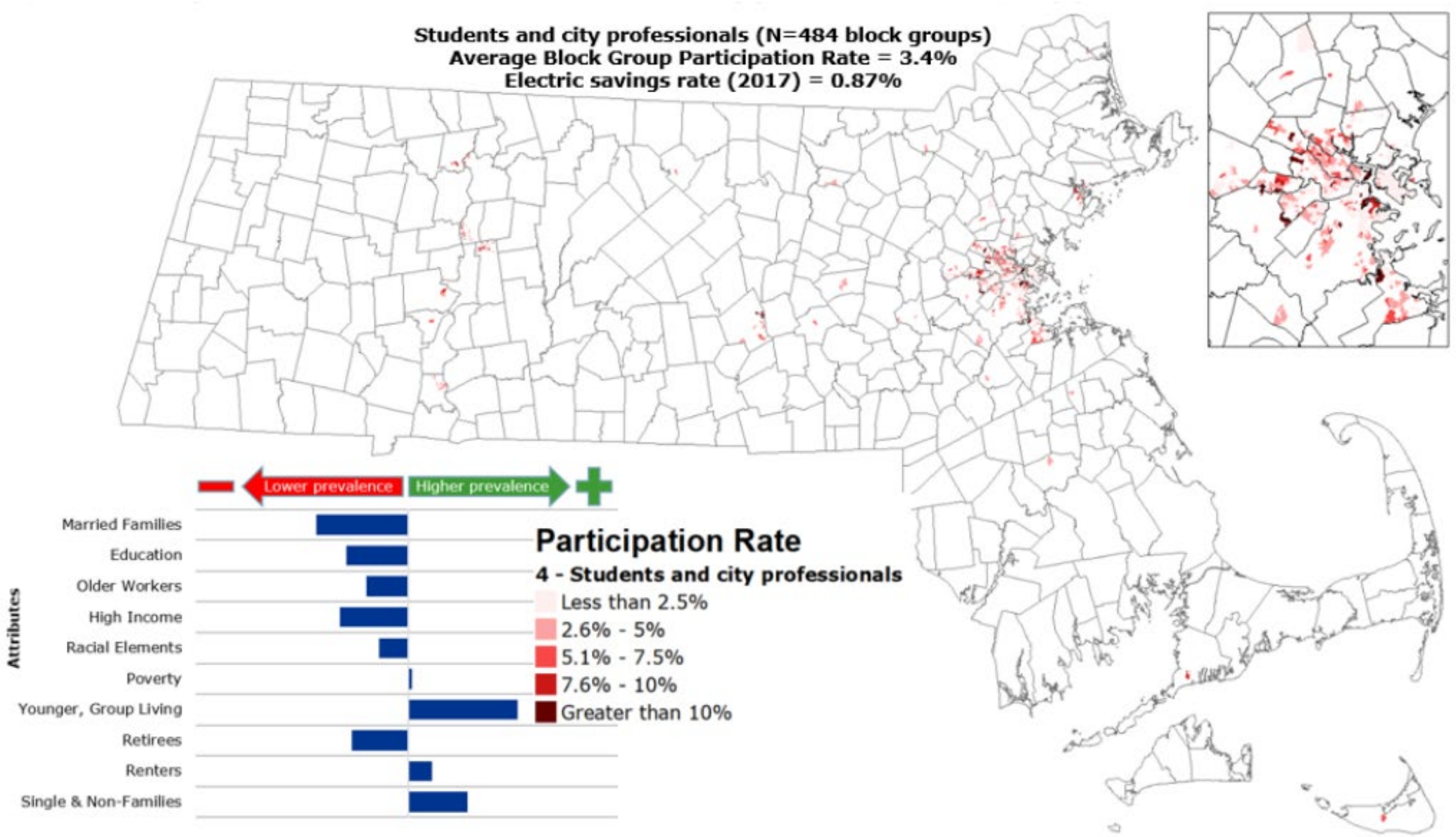
Cluster	Statistics	Participation Rate	F1: Single/Non-family HHs	F2: Renters	F3: Retirees	F4: Younger, Group Living	F5: Poverty	F6: Minority Groups	F7: High Income	F8: Older Workers	F9: Education	F10: Married Families
1. Urban outskirts	Maximum	80.4%	4.63	3.57	1.69	3.33	2.59	5.85	2.83	1.97	2.87	1.72
	Mean	4.5%	-0.10	0.99	-0.49	-0.31	-0.97	0.63	-0.28	-0.75	-0.16	-0.30
	Minimum	0.1%	-3.01	-2.16	-2.33	-2.58	-3.67	-1.39	-3.37	-2.02	-2.78	-3.70
	Observations: 1,206											

- Condensed factors into descriptive clusters through working group collaboration

Cluster 2: Retired and rural or seasonal
Average Block Group Participation Rate = 7.4%
N = 995






Students and city professionals (N=484 block groups)
Average Block Group Participation Rate = 3.4%
Electric savings rate (2017) = 0.87%
Lower prevalence
Higher prevalence
Attributes
Married Families
Education
Older Workers
High Income
Racial Elements
Poverty
Younger, Group Living
Retirees
Renters
Single & Non-Families
Participation Rate
4 - Students and city professionals
Less than 2.5%
2.6% - 5%
5.1% - 7.5%
7.6% - 10%
Greater than 10%

How to leverage this type of work

For Utilities and Program Implementation

- Understand comparison groups
- Generate customer outreach lists
- A proactive way to support stakeholders while complying with legal obligations

For Regulators

- Context for regional variation in policy mechanisms
- Greater insight into data patterns to formulate more targeted questions

For Stakeholders

- Focused outreach ability augmented by local knowledge of customers and relationships
- A utility partner with data and tools to help secure funding for your mission driven work

All Parties

- Identify geographic areas of interest
- Have a shared understanding of the customer landscape
- A congenial and collaborative way to share data and biases grounded by physical space

What were the challenges?

- The usual – data cleaning, imperfect information, and hard decisions
- Balancing technical details with stakeholders
- Integration of prior knowledge and policy pressures
- Analysis spatial resolution
- One-size-fits-all data presentation
- “how come” and “what about” reactions

www.dnv.com