CAMBRIDGE SYSTEMATICS

Think Forward

Evaluating Small Area Forecasting in a Rapidly Changing Landscape

A Review of SCAG's SASVAM Tool

presented to

2025 Modern Mobility Conference

presented by

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September 15, 2025

Background and Objective

Our Charge in This Study

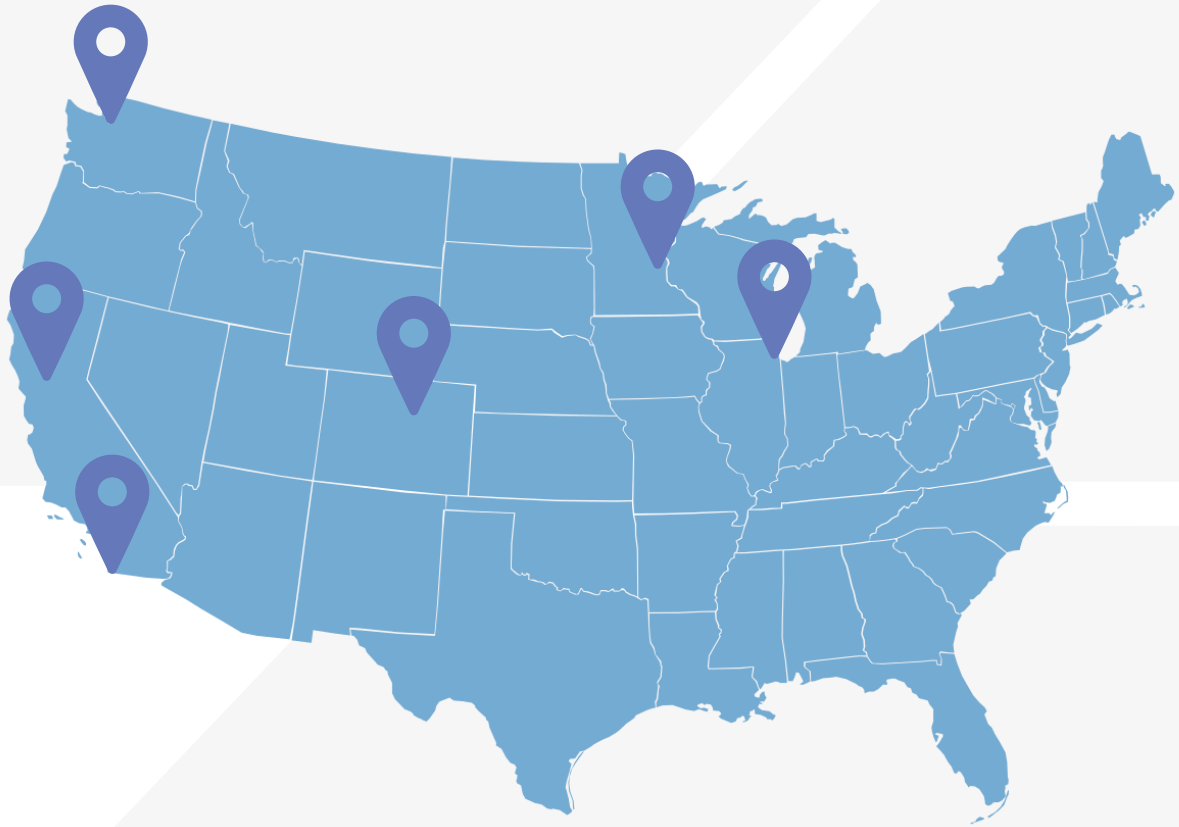
- SCAG uses the SASVAM tool to disaggregate population and households into secondary demographic variables.
- Primary Use: To generate inputs for the PopSyn, which feeds the Travel Demand Model.

- Objectives
  - Evaluate the current SASVAM tool; and
  - Provide implementable recommendations to improve forecasting accuracy.

Approach

Three Streams of Evaluation

- Literature Review
  - Identified emerging issues in population and household composition.
  - Summarized approaches for estimating secondary variables at the small-area level.
- Peer Agency Interviews
  - Interviews provided insights into state of the practice.
- Empirical Analysis
  - Empirical analysis of ACS data examined to explore demographic changes in special markets.



Literature Review Findings

State of the Practice and Research

No Single Best Method	• Different approaches (econometric models, microsimulation, proportional allocation) all face technical and political tradeoffs.
Small-Area Uncertainty	• Margins of error increase at fine geographies (TAZ, block), making “precise” outputs potentially misleading.
Complex ≠ Accurate	• Data-intensive, highly specified methods do not consistently outperform simpler, transparent approaches.
Manual Adjustments Required	• All forecasting methods require practitioner judgment to resolve anomalies and reflect local conditions.
Balance is Key	• Forecasting tools must trade some detail for usability, maintainability, and the ability to explain outputs to stakeholders.

Peer Agency Interviews Insights

Lessons from Other Regions

- Shared Challenges
  - Other MPOs and agencies face similar issues with small-area demographic forecasting.
- Simplicity Valued
  - Tools need to be usable, maintainable, and easy to explain — not just technically advanced.
- Manual Adjustments Universal
  - Even agencies with sophisticated tools routinely intervene to correct anomalies.
- Resource Considerations
  - Building or switching to a new system is costly and staff-intensive.
- Pragmatic Approach
  - Incremental improvements often deliver more value than wholesale replacement.

Empirical Analysis Findings

Where SASVAM Experiences Challenges

New Development Areas

- Base-year population or households = 0
- Future years > 0

Rapid Growth Areas

- Annual growth > 150%

Household Size Inconsistencies

- Distributions don’t align with household & person totals.

Current Limitations of SASVAM

Four Key Weaknesses of the Current Tool

Reliance on Historical Data

Household Size Inconsistencies

Population Mismatches

Excessive Complexity

Guiding Principles

Shaping Our Recommendations

Retain Existing Framework

Simplify Where Possible

Balance Accuracy with Usability

Prioritize Higher Geographies

Plan for Sustainability

Recommendation: Simplification

Streamlining Variables and Categories

Variable	Level of Geography for Control		Number of Categories	
	SASVAM	*Recommended*	SASVAM	*Recommended*
Age	Tier 2 TAZ	Meso-scale	10	5
Race/Ethnicity	Tier 2 TAZ	Meso-scale	6	6
Household Size	Tier 2 TAZ	Tier 2 TAZ	5	5
Housing Type	Tier 2 TAZ	Meso-scale	5	4
Household Income	Tier 2 TAZ	Tier 2 TAZ	16	5

- Benefits
  - Reduces False Precision: Avoids overconfidence in small-area estimates.
  - Improves PopSyn compatibility: Simplified categories ease calibration.
  - Lowers computational demand: Fewer coefficients, faster runtimes.
  - Easier Validation: Coefficients and results more transparent.
  - Supports Re-Estimation: Flexible structure accommodates new data.

Recommendation: Efficiency and Integration

Modernizing Code and Linking Tools

- SQL Joins
  - Replace sort/merge in SAS → significant run-time reductions.
- Python conversion:
  - Better integration with PopSyn and other tools.
  - Larger community and workforce familiarity.
  - Easier QA/QC through GitHub and modern workflows.
  - Supports advanced visualization and analysis.

Recommendation: Address Special Markets

Improving Forecasts for Unique Growth Areas

	New Development	Rapid Growth	Household Size Consistency
Definition	Base-year households or population = 0; future years > 0.	Annual growth > 150%.	Distributions don't align with household & person totals.
Current Approach	Apply county averages.	Apply county averages.	-
Issue	Fails to capture local conditions.	Unrealistic demographic representation.	Distributions sometimes misaligned with household/person totals.
Recommended Approach	Assign typologies with realistic demographic patterns.	Use typologies to capture diversity in fast-growing zones.	Implement household size disaggregation model; re-estimate with new data.

Typologies for Special Markets

Simplifying Complexity while Preserving Key Relationships

Purpose & Approach

- Partition the city into descriptive neighborhood types, comparable to market segmentation.
- Simplify complex demographic data while retaining key relationships.

Methodology

- Cluster zones based on demographic and other variables, such as density, housing prices, new construction, satellite imagery.
- Zones generally stay in their cluster over time; “problem zones” may shift clusters.

Application Styles

- Qualitative: Assign clusters by naming (e.g., “El Segundo becoming more like Santa Monica”).
- Quantitative: Algorithmic reassignment as attributes shift (e.g., zone moving from cluster 11 → 7).

Adjustment

- After reassignment, zones are balanced to align with overall regional forecast.

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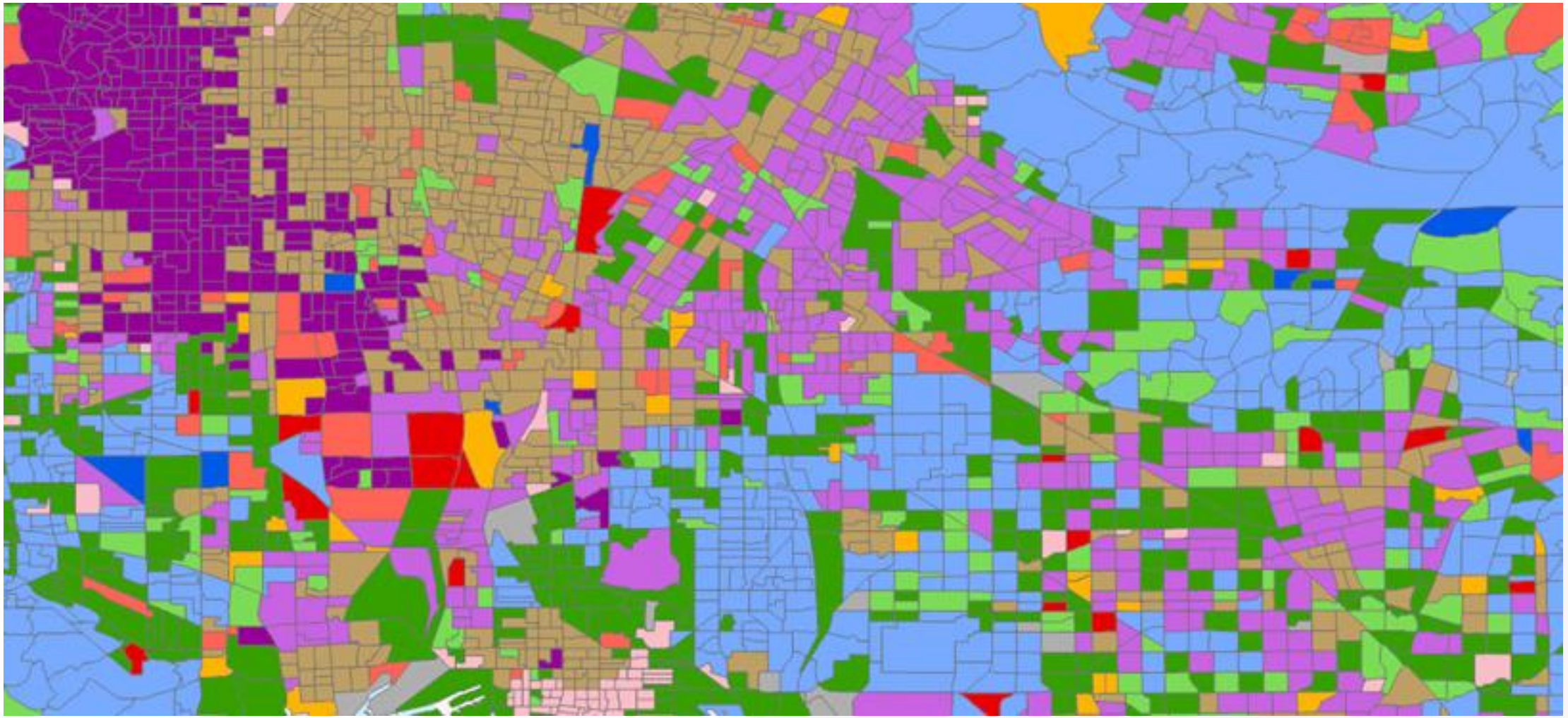

Takeaways and Recommendations

Takeaways

- Important for process to be defensible and explainable.
- There is no right answer. The future is hard to predict.
- There is no right way to do it. There are limitations (technically and/or politically) for all the approaches.
- Most agencies report needing to do manual, simple adjustments, regardless of approach.

Recommendations

- Aim for a clean, simple, and easy-to-communicate approach.
- Emphasize accuracy at higher geography levels.
- Address special markets by improving problem zones in a consistent and localized manner while readjusting all other zones back toward the regional control total.

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Thank You

Thank you to our clients at SCAG. For SASVAM-related questions, please reach out to SCAG's Senior Modeler, Sung Ho Ryu at ryu@scag.ca.gov.