

Can Nationwide Personal Transportation Survey Data be Used by Small Communities?

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Information

Background

- Although information rich, NPTS data were not recommended for estimating travel statistics for areas smaller than a Census division (e.g., New England, Middle Atlantic, Pacific)
- Extrapolating NPTS data within small areas could risk developing and subsequently using unreliable estimates

Usually, small and medium-sized communities use NPTS data in four ways:

1. Based on NPTS nation-wide estimates
2. Based on data from NPTS households that are from the same Census Region (4)
3. Based on data from NPTS households that are from the same Census Division (9)
4. Based on data from NPTS households that are from MSAs of similar size
 - 3M+, 1-3M, 500K-1M,....., < 250K

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Are there alternatives that :

- better reflect the characteristics of small and medium-sized communities?
- maintain the reliability of the estimates?

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Objectives

- Determine how NPTS data can be “transferred” to areas smaller than the NPTS sample design allows, and
- Determine the reliability of the transferred information.

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Outcome

- Number of person trips (PT) and person miles traveled (PMT) per household,
- Number of vehicle trips (VT) and vehicle miles traveled (VMT) per household, and
- PT, PMT, VT and VMT categorized by
 - ✓ Purpose (why), and
 - ✓ Mode (how).

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Three Premises of Our Approach

- Majority of the households within a census tract are sufficiently homogeneous with respect to travel determinants reported for each tract
- Census tracts can be grouped into homogeneous clusters with respect to travel determinants reported for each tract
- There are enough NPTS households assigned to each cluster, and NPTS households in a cluster are representative of all households within that cluster, with respect to travel determinants.

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Approach



1. Identify significant travel determinants based on NPTS data
2. Categorize all of the census tracts around the country into “homogeneous” clusters, with respect to travel determinants reported for each tract,
3. Assign NPTS households to these clusters based on the census tract where the household is located.
4. Calculate cluster-specific travel statistics based on data collected from NPTS households
5. Calculate total census tract-specific travel demand.

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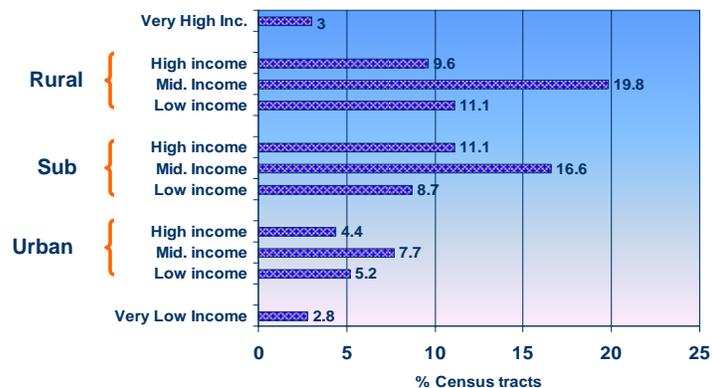
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Step 2. Categorize Census Tracts into Clusters

- ✦ There are 61,258 tracts nationwide
- ✦ Manhattan tracts and tracts without any population were excluded (1,430 tracts).
- ✦ Clusters are developed using the cluster analysis -- in such a way that the variation within a cluster is minimized and the variation between clusters is maximized.
- ✦ Census tract characteristics -- area type (urban, suburban, rural), median household income, vehicle ownership, and employment rate -- are the significant "classifiers."
- ✦ The final clustering scheme results in 11 clusters of census tracts.

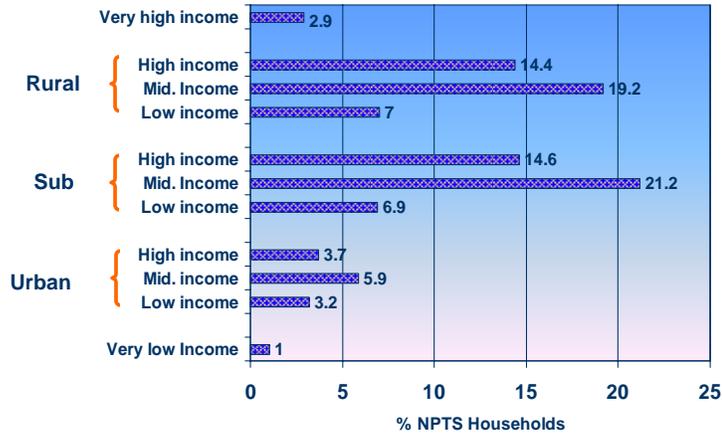
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All eligible tracts were grouped into 11 clusters



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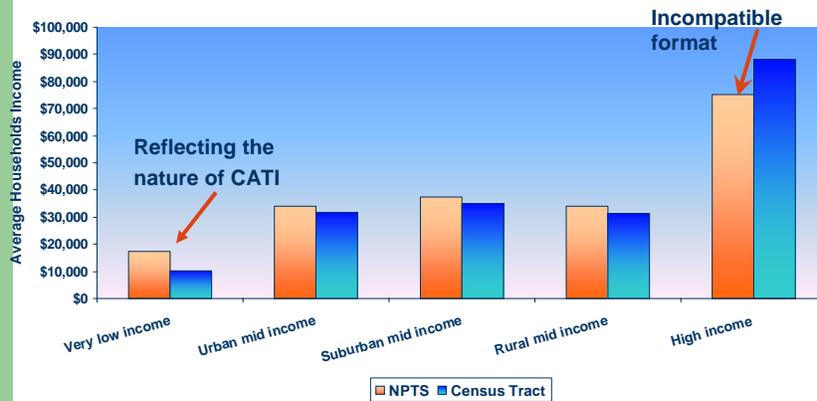
Step 3. Assign NPTS households to the 11 clusters



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In general, NPTS households are representative of the households in their corresponding clusters, with a few exceptions.



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NPTS-based Person Trips Per Household

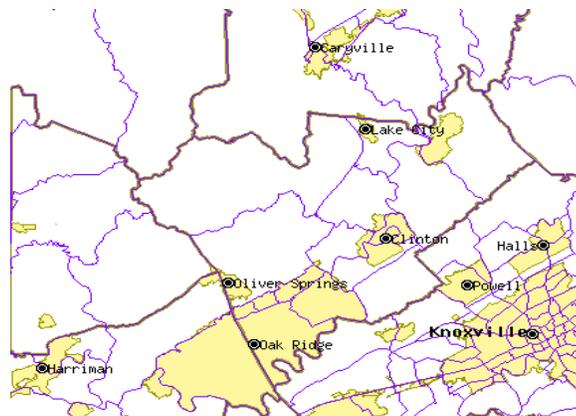
Household Size	Rural			...	Urban			Very High Income
	Low Income	Mid Income	High Income		Low Income	Mid Income	High Income	
1	3.6	4.0	3.6		3.8	4.4	4.8	4.5
2	8.0	7.8	7.9		6.2	8.1	7.8	8.0
3	12.0	12.1	11.4		10.5	11.0	12.0	12.6
4	15.6	16.3	14.5		11.2	13.2	14.9	16.0
5+	19.3	21.5	18.9		13.5	16.6	17.7	19.6

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An Example of how this tool works



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Estimating Travel Demand for City of Oak Ridge

T. 201	→	Rural "low"	←	2,886 NPTS HHs
T. 202	→	Rural "high"	←	5,934 NPTS HHs
T. 203	→	Rural "mid"	←	7,890 NPTS HHs
T. 204	→	Rural "mid"	←	7,890 NPTS HHs
T. 205	→	Rural "low"	←	2,886 NPTS HHs
T. 206	→	Rural "high"	←	5,934 NPTS HHs
T. 301	→	Very "high"	←	1,182 NPTS HHs

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City of Oak Ridge (cont'd)

Tract 201 → Rural "low" ← 2,886 NPTS HHs



632 HHs × 3.595 person trips/HH = 2,272 total person trips



365 HHs × 8.011 person trips/HH = 2,924 total person trips



174 HHs × 12.022 person trips/HH = 2,092 total person trips



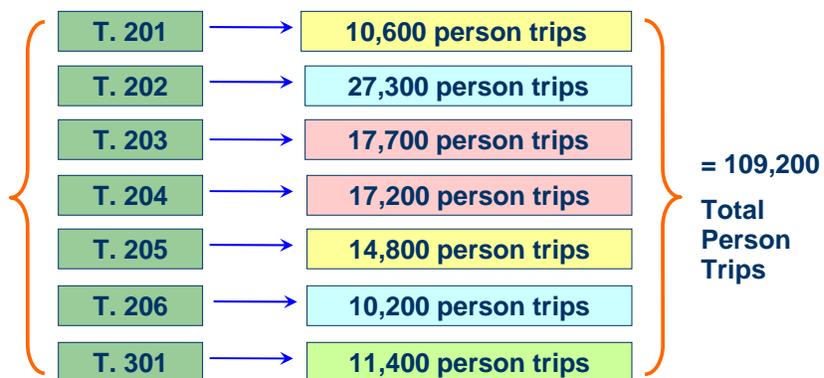
124 HHs × 15.606 person trips/HH = 1,935 total person trips



72 HHs × 19.3 person trips/HH = 1,390 total person trips

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Estimated Travel Demand for City of Oak Ridge



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The Next Question Is:

“How good are these cluster-based estimates?”

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We conducted four separate assessments

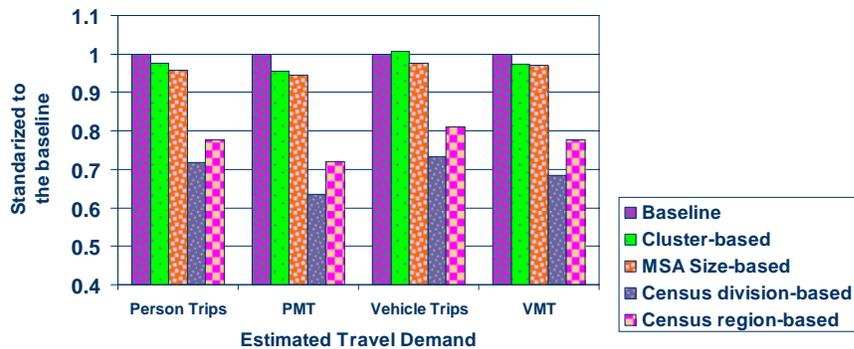
1. Against New York NPTS add-on (random half of a sample of 11,004 HHs)
2. Against Oklahoma NPTS add-on (random half of a sample of 3,932 HHs)
3. Against Massachusetts NPTS add-on (random half of a sample of 7,801 HHs)
4. Against Baton Rouge Household Survey (1,395 HHs)

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If not “contaminated” by differences in survey methodology, cluster-based estimates are extremely close to the “baselines.”



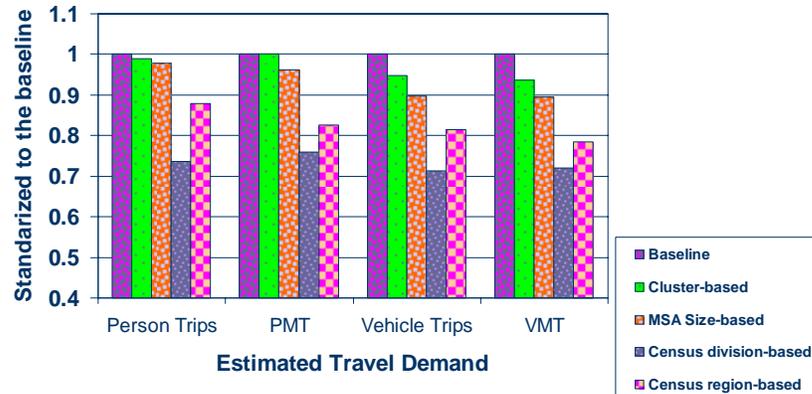
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Another Example of the Assessment

Massachusetts NPTS Add-On



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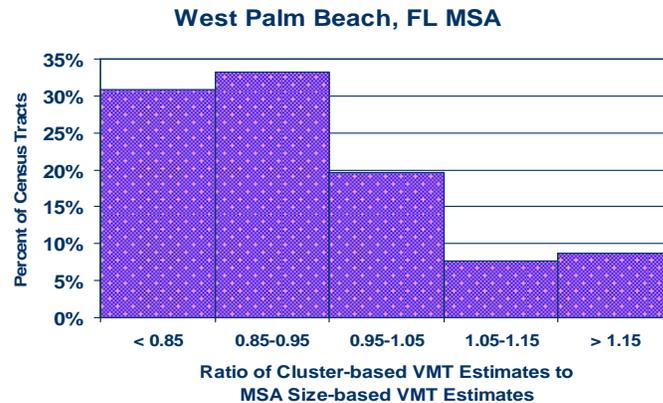
Cluster-based Approach vs. MSA-size Based Approach

Assessment results suggest that cluster-based approach does not demonstrate apparent advantages over MSA-size based approach.

Then, why bother?

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However, if estimating for areas smaller than an MSA, then the cluster-based approach provides more finely differentiated estimates than the MSA size-based approach.



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Conclusions

- If resources are available, a locale-specific household survey is most likely to yield estimates that are more accurate than those based on other surveys.
- Otherwise, one has 5 ways to use the NPTS data
 - Cluster based
 - MSA-size based
 - Census-Division based
 - Census-Region based
 - Nation-wide

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Conclusions (cont'd)

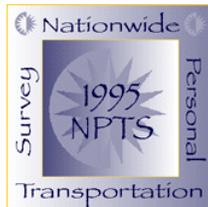
- Our results suggest that cluster-based estimates are more accurate than those derived from the other 4 approaches
- Although the percentage improvements are small (e.g., improving VMT estimate by less than 1%), the absolute improvements contributed by the cluster-based approach can not be ignored.

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This tool is available on:



<http://cta.ornl.gov/NPTS>

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