

Research on Commuting Expenditures and Geographic Adjustments in the Supplemental Poverty Measure

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Travel Expenses in the SPM

Thresholds

- Basic needs:
 - food, clothing, and shelter (including utilities)
- Other basic needs:
 - household supplies, personal care, and non-work-related transportation

Resources

- Resources that a family unit has available to spend on items included in the threshold
- Deductions for work-related expenses:
 - child care, medical-out-of-pocket expenses, commuting costs, etc.



Adjusting the SPM

Thresholds

- How other basic needs are calculated:
 - 20 percent multiplier to the food, clothing, and shelter component (Citro and Michaels 1995, 151)

Resources

- How other work-related expenses are taken into account:
 - subtracting a flat amount from a family's resources for 'Other Work-Related Expenses'
 - 85% of the median amount spent on 'Other Work-Related Expenses'



Purpose

- This research examines the appropriateness of the application of a flat amount for work-related expenses by investigating:
 - geographical variation across 100 urban areas
 - for automobile commuters
 - by population size and Census region and division
- Two methods are used to translate travel time into travel costs: (1) state gas prices and (2) federal reimbursement rate.



Limitations

- The SPM is currently only adjusted by housing costs.
- This research
 - does not include non-work-related travel.
 - does not include areas outside of 100 urban areas.
 - estimates for automobile commuters only (76% of commuters, 86% with carpoolers).
- ACS has travel time but not distance.



Surveys with Commuting Data

- *American Community Survey (ACS)*
- *Survey of Income and Program Participation (SIPP)*
- *American Housing Survey (AHS)*
- *National Household Travel Survey (NHTS)*
- *Current Population Survey (CPS)*
- *American Time Use Survey (ATUS)*
- *Consumer Expenditure Survey (CE)*
- *Texas Transportation Institute (TTI)*



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Data

- 2009 1-Year ACS
 - Mean travel time data (in minutes)
- TTI 2010 Annual Urban Mobility Report
 - Average speed data (in mph) for 100 urban areas
 - State gas prices



Figure 4: Mean Travel Time by County in the U.S.

2009 American Community Survey

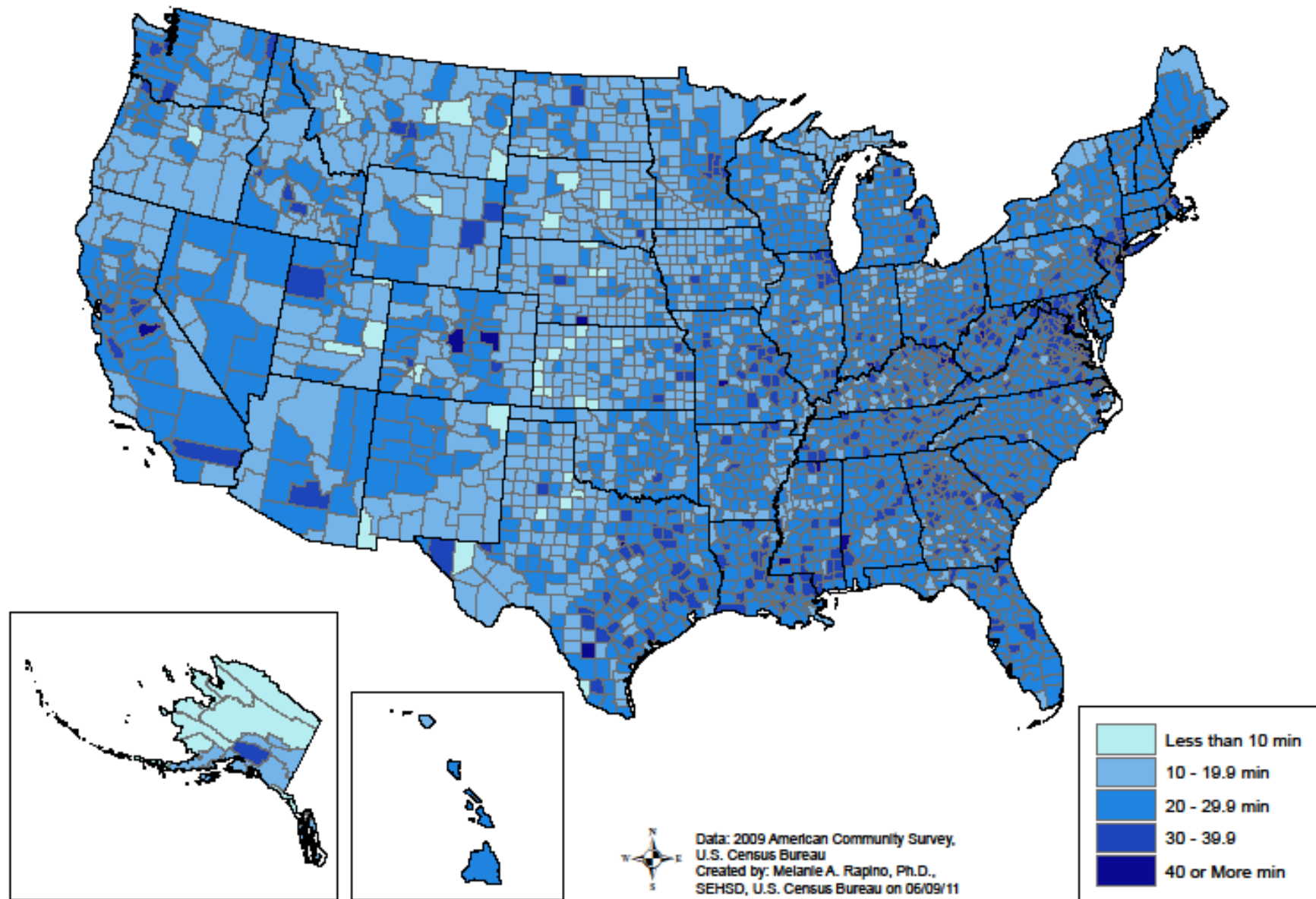
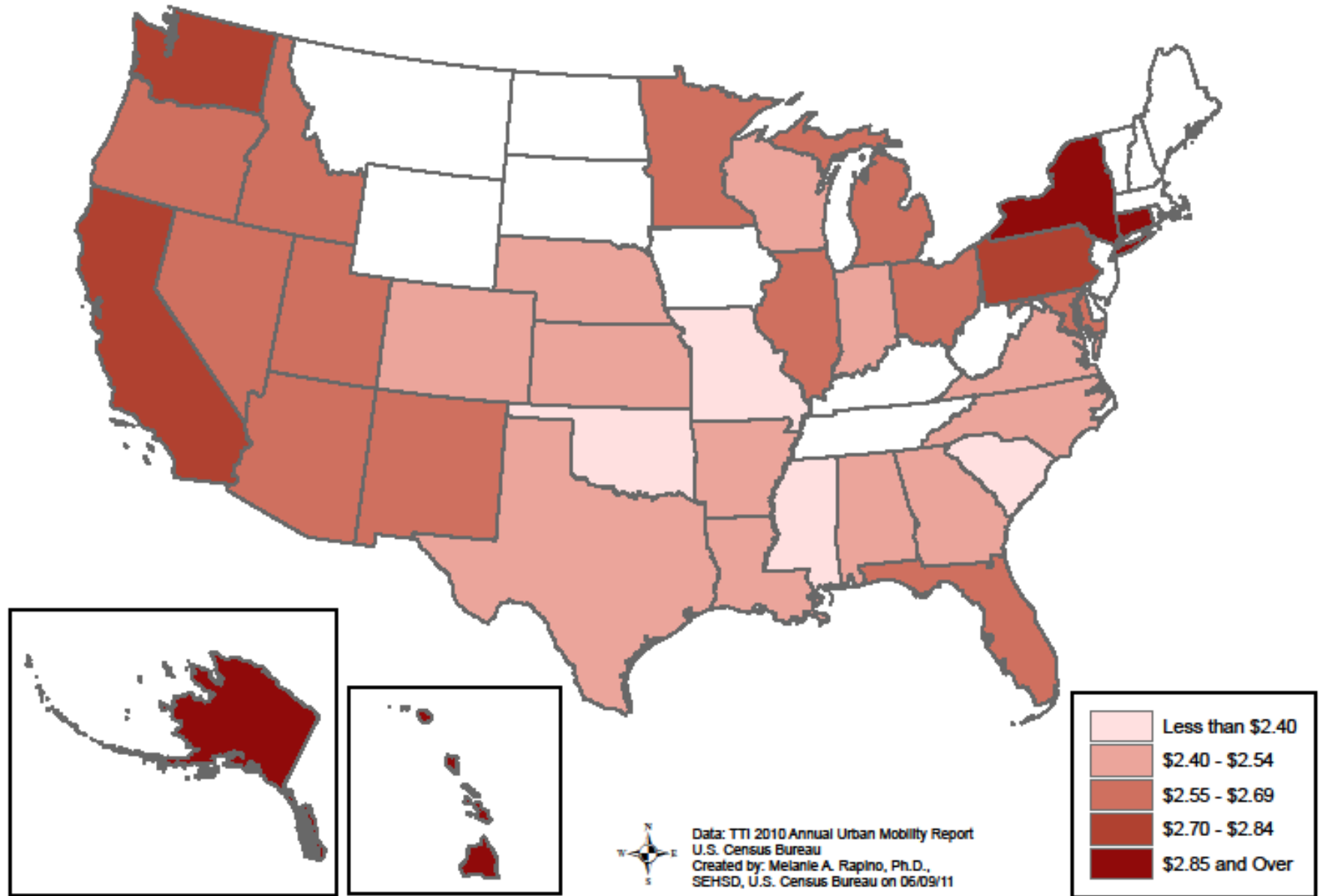


Figure 5: State Gas Prices
TTI 2010 Annual Urban Mobility Report



Methods

Gas Prices

$$\left(\frac{\text{Average Distance (in miles)} \times (\$/\text{gallon of gas})}{\text{Average Fuel Economy (in mpg)}} \right) \times 2 \times 251$$

Reimbursement Rate

$$(\text{Average Distance (in miles)} \times \$0.55/\text{mile} \times 2) \times 251$$

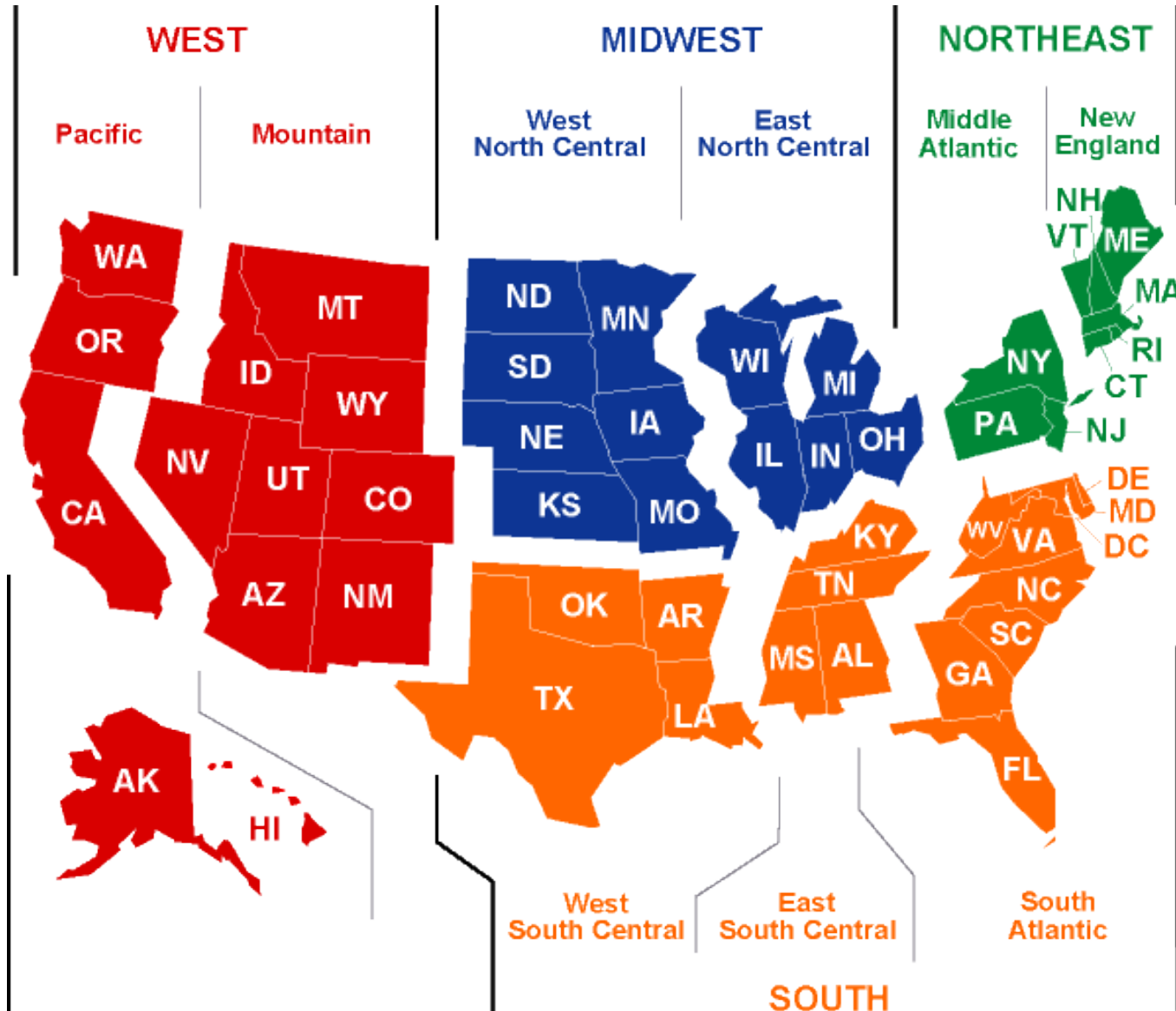


Urban Areas

- Small = less than 500,000
- Medium = 500,000 to 1 million
- Large = 1 million to 3 million
- Very Large = more than 3 million



US Census Bureau Regions and Divisions



Descriptive Statistics, Pearson's Correlation, and Independent t-test Results

	Gas Prices	Reimbursement Rate
Mean	\$1,129	\$4,773
Standard Deviation	\$221	\$789
Standard Error	\$22	\$79
Minimum	\$754	\$2,912
Maximum	\$2,024	\$7,796
Test Results		
t-test	t-value = -44.46 (p <0.0001)	
Pearson's Correlation	$\rho=0.87033$ (p <0.0001)	

Highlights

- Reimbursement Rate > Gas Prices
- Variation by geographical areas and scale
- As size increases, so does cost
- Northeast = high
- Middle Atlantic = high
- Gas prices:
 - Small and Very large in Northeast = highest
- Reimbursement Rate:
 - Small and Very Large in Northeast = highest



Urban Areas with the Highest Commuting Costs Using Gas Prices

	Cost	SE	Size	Region	Division
Honolulu HI	\$2,024	\$21	Med	West	Pacific
Lancaster-Palmdale CA	\$1,891	\$42	Med	West	Pacific
New York-Newark NY-NJ-CT	\$1,798	\$2	Vlg	Northeast	Middle Atlantic
Poughkeepsie-Newburgh NY	\$1,688	\$36	Med	Northeast	Middle Atlantic
Bridgeport-Stamford CT-NY	\$1,523	\$13	Med	Northeast	New England
Washington DC-VA-MD	\$1,502	\$6	Vlg	South	South Atlantic
Riverside-San Bernardino CA	\$1,492	\$14	Lrg	West	Pacific
Stockton CA	\$1,455	\$38	Sml	West	Pacific
Baltimore MD	\$1,418	\$9	Lrg	South	South Atlantic
Chicago IL-IN	\$1,389	\$4	Vlg	Midwest	East North Central

Urban Areas with the Highest Commuting Costs Using the Reimbursement Rate

	Cost	SE	Size	Region	Division
Lancaster-Palmdale CA	\$7,795	\$348	Med	West	Pacific
Poughkeepsie-Newburgh NY	\$6,739	\$288	Med	Northeast	Middle Atlantic
Stockton CA	\$6,623	\$343	Sml	West	Pacific
New York-Newark NY-NJ-CT	\$6,484	\$17	Vlg	Northeast	Middle Atlantic
Riverside-San Bernardino CA	\$6,186	\$117	Lrg	West	Pacific
Bridgeport-Stamford CT-NY	\$6,142	\$103	Med	Northeast	New England
Honolulu HI	\$6,108	\$125	Med	West	Pacific
Baltimore MD	\$6,055	\$76	Lrg	South	South Atlantic
Washington DC-VA-MD	\$5,959	\$50	Vlg	South	South Atlantic
Atlanta GA	\$5,899	\$73	Vlg	South	South Atlantic

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Washington DC-VA-MD	\$5,959	\$50	Vlg	South	South Atlantic
Atlanta GA	\$5,899	\$73	Vlg	South	South Atlantic

Urban Areas with the Lowest Commuting Costs Using Gas Prices

	Cost	SE	Size	Region	Division
Boulder CO	\$755	\$19	Sml	West	Mountain
Boise ID	\$805	\$12	Sml	West	Mountain
Wichita KS	\$818	\$13	Med	Midwest	West North Central
Brownsville TX	\$833	\$22	Sml	South	West South Central
Tulsa OK	\$838	\$10	Med	South	West South Central
Oklahoma City OK	\$840	\$10	Med	South	West South Central
Eugene OR	\$881	\$20	Sml	West	Pacific
Omaha NE-IA	\$889	\$11	Med	Midwest	West North Central
Laredo TX	\$912	\$26	Sml	South	West South Central
Little Rock AR	\$913	\$17	Sml	South	West South Central

Urban Areas with the Lowest Commuting Costs Using the Reimbursement Rate

	Cost	SE	Size	Region	Division
Boulder CO	\$2,912	\$144	Sml	West	Mountain
Boise ID	\$3,076	\$94	Sml	West	Mountain
Spokane WA	\$3,243	\$88	Sml	West	Pacific
Anchorage AK	\$3,393	\$130	Sml	West	Pacific
Wichita KS	\$3,672	\$113	Med	Midwest	West North Central
Brownsville TX	\$3,693	\$199	Sml	South	West South Central
Eugene OR	\$3,734	\$173	Sml	West	Pacific
Bakersfield CA	\$3,821	\$142	Med	West	Pacific
Sarasota-Bradenton FL	\$3,829	\$145	Med	South	South Atlantic
Oklahoma City OK	\$3,860	\$89	Med	South	West South Central

Urban Areas with the Lowest Commuting Costs Using the Reimbursement Rate

	Cost	SE	Size	Region	Division
Boulder CO	\$2,912	\$144	Sml	West	Mountain
Boise ID	\$3,076	\$94	Sml	West	Mountain
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Bakersfield CA	\$3,821	\$142	Med	West	Pacific
Sarasota-Bradenton FL	\$3,829	\$145	Med	South	South Atlantic
Oklahoma City OK	\$3,860	\$89	Med	South	West South Central

Significance Test Results for Urban Areas based on Size of Population

Gas Prices

	Commuting Costs	SE	Small	Medium	Large	Very Large
Small	\$995	\$21	X	•	•	•
Medium	\$1,130	\$16		X		•
Large	\$1,129	\$10			X	•
Very Large	\$1,326	\$6				X

• = Statistical significance at $p < 0.10$

Reimbursement Rate

	Commuting Costs	SE	Small	Medium	Large	Very Large
Small	\$4,344	\$87	X	•	•	•
Medium	\$4,762	\$134		X		•
Large	\$4,831	\$84			X	•
Very Large	\$5,311	\$52				X

• = Statistical significance at $p < 0.10$

Significance Test Results for Urban Areas based on Region

Gas Prices

	Commuting Costs	SE	Midwest	Northeast	South	West
Midwest	\$1,042	\$10	X	•		•
Northeast	\$1,315	\$13		X	•	•
South	\$1,061	\$14			X	•
West	\$1,176	\$16				X

• = Statistical significance at $p < 0.10$

Reimbursement Rate

	Commuting Costs	SE	Midwest	Northeast	South	West
Midwest	\$4,571	\$87	X	•		
Northeast	\$5,233	\$106		X	•	•
South	\$4,704	\$126			X	
West	\$4,747	\$132				X

• = Statistical significance at $p < 0.10$

Significance Test Results for Urban Areas based on Division

Gas Prices

	Cost Estimate	SE	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central
East North Central	\$1,078	\$10	X	•	•	•	•	•	•	•	•
East South Central	\$1,024	\$13		X	•		•	•	•	•	•
Middle Atlantic	\$1,341	\$13			X	•	•	•	•	•	•
Mountain	\$1,020	\$12				X	•	•	•	•	•
New England	\$1,286	\$13					X		•	•	•
Pacific	\$1,258	\$18						X	•	•	•
South Atlantic	\$1,142	\$14							X	•	•
West North Central	\$957	\$9								X	
West South Central	\$979	\$15									X

• = Statistical significance at $p < 0.10$

Reimbursement Rate

	Cost Estimate	SE	East North Central	East South Central	Middle Atlantic	Mountain	New England	Pacific	South Atlantic	West North Central	West South Central
East North Central	\$4,633	\$89	X		•		•	•	•	•	
East South Central	\$4,726	\$120		X	•	•	•			•	
Middle Atlantic	\$5,258	\$107			X	•		•	•	•	•
Mountain	\$4,404	\$108				X	•	•	•		
New England	\$5,203	\$105					X		•	•	•
Pacific	\$4,928	\$144						X		•	•
South Atlantic	\$4,904	\$119							X	•	•
West North Central	\$4,420	\$82								X	
West South Central	\$4,455	\$136									X

• = Statistical significance at $p < 0.10$

Conclusions

- Regardless of the method used, the top 10 urban areas with the highest and lowest commuting costs were relatively consistent
- Very large urban areas (pop. 3 million+) and small urban areas (pop. <500,000) had significantly different commuting costs
- Generally, these results indicate that the Midwest and the South have lower commuting costs than the Northeast and the West

Conclusions (cont'd)

- Using gas prices, the East North Central, Middle Atlantic, and the South Atlantic urban areas have significantly different commuting costs compared to urban areas in other divisions
- The use of gas prices, in comparison to the reimbursement rate, provides additional geographic variation





Further research is needed on:

- Appropriate geographic scale of analysis
- Appropriate method of estimation
 - possible data sources or methodology for estimating speeds, travel times, and distance, and ultimately, cost estimates for commuting in the additional 339 urban areas as well as non-urban and rural areas
- Cost estimations for utilizing public transit in urban areas where it is available
- H + T Affordability Index by the Center for Neighborhood Technology (CNT)



ACS Distance-Based Approach to Measuring Commuting Costs





Overview of ACS Distance-Based Approach

- Overall Objective- Calculate commuting costs for workers at varying summary levels.
- Approach
 - Measure distance between residence block and place of work block for individual ACS respondents.
 - Multiply distance traveled by standard mileage reimbursement rate for automobile commuters.



Additional Details

- Straight line (Euclidean) distance calculated between residence and POW block centroids using GIS.
- Differentiate distance estimates by principal travel modes (Automobile and public transportation).
- Aggregate to metro area level.
- Applies most directly to automobile commuters



Advantages

- Depends heavily on ACS data
 - Provides additional socio-economic characteristics
 - Standardization
 - In-house data
 - Flexibility in geographic summary levels
 - Ability to differentiate across travel modes



Disadvantages

- Depends heavily on GIS environment
- Resource intensive
- Methodological limitations
 - Euclidean distance vs. network distance
 - Does not account for major physical barriers across landscapes or varying street network forms



Other Considerations

- Which additional characteristics should feed into the commuting cost estimate?
 - Hours worked?
 - Worked at home?
- How should treatment of transit commuting costs differ from private automobile commuting costs?
 - How should this vary across places?
 - Transit makes up one-third of NYC metro area commutes, but makes up less than 5 percent of all commutes in all but 11 metro areas.



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Figure 1: Mean Travel Time for 100 Urban Areas
2009 American Community Survey

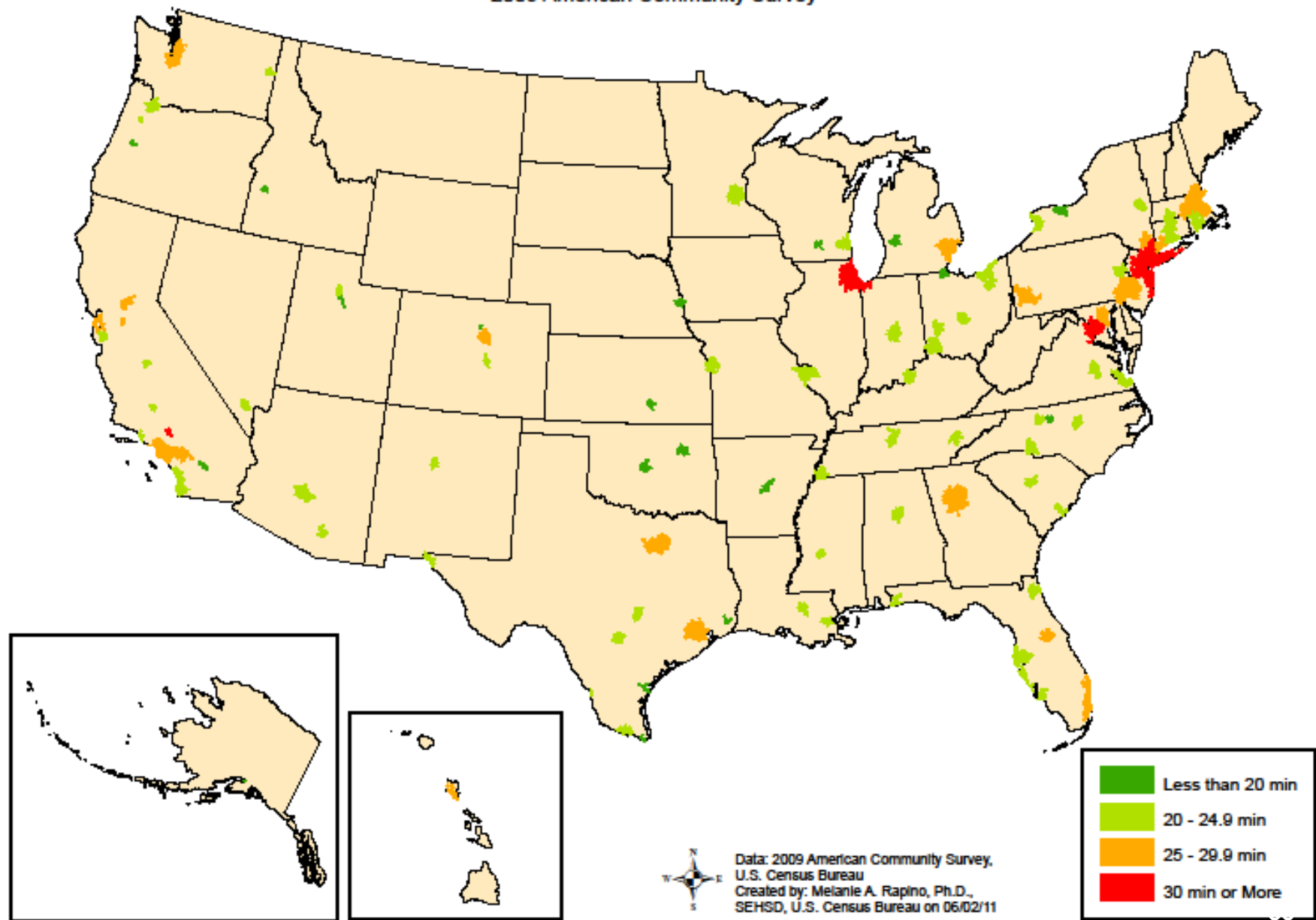
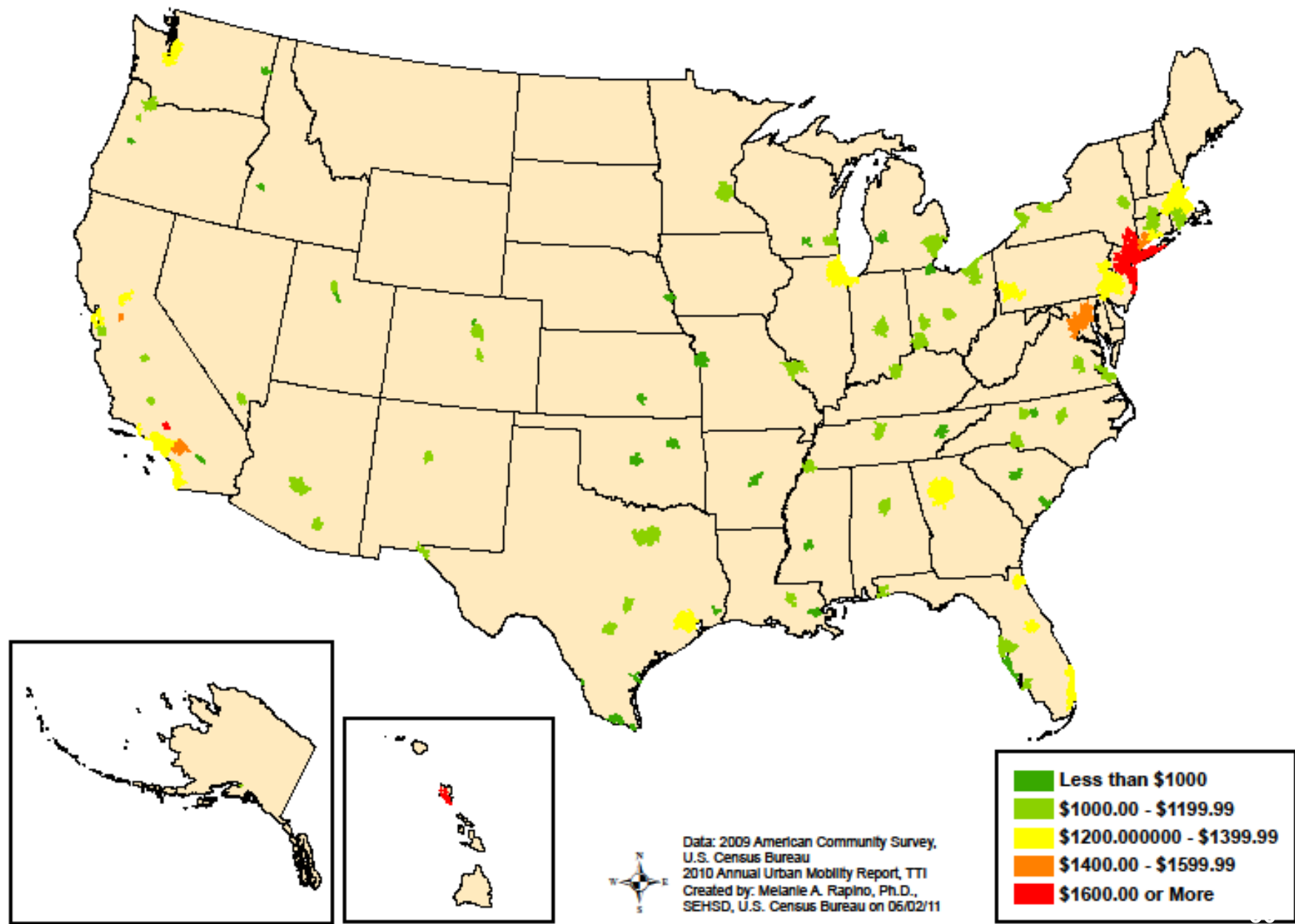
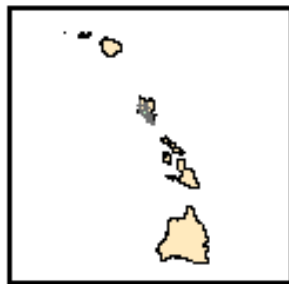
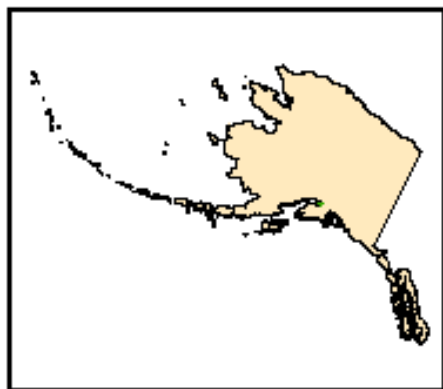
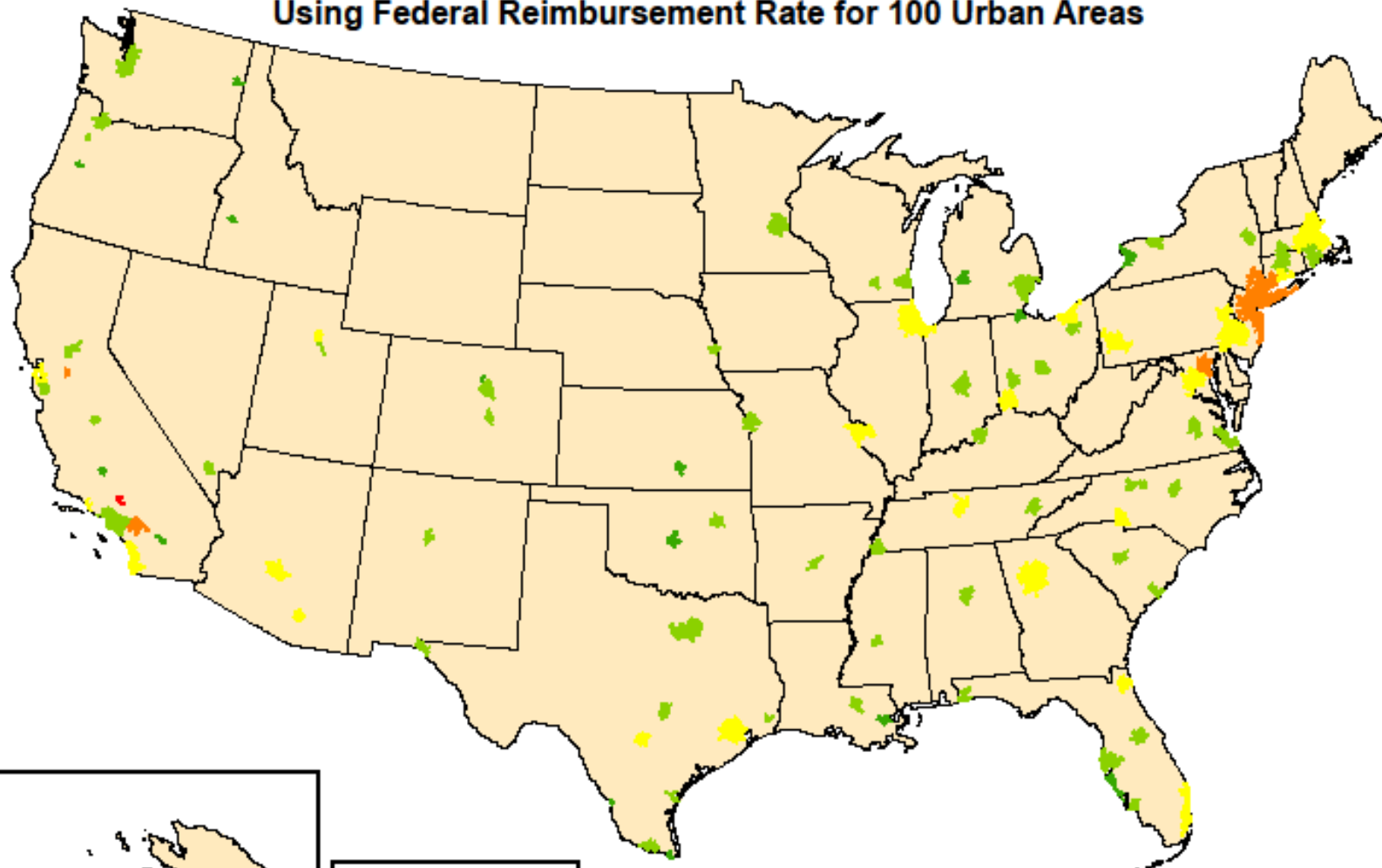


Figure 2: Annual Commuting Cost Estimates Using Gas Prices for 100 Urban Areas



**Figure 3: Annual Commuting Cost Estimates
Using Federal Reimbursement Rate for 100 Urban Areas**



Data: 2009 American Community Survey,
U.S. Census Bureau
2010 Annual Urban Mobility Report, TTI
Created by: Melanie A. Rapino, Ph.D.,
SEHSD, U.S. Census Bureau on 06/02/11

