

RSG's Smartphone Survey App, rMove



DAILY SURVEY

- Passive collection of spatial data AND prompted in-app surveys
- Collects data for travel demand modeling and regional planning purposes



TRIP SURVEY

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Challenges with Smartphone Data Collection

While smartphone data collection offers massive improvements over traditional methods, combining passive data with survey data is complex.

CHALLENGES

- Reported trip characteristics might not match the GPS trace
- Respondents misunderstand survey questions
- Missing values/non-response of survey data

SOLUTIONS

- Improved imputation
 - Trip purpose/mode imputation
 - Income, gender, race, and ethnicity imputation
- Improved app interface and data collection







Improved Imputation Example



Imputing Trip Purpose

We developed 30+ rules to impute a trip purpose when the reported trip purpose does not match the location type (i.e., home, work, school, or other).

Rules are based on:

- Reported trip purpose
- Distance from habitual locations
- Trip mode
- First/last trip of day
- Time spent at destination
- Number of travelers
- Type of trip made before/after





Trip Purpose Imputation Example

Rule: Identifies trips dropping off/picking up someone at another person's home, work, or school.

The criteria are:

- 1. The mode for the trip is the same as the mode for the next trip
- 2. The number of travelers for the trip is different from the number of travelers for the next trip
- 3. Time spent at destination is 30 minutes or less
- 4. The destination is not the last one of the day

Example trip details	
Destination location type	Child's school
Reported purpose	Primary workplace
Imputed purpose	Drop off at school



Note: This is an example trip and is not an actual trip made by any data subject in a study.



Trip Purpose Imputation Results

- Before imputation, about 80% of trips have a destination location type that matches the stated destination purpose category.
- After applying the set of rules, this share is close to 100%.

LOCATION	PURPOSE	BEFORE IMPUTATION	AFTER IMPUTATION
No mismatch		79.9%	99.8%
Home	Not Home	3.3%	0.2%
Not Home	Home	3.4%	0.0%
Work	Not Work	0.8%	0.1%
Not Work	Work	1.1%	0.0%
School	Not School	0.3%	0.0%
Not School	School	0.2%	0.0%
Purpose is missing		11.0%	0.0%
Total		100.0%	100.0%





App Changes



Collecting Habitual Locations

We started asking respondents to report their habitual locations earlier in data collection.

Asking respondents to report their habitual locations has two benefits:

- 1. More reliable habitual location data
- 2. We can use this information dynamically in trip surveys



Note: This is the RSG office in Burlington, VT.



Collecting Trip Purpose

If trip ended near home
App Store ■ ? 10:33 AM
1 2:56 PM - 3:07 PM
Did this trip end at home?
Yes
No
Previous Next

ł	If trip end lousehold me	ded near a ember's school	
Ар) Store 🖬 🗢 4:4	7 PM 🦪	ŗ
	8:00 AM	- 8:05 AM	
lt l ho yo	boks like you stop usehold member's u do at the school	ped at another s school. What did ?	
	Pick-up someone		
	Drop someone off		
	BOTH pick-up AND c	drop-off	
	Accompany someone along for the ride)	e only (e.g., go	
	Other activity at scho attend meeting, pick- item)	ol only (e.g., -up or drop-off	
	Went somewhere oth school	er than the	
	Previous	Next	





Conclusion

- We have advanced our imputation methods and improved the rMove app to address challenges.
- We are continuing to evolve our methods and the app.
- We are finding a balance between data collected, respondent burden, and privacy concerns.







Rachel Schmidt

Senior Analyst Rachel.Schmidt@rsginc.com

Jeffrey Dumont Senior Data Scientist Jeff.Dumont@rsginc.com

Mark Bradley

Senior Director Mark.Bradley@rsginc.com