An Imputation Method and Evaluation for Determining Alighting Location in On-board Transit Surveys

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Overview of Presentation

• Introduction
• Purpose for Developing Imputation Method
• Elements Required for Imputation Method
• Example, Central Ohio Transit Authority
• Conclusion
Introduction

• Objective
  – Continue to improve data completion in OB studies
  – Improve data quality
  – Minimize respondent burden

• Data Elements (for TDM / TP)
  – Origin / Destination addresses / Trip Purposes
  – Boarding and Alighting locations
  – Route Sequence
  – Access and Egress Modes

Introduction

• TDM / TP – more “hungry for data”
  – Data Accuracy
    • Weighting at the trip (route) level
  – Data Quality
    • Additional requested addresses, more potential error
  – Data Completeness
    • Origin and Destination, Home address
    • Boarding and Alighting locations
Purpose for Imputation Method

• Data Accuracy
  – Limitations with Previous Methods
    • Weighting (response factor) options limited
    • Boarding counts collected at the trip level
    • Trip segments under and over represented
    • Short trip bias

• Data Quality
  – Limitations with Previous Methods
    • Requesting four / five different addresses
    • Limited rider comprehension
      – Misinterpreting O/B and D/A
      – Lack of understanding “one-way trip”
      – Lack of understanding of transit network
    • Incorrect / illogical location data
Purpose for Imputation Method

- Data Completeness
  - Limitations with Previous Methods
    - Prone to missing address information
    - Questionnaire intimidation
    - Lack of time to complete entire questionnaire
      - Unit response rate
      - Item response rate

What is the solution???

Use technology to increase data accuracy, quality and completeness and minimize respondent burden in the process.
Application of Technology

- GPS equipped PDAs
  - Precise boarding time / location
    - GPS
    - Bus stop drop down list
  - Precise passenger volume
    - Boarding and Alighting counts by stop

Develop Imputation Method

- Imputation Method - Alighting Location
  - Variables and other items used
    - Trip information (route, time, direction)
    - Transit network
    - Destination address
    - Future transfer information
    - Egress mode
Example of Alighting Imputation

- Central Ohio Transit Authority (COTA)
  - Conducted in Columbus in 2008
  - Pilot - Comparing 3 alighting locations
    - Respondent provided
    - Imputed
    - 3rd person collected

Example of Alighting Imputation

- Pilot Study Alighting Imputation Test
  - Preliminary results
    - Direction of trip issues – 35%
      - Unique riding patterns (A, B trips)
      - PDA auditing issues
      - Riders reversing O/D
    - Transfer info issues – 45%
      - Either / Or route selection
      - Reverse Order
    - Destination location geocode issues – 20%
Example of Alighting Imputation

- Full-Scale Study Alighting Imputation Results
  - Total records – 5,747 records
  - Rider provided alighting – 4,243 (74%)
  - Records with Imp and Rider provided alighting within 200 ft – 4,161 (98%)

Conclusion

- Imputation increases unit and item response (alighting location)
- Accurate estimation of alighting location
- Validates other questionnaire inputs (destination address)
Additional uses of GPS data

• Additional value for surveyed trip
  – Respondent trip length (distance)
  – Respondent trip time
• Additional value for transit agency
  – Schedule adherence
  – Transit speeds
  – Bus load peak levels
  – APC Corroboration

Thank You!