

Estimation of Demand for Rural Intercity Bus Services

TCRP B-37

Presentation
October 25, 2010



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Purpose: Develop Tool to Estimated Demand for Rural Intercity Bus Services

Goals Included:

- Easy to Use
- Not Requiring Access to Specialized Data or Software
- Appropriate for Rural Intercity Bus Services
- Sensitive to Variety of Factors Potentially Affecting Demand



Methodology:

- Literature Review
- Gather Data to Identify Rural Intercity Bus Services:
 - Survey State DOT's to Identify Funded Operators
 - Contact or Survey Operators to Obtain Data on Ridership, Operating Characteristics
- Classify Services
- Develop Full Data for Each Service
 - Points Served
 - Frequency
 - Route Length
 - Population
 - Demographic Data
 - Service to Key Destinations (Major Medical, Airports, Passenger Rail, Correctional Facilities, Universities)
 - Connectivity to the intercity bus network



Methodology Continued:

- Classification Revised Following Panel Meeting
- Population Alternatives:
 - Municipal populations at stops
 - Urbanized Area/Census Designated Place population
- Test Relationships Among Variables
- Develop Statistical Models—Regression
- Develop Alternative Models Using Data from the National Personal Transportation Survey
- Develop User-Friendly Toolkit



Data on Services:

- Classified as:
 - Regional: Not operated by an intercity bus carrier part of the national network (local fares, information not national)
 - ICB: Operated by an intercity carrier that is part of the national network (allows for interline ticketing and information)
- Key Issue: Definition of Intercity
 - Not all Section 5311(f) funded routes included
 - Connectivity to National Intercity Network a key characteristic used in classifying services
 - Non-intercity services deleted (commuter characteristics, long rural transit routes with no connectivity, etc.)
- Many issues with data:
 - Ridership (one full year, for this particular route/service)
 - Service Characteristics (round-trips per week)
 - Fares (Cents per mile calculated from end-to-end fare)



Resulting Database:

- 135 routes identified in survey
- 120 routes with basic data (ridership)
- 57 routes that met final definition of intercity and had complete data.



Population Data:

- 2000 Census
- Use of Census-designated areas, rather than GIS
- Initially used Municipal populations for each stop
- Summed for the route
- Issues led to use of Urbanized Area/Census Designated Place populations
- Population of Destination/Origin in Major Metro Area—how to address?



Resulting Models:

- Regression Model
- Trip Rate Model

Regression Model

- Basic Model:

Annual Ridership = $-2,803.536 + 0.194(\text{Average Origin Population}) + 314.734(\text{the number of stops on the route}) + 4971.668(\text{yes to airport service/connections}) + 5783.653(\text{yes to service provided by an intercity provider})$

$R^2 = 0.712$, Adjusted $R^2 = 0.690$

All variable significant a 5% level or better

- Signs are plausible
- Shows positive impact of connectivity to air and national network
- Use of average population and number of stops positively related to ridership.



Trip Rate Model:

- Used data from National Household Travel Survey
- Base Data was Long Distance Trips (50 miles or more one-way)
- By Urban and Rural
- By Region (Census Divisions)
- By Income Group:
 - Under \$30,000
 - Under \$75,000
 - Over \$75,000
- Converted to a Per Capita rate for Rural Trips, by region
- Bus Mode Share of .09 percent rounded to 1% produced best estimates

Accuracy of Models

- Trip Rate with 1 percent Mode Share:
 - Within 50 percent of actual ridership 45.60%
 - Within 10 percent of actual ridership 14.00%
- Adjusted 1% Trip Rate Model (used regression to predict error terms, which were then subtracted from Trip Rate predictions):
 - Within 50 percent of actual ridership 54.40%
 - Within 10 percent of actual ridership 15.80%
- Regression Model:
 - Within 50 percent of actual ridership 59.60%
 - Within 10 percent of actual ridership 17.50%

Limitations:

- Continued need for judgement in application of the models:
 - Which estimate to use
 - Diligence in entering plausible data
 - Deciding whether or not a service is operated by an “Intercity Bus Carrier”, or serves an Airport if some type of transit connection is required
- Neither model is sensitive to changes in fare or frequency
- Neither model includes overhead or through ridership that might result from being part of a network



Potential Next Steps:

- More data, try again
- Stop level models—predict ridership at a single stop
- Further efforts to include fare and frequency effects
- Impact of terminals and park and ride
- Include demand tools in an overall intercity planning and procedures guidebook
- Develop a national network model to include network effects (may be more important as Section 5311(f) is used to fill network gaps, rather than replace dead-end branches)



Toolkit Development:

- Simple and User-Friendly
- Not Requiring GIS Software
- Self-Contained—Includes Data
- Includes Both Models
- Provides Reference to Ridership on Comparable Routes
- Allows for User Adjustments to Reflect Special Conditions



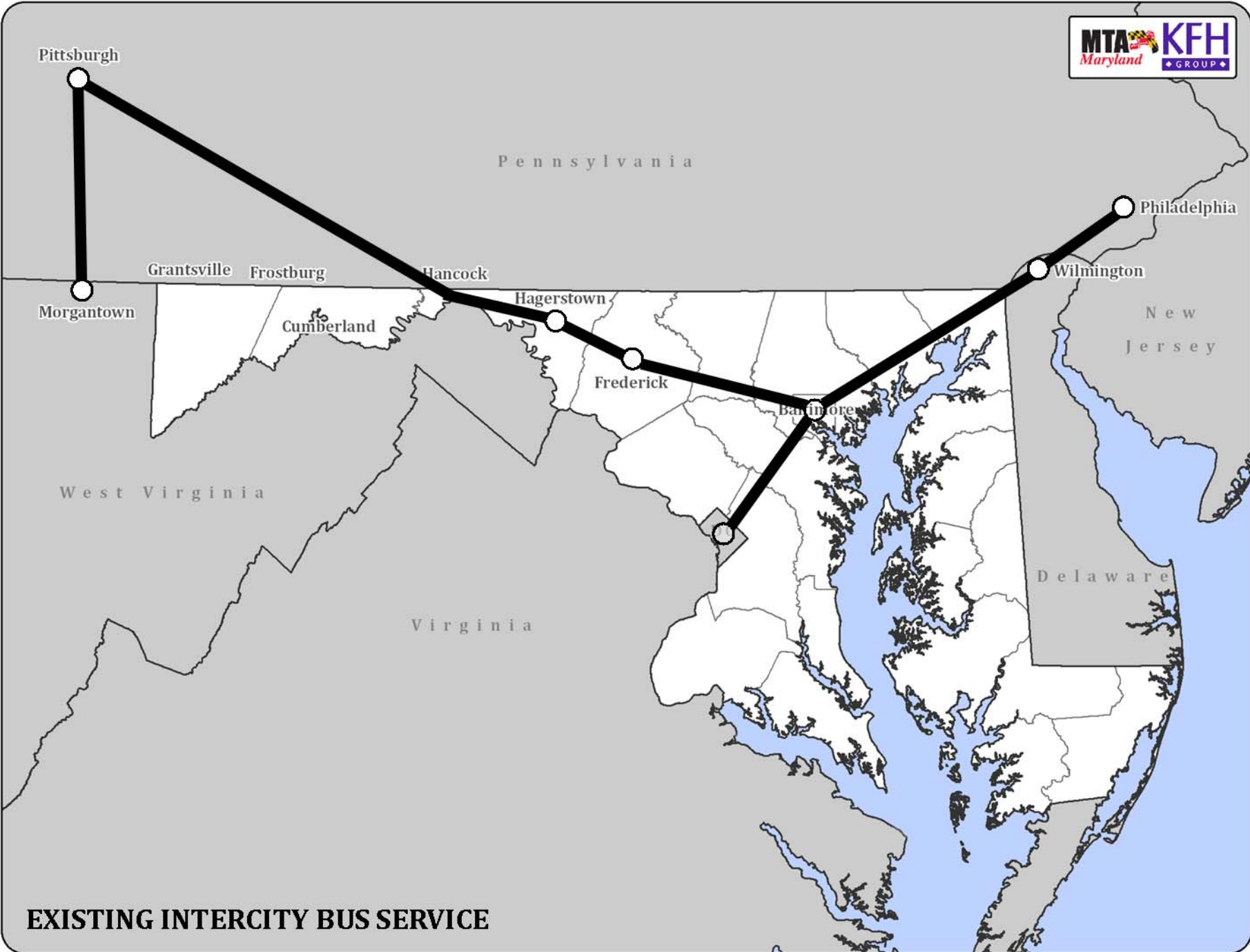
Toolkit:

- Product is a CD, Requires Excel
- All Directions and References are Included
- Includes Introduction, Application Steps
- Example of Application
- Includes All Required Census Data

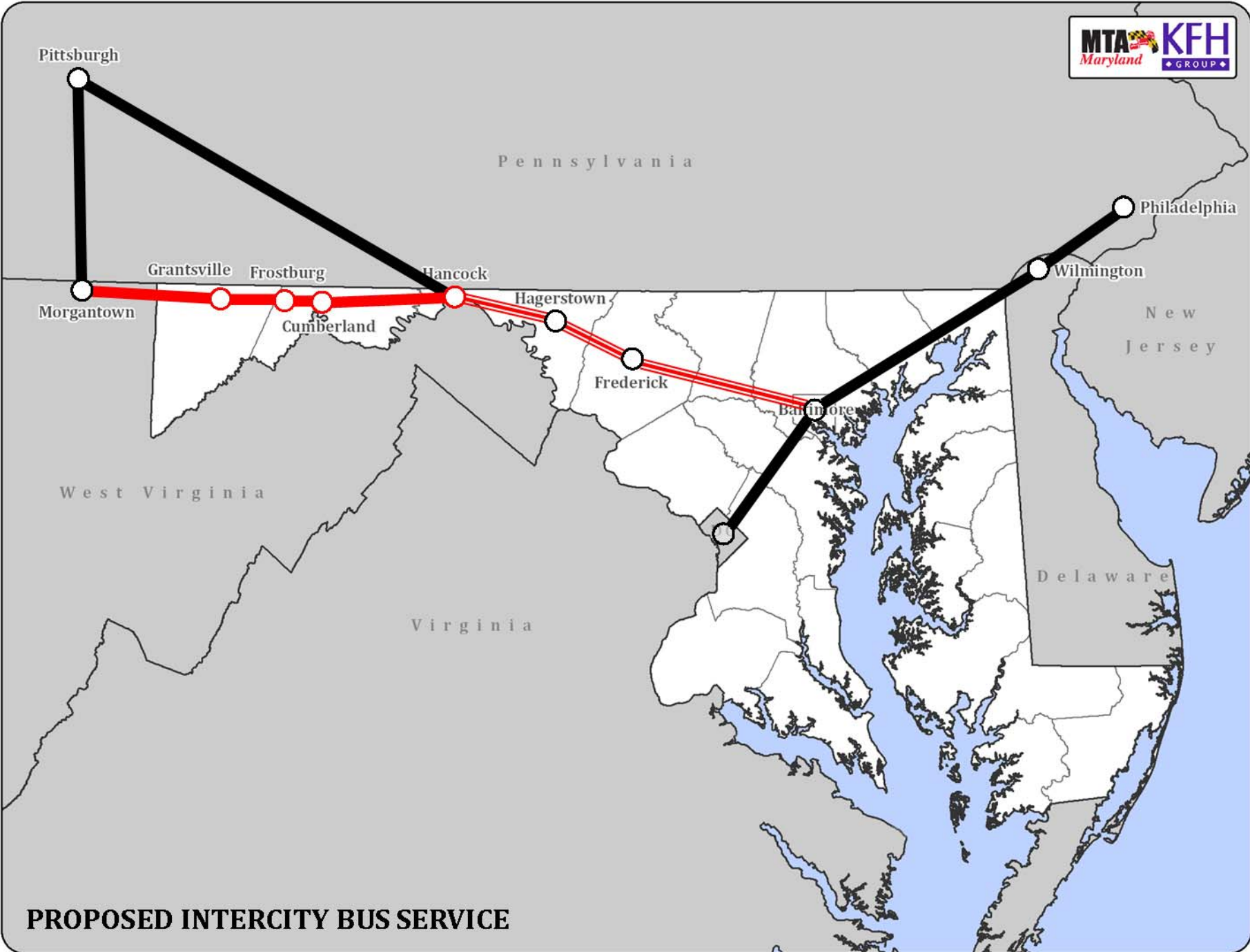


Demonstration: Western Maryland

- Imagine that you are a planner working in the state of Maryland
- A statewide intercity bus needs study has identified the existing network, and compared it to areas of the state with transit needs and likely key destinations
- A gap in service is identified in far western Maryland, and so you want to see if there might be sufficient demand to support a Section 5311(f) project
- You have the TCRP Project B -37 Toolkit disc....



EXISTING INTERCITY BUS SERVICE



PROPOSED INTERCITY BUS SERVICE

Demonstration (continued):

- Desire to estimate demand for a route that fills this gap in the state's network
- A goal is to connect the eastern and western rural areas of the state with the populated center, and connect to the frequent intercity bus services in the Washington-New York corridor—so the service will need to connect to Baltimore
- Points identified for this possible service include:
 - Baltimore
 - Frederick
 - Hagerstown
 - Hancock
 - Cumberland
 - Frostburg
 - Grantsville
 - Morgantown, West Virginia



Demonstration (continued):

TCRP B-37
ESTIMATION OF DEMAND FOR RURAL INTERCITY BUS SERVICE
TOOLKIT

Purpose:

This toolkit is intended to assist planners, service providers, program managers and other stakeholders in estimating the potential ridership on rural intercity bus services. It includes information on several potential methods and considerations in the estimation of potential ridership.

For more information on the toolkit click on the following:

- [How was this toolkit developed?](#)
- [Who is this toolkit intended for?](#)
- [What are the steps in applying this toolkit?](#)

*Input
Worksheet*