



Kansas RTAP Fact Sheet

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Forecasting Paratransit Demand, Then and Now

By Clifton Hall

As rural and urban populations continue to change, the population of transportation-disadvantaged persons will change, as well. Kansas's overall population is growing, but many rural counties have aging or declining populations. Knowing the future and current demographic make-up of your service area could be crucial for decision-making for your agency's leadership. Forecasts could give key clues to the assets and operational support that will be needed to meet transit ridership demand.

Two spreadsheets are available that allow transit managers to assess and forecast current and future needs and demand in their service area using data from the US Census Bureau. One is a product of Transit Cooperative Research Program Report 161. The other was produced by the Center for Urban Transportation Research (CUTR) and published by the National Center for Transportation Research. This article will describe the development of these two spreadsheets for modeling rural transportation demand, how they provide improvement over previous models, and how they can be used by transit providers in their own service areas.

That was then

In the past, forecasting was a complicated and tedious process, requiring resources and special skills not available to many smaller organizations. Today, with the increased availability of technology and ease of access to detailed data, certain forecasting methods can be used with common spreadsheet software.

One of the earlier studies on local demand forecasting was a product of a Transit Cooperative Research Board, *TCRP Report 3*, published in 1995. *Report 3* sampled data



Detailed population data is now more readily available and forecasting can now be done with simple spreadsheet software.

from 39 rural counties, and while a big improvement over previously available tools, did not include “need” as a parameter for funding or planning purposes, and was not applicable to sub-county areas. That study was updated with *TCRP Report 161* published in 2013.

The current model was developed by CUTR in 2013 and replaced a model commonly used in Florida, derived from a 1988 study by the Urban Mass Transportation Administration (now FTA) that focused on travel

patterns in the San Francisco Bay area. That model used 1990 U.S. Census data.

This is now

Since the time these older models were developed, the overall environment of rural and paratransit services has shifted dramatically, with more emphasis on coordination of services and further agency experience with ADA requirements. Now a broader variety of Census and transportation data is available and being used in more accurate models that can be applied throughout the country at flexible scales.

The new models primarily use data from the American Community Survey (ACS) to tailor their models to any given area of the U.S. The ACS was implemented by the Census Bureau to replace the “long form” of the 10-year Census, and to provide more frequent information about the demographic, housing, social and economic characteristics of the population. The ACS conducts roughly 3 million surveys per year, and releases data from these surveys (called estimates) every one, three, or five years depending on the

size of the jurisdiction in question. For the purposes of this article, we will be focusing on three and five year estimates of Kansas counties.

The models require data to be retrieved from the Census Bureau website. Using the Census website's "American Factfinder" utility, users can retrieve data in table form on age, poverty rate, disability rate, household size, and gender.

The two models use somewhat different data sets. CUTR's Florida model uses data from the National Household Transit Survey (NHTS) and the Census Bureau's Survey of Income Program Participation. The TCRP model uses NHTS data, the FTA's Rural National Transit Database program, and the Census Bureau's Longitudinal Employment-Household Dynamics data set for their calculations.

Data about the service characteristics in your area will also be useful for trip forecasting, if available. While data for the service area must be generated and entered by the user, trip rate data and mathematical formulas are already built into the spreadsheet, ready to run in the model.

More details about the newer models

TCRP model. Using statistical methods, the TCRP project developed a model that helps address issues of both need and demand. The TCRP defines **need** as "the number of people in a given geographic area likely to require a passenger transportation service." To represent transportation need, TCRP use a measure called the "mobility gap," which is the difference between the number of trips taken by those without a vehicle and the number of trips they would likely take if they did have access to a personal vehicle. **Demand** is defined as "the number of trips likely to be made over a given period within a given geographic area at a given price and level of service." It divides services into four categories:

- public
- program or sponsored trips
- fixed-route service in small urban towns in rural areas
- commuters from rural areas to central cities

The TCRP spreadsheet seeks to give comprehensive predictions for organizations with broad ranges of service, without excluding smaller transit providers. This allows providers to tailor the demands they might face to different sectors of their service population. The TCRP spreadsheet focuses mostly on current need and demand, but population projections can be used with spreadsheet results to forecast the future.

Florida / CUTR model. The Florida model produced by CUTR is focused primarily on the transportation disadvantaged (TD), which CUTR defines as "those who because of physical or mental disability, income status, or age are unable to transport themselves or purchase transportation and are, therefore, dependent on others to obtain access to health care, employment, education, shopping, social activities, or other life-sustaining activities" or "children who are handicapped or high-risk or at-risk" as defined by Florida statute. This focuses the calculations of need on transportation-dependent individuals instead of

the general public, and gives unique values for the "general" TD population and "critical needs" TD populations, namely those who "due to physical limitations or low income are unable to transport themselves." It also is built with future transit need in mind, providing a tool that projects current need and demand estimates into the future using population projections. The CUTR model was developed with special emphasis on Florida's quickly growing elderly population.

Both spreadsheet tools are simple to use and effective in predicting transit need and demand. The strengths of the CUTR model are that it needs only one table taken from the ACS, and it gives the user the ability to forecast transit need for the next decade. It does not, however, predict current or future demand, and the model is based on counties in Florida, with a fundamentally different population and transit environment than Kansas. The CUTR model has very strong analytical qualities, allowing general analysis of both need and demand using ACS data, as well as analysis of peer and organization data to predict demand, program trips, and fixed-route demand forecasting.

Caveats and application to Kansas agencies

When using ACS data, it's important to consider how the age of the data. The frequency of ACS data's publishing is related to the size of the jurisdiction, so smaller counties in Kansas with population of less than 20,000 will receive ACS updates only every five years. This means that, for the CUTR spreadsheet, only five-year estimates can be used. The 2012 five-year estimates were released for all counties in Kansas in December 2013.

Also, the more frequent the release, the less precise the data, so there is a trade-off to keep in mind. For example, Johnson County may have one-year estimates available, but these are made with a higher degree of statistical uncertainty than are the county's three- or five-year estimates. The balance between being current and being precise should be considered based on the needs of your organization. If a service operates in a growing urbanized area such as Johnson or Wyandotte County, population changes might be such that one-year estimates may better allow managers and planners to make service decisions on a yearly basis. In service areas where population shifts are relatively small, three- and five-year estimates will be sufficient, and will provide conservative, reasonably accurate estimates of present need and future service growth.

Another consideration is how to project need and demand estimates into the future. The CUTR spreadsheet is meant to look forward, but the TCRP spreadsheet does not have this function built in. By calculating the percentage of a certain demographic and an annual growth rate, you can discover how that demographic will grow or shrink along with the population. Then, formulas from the spreadsheet can be used to calculate the demand in question.

Moderate spreadsheet skills are all that are needed; more information on this can be found by contacting Clifton Hall at Kansas RTAP at clifton.hall@ku.edu. Population estimates are

needed for the CUTR model, and are available for Kansas from Wichita State University at the URL at the end of the sources for this article.

Applying the models: Examples from Kansas

We downloaded both spreadsheets and ran the models for both McPherson and Saline counties, as examples. McPherson is a typical rural county in the middle of Kansas, with a major economic center. Saline County has a larger population and a similar, larger, economic center. In addition to the larger population, the City of Salina, the county seat, has a well-developed fixed-route transit system, developed from a demand-response system.

Results from running the models

Authors of the TCRP model stated that even though the need for transit usually seems much larger than the demand, the average transit system typically provides coverage for only 20 percent of the total trip need. However, Salina's primary fixed-route transit provider, CityGo, provided 146,280 rides in 2012, approximately 29 percent of the estimated need for the county, but is exceeding estimates for typical transit demand. CityGo has been aggressive in identifying and developing services in Salina that are being well utilized and successful in shifting some of the trips typically provided by personal automobile to transit.

Conclusion

Many factors go into making planning decisions for a rural transit provider. As you begin to make decisions about how your operation may change to fit present or future demand, forecasting need and demand can be helpful. The TCRP spreadsheet can give helpful insight into meeting new needs and distributing resources effectively. The CUTR model can give valuable insight into how the transit-dependent sector of your population may change in the near future but may not reflect rural conditions or rural transit utilization in Kansas.

Even though the information generated by the models is helpful, use it with knowledge that it has limitations. However, if you've noticed significant changes in demographics in your service area, forecasting could be a valuable tool for the decisions you make as a leader in community transportation.

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Results for Saline and McPherson Counties

TCRP Report 161 Model

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|-----------------------------|---|
| Inputs: | 0-Car households, population 60+, persons w/ambulatory difficulty |
| Travel Need (Trips): | 731,400 in Saline County / 258,900 in McPherson County |
| Transit Demand*: | 102,800 in Saline County / 9,400 in McPherson County |

CUTR Model

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|-----------------------------|--|
| Inputs: | Persons w/disabilities, in poverty, or elderly |
| Travel Need (Trips): | 604,731 in Saline County / 251,824 in McPherson County |
| Transit Demand*: | 235,240 in Saline County / 97,960 in McPherson County |

* Based on Florida data, assumes transit meets 39 percent of needed trips.

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