

ALTERNATIVE SAMPLING TECHNIQUES FOR NTD REPORTING

PROBLEM STATEMENT

As part of its National Transit Database (NTD) reporting guidelines for fixed-route bus services, the Federal Transit Administration (FTA) provides a set of sampling plans for estimating unlinked passenger trips (UPT) and passenger miles (PM). These sampling plans are published in FTA Circular C2710.1A (UMTA, 1988). The plans vary in the daily number of one-way bus trips sampled and the frequency of sampling (rows 3 and 4, Table 1). The most popular plan requires sampling 3 one-way bus trips every 2nd day with an annual sample of 549 trips. FTA requires that any sampling technique used for NTD reporting meet a confidence level of 95 percent and a precision level of ± 10 percent. However, even FTA's own sampling plans do not always yield these levels of confidence and precision. FTA's sampling plans may not minimize the sample size either for the specific conditions of any individual transit agency.

FTA also gives transit agencies the option of using alternative sampling techniques as long as they are developed and certified by a qualified statistician. Many transit agencies, however, do not exercise this option and still use FTA-approved plans to estimate either their UPTs or PMs, or both, either because they are not aware of the problems in using the FTA plans or because they are reluctant to take the necessary steps toward developing their own alternative sampling plans.

OBJECTIVES

The objectives of this project are to investigate alternative sampling techniques for NTD reporting and to develop a guide that transit agencies can use to customize sampling plans for their fixed-route bus services with ease.

FINDINGS AND CONCLUSIONS

Researchers produced an alternative approach to FTA's sampling methodology and included it in the developed guide. The information needed is annual days of service, daily system total one-way bus trips, and an existing NTD sample. Transit agencies only need to enter the required information in a pre-specified format in Excel templates provided with this guide, which is designed to allow transit agencies to transition easily from the FTA sampling plans to the customized sampling plans. The customized sampling plans retain the primary features of the original FTA sampling plans. The steps following the development of the customized sampling plans are identical to those following the FTA sampling plans. Guidance is provided for computing a few statistics on passenger miles and unlinked passenger trips from the existing NTD sample. These statistics include the relative variances in both quantities and their correlation. Users just enter their sample data on passenger miles and unlinked passenger trips in a pre-specified format in an Excel environment, and then follow steps detailed in the guide to compute the statistics (using existing Excel functions). An Excel file with a real NTD sample is attached to the guide to illustrate this computation.

The guide provides direction to transit agencies, which have or expect to have the 100-percent count of unlinked passenger trips, for determining sampling plans. Guidance is also provided for agencies

that do not have a 100-percent count. In either case, a template is included with the guide. Once the user enters a few data items (e.g., annual service days, daily system one-way bus trips, relative variances, correlation between passenger miles and unlinked passenger trips) in the template, the template automatically determines the sampling plans.

This guide complements “Sampling Procedures for Obtaining Fixed Route Bus Operating Data under the Section 15 Reporting System,” FTA Circular C2710.1A. Essentially, a transit agency (1) replaces the table of sampling plans in Table II-1 in the Circular with those it develops using the guide, (2) selects one of the new plans that best meet its staffing needs, and (3) follows the procedures in the Circular on sampling and collecting field data.

BENEFITS

By minimizing the sample size while meeting FTA’s confidence and precision levels, the customized sampling plans represent more reliable and cost-effective alternatives to the FTA sampling plans. The benefits of this guide to an individual agency will depend on whether the agency has a 100% count of its unlinked passenger trips. If it does not, the sampling plans developed would yield FTA required accuracy and might even reduce the agency’s sample size. If an agency has a 100% count, it should report it to the NTD and estimate total passenger miles by multiplying it by the average passenger trip length derived from their NTD sample. The sampling plans developed under such circumstances can significantly reduce the sample size for most transit agencies.

Table 1 shows sample plans, developed using this guide, for HARTline in Tampa, Florida, under FY2002 conditions. If an agency with these conditions does not have the 100% count of unlinked passenger trips or chooses not to use the count to estimate the total passenger miles, it can cut the sample size by 50% if it chooses to sample every day (rows 5 & 6). At the same time, it will not meet FTA’s required accuracy if it samples less frequently than every 2nd day. Otherwise, it can significantly reduce the sample size for any frequency of sampling (rows 7 & 8). If it samples every 2nd day, for example, it only needs to sample 1 instead of 3 one-way bus trips.

Table 1. Example Sampling Plans based on FY2002 HARTline Conditions

		Row	Sample Size by Frequency of Sampling					
			Every Day	Every 2 nd Day	Every 3 rd Day	Every 4 th Day	Every 5 th Day	Every 6 th Day
FTA Approved Plans	Daily Trips	3	2	3	5	7	10	15
	Annual Sample	4	730	549	610	644	730	915
Without 100% Passenger Trips	Daily Trips	5	1	3	6	20	N/A	N/A
	Annual Sample	6	365	549	732	1840	N/A	N/A
With 100% Passenger Trips	Daily Trips	7	1	1	2	2	3	5
	Annual Sample	8	365	183	244	184	219	305

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