# Statistical estimation of traffic speed on Metro Roadways

## Introduction

Metro Nashville Public Works is in the process of establishing a long term Neighborhood Traffic Management Program. As part of this program it is necessary to establish a baseline speed for residential roadways. The purpose of this baseline is to compare a residential roadway requesting assistance to "the average Davidson County Residential Street" for speed purposes. All residential streets in Nashville have a standard speed limit of 30 MPH unless otherwise posted. The vast majority of the streets in this study have posted speed limits of 30 MPH, a very few have 25 MPH speed limits. No streets in this study have lower speed limits.

A request for proposal was submitted to a consultant, currently under contract studying aspects of Metro Neighborhood Traffic Management Program, to generate this baseline speed number with a 95% confidence interval given +- 1 MPH. The initial estimate placed the cost of this endeavor at $55,000.00. Based on this estimate a decision was made to complete this study in house to reduce the cost to Davidson County residents.

## Study Information

Sample populations were selected for roadways classified as Local Residential Streets; these roadways were not segregated by any other criteria; as other variables would increase the variation of the sample and increase the number (n) of samples necessary. Areas were not broken out; this was a random grouping in which street names were not included after the initial sorting into classifications of arterial, collector, and residential. These road types were separated to be handled independently. The sample distribution of each of the road types is expected to assume the behavior of a normal distribution.

Statistics calculated from random samples or estimators were used to estimate the $85^{th}$ percentile speeds on residential roadways. These samples were taken from previous speed studies conducted in Davidson County over the past few years to reduce the costs and time necessary to obtain the required data.

## Statistical Background

When a random sample is taken it can be assumed that any statistical function calculated as a result of the sample data should also be considered a random variable. The underlying random experiment created by random sampling is selecting items from a population.

The formulas for the mean and standard deviation respectively can be applied to any set of numbers. If conclusions or predictions are to be drawn from such calculations, special attention must be paid to several items. When data is gathered from a random process or procedure developed for this purpose the data can be thought of as random sampling from a population as long as effort is made to ensure the data has not been selected rather than gathered. Knowledge of their probability distributions allows one to make predictions and inferences concerning the process. This data can then be used to calculate statistical factors, which can be used to estimate unknown population parameters.

**Findings**

A total of 135 sample data studies were used in this study. The below chart show the individual 85th percentile speeds along with the results of my calculations. We were able to achieve a confidence interval of 99% with a +- 1 MPH. The mean value of the 85th percentile speed in Davidson County is 35.75 MPH.

**Conclusion**

This study was very effective. We now have a good basis for providing the public with a critical piece of information; that being, what is the average speed on residential streets in Nashville. As the study proves the answer to that question is: "about 9 out of 10 drivers travel at or under 36 MPH on residential streets".

**85th % Speed Data for Residential Streets in Davidson County**

| 1 | 2 | 3 | | 4 | 5 | 6 | 7 | 8 | 9 | 10 |
|---|---|---|---|---|---|---|---|---|---|---|
| 39.90 | 38.00 | 38.30 | | 36.50 | 40.60 | 38.80 | 38.40 | 24.30 | 23.80 | 40.4 |
| 39.60 | 41.80 | 39.00 | | 25.50 | 35.10 | 39.20 | 37.50 | 34.30 | 26.80 | 39.5 |
| 36.80 | 42.30 | 33.20 | | 41.10 | 38.30 | 31.80 | 34.80 | 32.90 | 28.40 | 38.33 |
| 39.00 | 34.70 | 32.50 | | 40.50 | 45.30 | 37.20 | 34.60 | 30.60 | 35.90 | 35.6 |
| 44.20 | 35.80 | 31.60 | | 39.60 | 38.30 | 38.40 | 36.90 | 30.20 | 35.50 | 39.1 |
| 40.70 | 40.80 | 39.90 | | 41.00 | 34.90 | 35.40 | 37.60 | 29.40 | 33.00 | 38.7 |
| 42.30 | 39.00 | 44.00 | | 39.80 | 30.40 | 25.10 | 34.50 | 36.20 | 33.80 | 33.6 |
| 34.20 | 42.40 | 39.60 | | 34.60 | 29.80 | 38.10 | 36.60 | 35.60 | 33.60 | 37.7 |
| 32.70 | 39.40 | 43.50 | | 35.50 | 39.20 | 38.20 | 36.90 | 24.80 | 31.10 | 37.5 |
| 28.50 | 39.40 | 41.40 | | 42.50 | 37.60 | 27.60 | 30.10 | 27.60 | 28.70 | 36.6 |
| 37.4 | 33.00 | 25.90 | | 33.50 | 33.80 | 31.60 | 31.30 | 27.90 | 34 | 33.6 |
| 34 | 28.60 | 25.20 | | 31.70 | 33.30 | 29.50 | 31.10 | 40 | 41.7 | 34 |
| 37.4 | 39.8 | 38.7 | # | 37.5 | 33.6 | 44.6 | 38.2 | 34.4 | 39.4 | 37.7 |
| 42.3 | 42.5 | 30.9 | | 39.1 | 37.4 | | | | | |

Data listed showes individual sample speeds

n = 135
Sigma = 4.37
D.F. = 134 (aprox = inf.)
B = 1 M.P.H

X BAR = 35.75 M.P.H
99% Conf +- 1 M.P.H