

Statistical road safety: 18th century math, 21st century road safety

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What possible connection could there be between an eighteenth century British Presbyterian minister and preventing road traffic accidents in Hartford, Connecticut. Everything, according to a report in the *International Journal of Intelligent Systems Technologies and Applications*.

Thomas Bayes (1702-1761) was not only a church minister but also the mathematician who formulated a probability theorem that can be used to solve problems that stymie conventional statistics. The crux of his theorem can be stated as follows:

"The probability of any event is the ratio between the value at which an expectation depending on the happening of the event ought to be computed, and the value of the thing expected upon its happening."

This inverse probability, which hinges not only on the concept of "heads-or-tails", but on expectations has been used previously to develop powerful email spam filters, to improve medical diagnostics, and most recently to improve road safety in Hartford.

Clara Fang at the Department of Civil Engineering, University of Hartford, and colleagues Joseph Rimiller and Najib Habesch of Urban Engineers, Inc, also in Hartford, explain how Hartford was the first US city to develop and implement a comprehensive citywide traffic calming masterplan. Included in the plan were the building of mini-roundabouts, curb extensions, speed tables, parking chicanes, bicycle lanes and the implementation of "road diets" in which excess lanes were eliminated

from particular streets.

The team has now analyzed the before and after crash data for the traffic calming devices to determine which were most effective in reducing accidents.

Rather than using conventional data analysis to look at the before and after statistics, the team used an empirical Bayesian method. This allowed them to predict the expected crash rate at specific sites around the city assuming that no safety and traffic-calming measures had been put in place. Study site crash rates with and without treatment for the same time period were compared. They then also compared this with a conventional analysis to weed out any analytical biases.

Their analysis revealed that all implemented safety features led to fewer crashes, but also that the higher the "before" crash rate and the greater the traffic demands, the greater the reduction. In other words, those sites that had few crashes before, also had few crashes after. However, there were significant reductions in crash rates on three streets, Franklin, Main and Wethersfield, which the team explains was due significantly to the reduction in speed on these roads achieved by putting them on a road diet.

"Speeds at the study sites were reduced by up to six miles per hour, with an average reduction of three to four miles per hour," the team explains, "The road diets also prevented aggressive drivers from passing more prudent drivers, thus, eliminating one potential source of conflict."

It would seem that a seventeenth century clergyman has plenty to say about solving a twenty-first century problem.

More information: "A simplified Empirical Bayesian method to safety evaluation of traffic calming treatment for urban road systems" in *Int. J.*

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