Abstract

A frame coverage problem is addressed, one that is urgent in a road traffic survey conducted annually by the Swedish National Road Administration. The main objective of the survey is to estimate the average vehicle speed for the Swedish urban road network. The road network is viewed as partitioned into one-meter road sites, which represent the population elements. A three-stage sampling design is employed, where the primary sampling units are population centers and the secondary sampling units are small areas. For each selected small area, a frame of the road network is used. The frame units are road links, and the frame contains information on the length of each link. From the frame, one road site is randomly selected for observation.

When the frames of road links were constructed, the link lengths were determined manually from maps. Hence, the lengths may be subject to measurement errors. If a road link is shorter in the frame than in reality, this corresponds to an undercoverage of target elements, and correspondingly, if a frame link is too long, the frame suffers from overcoverage. By use of a simple error model, we examine the impact of erroneous frame link lengths on the bias and variance of the estimator of average speed. In our model, the total frame road length for a small area is viewed as a function of the true length and a random error. Data from an empirical study of the errors in the frame are used to evaluate the model and estimate the error parameters. Our results suggest that the length error does not imply bias, or any variance increase to speak of, in the estimator.

The length problem may be more generally formulated as that of using incorrect inclusion probabilities in survey sampling. The thesis includes an investigation of the general consequences of such a procedure.

Key words: Survey, master frame, vehicle speeds, frame errors, error model, erroneous inclusion probabilities.

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