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Nonresponse analysis and adjustment in a mail survey on car accidents

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ABSTRACT

Statistical accident data plays an important role for traffic safety development involving the road system, vehicle design, and driver education. Vehicle manufacturers use data from accident mail surveys as an integral part of the product development process. Low response rates has, however, lead to concerns on whether estimates from a mail survey can be trusted as a source for making strategic decisions.

The main objective of this paper was to investigate nonresponse bias in a mail survey addressing driver behaviour in accident situations. Insurance data, available for both respondents and nonrespondents were used to analyze, as well as adjust for nonresponse. Response propensity was investigated by using descriptive statistics and logistic regression analyses. The survey data was then weighted by using inverse propensity weights. Two specific examples of survey estimates are addressed, namely driver vigilance and driver's distraction just before the accident. The results from this paper reveal that driver age and accident type were the most influential variables for nonresponse weighting. Driver gender and size of town where the driver resides also had some influence, but not for all survey variables investigated.

The main conclusion of this paper is that nonresponse weighting can increase confidence in accident data collected by a mail survey, especially when response rates are low. Weighting has a moderate influence on this survey, but a larger influence may be expected if applied on a more diverse driver population. The development of auxiliary data collection can further improve accident mail survey methodology in future.

1. Introduction

1.1. Background, objectives and research questions

Statistical accident data plays an important role for traffic safety development and has three main applications in road safety development: (1) making priorities bases on how frequently different safety issues occur and the consequences of when they occur, (2) making effect analysis of safety improvements that are yet to be implemented, and (3) verifying real world performance measured by the change in number of accidents or personal injuries once changes are implemented in real traffic (Isaksson-Hellman and Norin, 2005; Vaa et al., 2007). During the last few decades, real world accident data has formed an important part of traffic safety development around the world. Based on this data, improvements have been made to infrastructure, vehicles, and driver education. Accident data collected by mail surveys and in-depth investigations have successfully been used within the Swedish vehicle industry since the early 1970s as a part of the product development process, which has since substantially reduced the amount of personal injuries (Isaksson-Hellman and Norin, 2005). Accident data is a driving force in vehicle product development and guides strategic priorities, requirements and physical or virtual verification methods. Historically, vehicle safety development has mainly been concerned with injury prevention during collisions. In more recent years, product development has been directed towards driver behaviour and accident causation as well. In addition, low response rates has lead to concerns on whether estimates from a mail survey can be trusted as a source for making strategic decisions. This brings on new methodological challenges when collecting statistical accident data by using a questionnaire.

Analysis and compensation for nonresponse bias is a well established part of mail surveys in general. However, when using mail surveys to collect statistical accident data, nonresponse analysis is commonly not included as an integral part of the analysis. Sagberg (1999, 2001) presented an interesting study where accident data based on mail surveys was analyzed specifically for mobile phone use and tired drivers. Nonresponse analysis was not performed since background data for nonrespondents was not

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