



The range of replications technique for assessing the external validity of road safety evaluation studies

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ABSTRACT

This paper introduces a simple statistical technique that can be used to assess the external validity of road safety evaluation studies. External validity refers to the possibility of generalising the results of research to other contexts than those in which it was made. There are several aspects of external validity. Two aspects that are often of interest concern the applicability of the results of road safety evaluation studies across countries and time. Can the results of studies made in one or more countries be applied in countries where studies have not been made? Can the results of studies made many years ago still be applied? The technique introduced in this paper is designed to provide support in answering these questions. The technique evaluates the stability of research results in time and space. The technique is based on cumulative meta-analysis and produces statistics that show the consistency of study results in time and space (across countries). The range of replications denotes the span of time and countries in which studies have been made. The idea is that if the results of studies are stable throughout the range of replications, one may have greater confidence in their external validity than if the results of research vary in time and between countries. The technique is illustrated by means of numerical examples.

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1. Introduction

About 15 years ago, there were very few roundabouts in the United States. In Europe, Australia and New Zealand thousands of junctions had been converted to roundabouts and very favourable safety effects were reported. There was therefore an increasing interest in introducing roundabouts in the United States. However, since the safety effects of roundabouts had not been evaluated in the United States, there was doubt as to whether the results of foreign studies could be applied, i.e. whether the findings of these studies could be used to predict what the safety effects of roundabouts would be in the United States (Hasson, 2010). A careful study of non-US experience was performed. It was decided to introduce roundabouts in the United States and evaluate their effects on safety. In the end, these effects turned out to be even more favourable than those reported in other countries (Rodegerdts et al., 2007).

For large countries, like the United States, it is not common that there are no national evaluation studies of the effects of a road safety measure. In smaller countries, however, it is often not feasible to perform evaluation studies of every road safety measure. The question then becomes whether one can rely on studies made

in other countries. More generally, the question is whether it is possible to assess objectively whether the findings of road safety evaluation studies can be generalised in time and space, e.g. from one country to another or from one decade to another? This question refers to the external validity of road safety evaluation studies. External validity denotes the possibility of generalising the results of research to other contexts than those in which it was made. Context may be defined in terms of, for example, the year and country where a study was made. Can the external validity of road safety evaluation studies be assessed objectively?

The objective of this paper is to introduce a simple statistical technique for assessing the external validity of road safety evaluation studies. The technique can be used to calculate statistics showing the consistency in time and space of the results of studies that have evaluated the effects of road safety measures. The technique is “objective” in the sense that the statistics estimated do not depend on decisions made by the analyst and are based on data that are easily reproduced. Informal assessments of external validity, made without the support of a statistical technique, are likely to be influenced by subjective judgements regarding, for example, the “similarity” of countries. It is clearly not possible to demonstrate external validity statistically. Generalising research to a new context is a non-statistical generalisation. It therefore cannot rely on any statistical indicator exclusively, but will always contain an element of judgement. It is, however, possible to develop numerical indicators that may help support the assessment of external

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