Benchmarking road safety performance by grouping local territories: A study in the Netherlands

L.T. Aarts *, S. Houwing

SWOV Institute for Road Safety Research, PO Box 1090, 2260 BB Leidschendam, The Netherlands

ABSTRACT

The method of benchmarking provides an opportunity to learn from better performing territories to improve the effectiveness and efficiency of activities in a particular field of interest. Such a field of interest could be road safety. Road safety benchmarking can include several indicators, ranging from performance indicated by crash statistics, to indicators that also account for consequences in costs or the underlying state of the road safety system and relevant organisation and processes at actor level. The structure and culture of a territory is identified as a basic context of road safety performance. This is regarded as important information to use in grouping of territories to get more homogenous or equal and comparable conditions to learn from 'the best in class'.

The main aim of this study is to assess the usability of different groupings using the physical structure for benchmarking road safety performance at local territorial level. A traditional grouping of municipalities in the Netherlands was compared with a simple grouping of these municipalities based on their level of urbanisation and an advanced grouping in which more indicators such as differences in demography, growth and road structure were taken into account. As in other studies, urbanisation showed to be the most predominant structural factor for grouping local territories and related to differences in road safety performance. However, if information would be needed for specific target groups, other factors like age and gender distribution or the distribution of the road network can provide valuable additional insight and better homogenous starting points for benchmarking. Especially benchmarking of rural territories may profit from such extra distinctive characteristics.

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1. Introduction

Road safety is an important health issue. More than one million people die each year on the world's roads, and between 20 and 50 million sustain non-fatal injuries (WHO, 2013). In May 2011, the Decade of Action for Road Safety 2011–2020 was launched in more than 100 countries, with one goal: to prevent five million road traffic deaths globally by 2020 (WHO, 2013). To achieve this goal, many countries have taken measures towards improving road safety, such as increased enforcement, safer road infrastructure, and new legislation.

To decrease the number of traffic crashes in an efficient way, structured knowledge is needed of the influence of the components of the road traffic system on road crashes.

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* Corresponding author. Tel.: +31 70 317 33 79.
  E-mail addresses: Letty.Aarts@SWOV.NL (L.T. Aarts), Sjoerd.Houwing@SWOV.NL (S. Houwing).
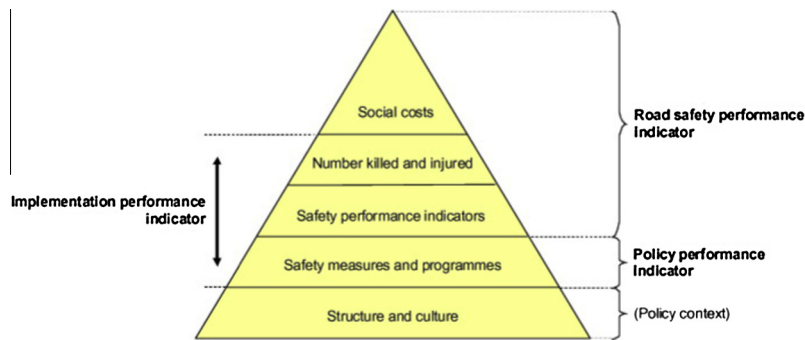
Fig. 1. Road safety piramid. (LTSA, 2000; Koornstra et al., 2002).

Fig. 1 shows a model of the hypothesised relationships between the components of the road safety system and road crashes, which is visualised by layers of a road safety pyramid (Koornstra et al., 2002; LTSA, 2000). Each layer can be regarded as a result of its lower layer(s). This safety pyramid can be used to understand how road safety performance can be improved. One way to do this is by benchmarking territories (e.g. Bax et al., 2012; Eksler, 2010; Hermans et al., 2009; Wegman et al., 2008; Wegman and Oppe, 2010).

The basic idea behind benchmarking is that it provides an opportunity to learn from 'the best in class'. Wegman and Oppe (2010) state that benchmarking can be done by using indicators at different levels of the road safety pyramid: (a) road safety performance (outcome), (b) implementation performance (a process indicator) and (c) policy performance. In all these performance indicators, the structure and culture layer has to be regarded as a background layer. Fair benchmarking of territories is better possible if these background characteristics are taken into account. Wegman and Oppe (2010) state that ''*differences in structure and culture between countries not only have an effect on the size and nature of road safety problems, but they also influence the possibilities to reduce the problem effectively and efficiently*'' (p. 1208). Background characteristics can be taken into account by:

- normalising performance in each territory (e.g. correcting performance by exposure measures), or by
- grouping territories that are comparable on background factors and thus can form a more or less homogenous benchmarking group.

Wegman and Oppe (2010) are in favour of grouping, as territories with similar backgrounds would be more motivated to learn from each other. They studied how European countries could be grouped, using three methods: (a) expert grouping, (b) grouping of road safety level and improvement in road safety using a feature extraction method and (c) grouping based on multiple characteristics of which data was available: seatbelt use, mountainous areas, winter and summer temperature, part of the population with at least secondary education, latitude, main religion, literacy, population density and, gross domestic product. Latitude and population density showed to be important grouping features. Furthermore, the researchers concluded that there were 'many points of agreement' between the different groupings and that grouping did not cause large problems. They however also concluded that a carefull selection of variables is needed.

As in the study of Wegman and Oppe (2010), traditionally, comparisons of road safety are made at national territorial level (Eksler, 2010; Jacobs et al., 2000). According to Eksler (2010) and Eksler and Lassarre (2008), benchmarking at sub-national level can provide interesting new opportunities to improve road safety performance. In a previous study, Eksler (2009) showed that 60% of the variance in road mortality between territorial areas was related to differences at the local level.

Eksler (2010), however, also mentions a number of issues have to be taken into account when comparing road safety performance at sub-national level. First of all, because of the low numbers in road deaths, killed and seriously injured (KSI) should be used to get significant results. Secondly, he advises to use relative rates, as rates may largely depend on the constellation within a territory. In his studies directed at sub-national comparisons (see Eksler, 2010; Eksler and Lassarre, 2008; Eksler et al., 2008), he uses Bayesian statistics, also taking spatial and temporal interdependencies between adjacent territories into account. Population density or urbanisation has been found to be of major importance in relation to territorial differences, but from Eksler's studies appears that also other factors are relevant (e.g. Eksler, 2009 and Eksler et al., 2008).

1.1. Structure and culture indicators relevant for road safety

The influence of structure and culture on differences in road safety performance of territories can be described either by an effect on safety risk or by an effect on the amount of exposure to risks. Eksler (2009) classifies three types of structure and culture factors: 'physical structure', 'operational structure', and 'culture'. 'Culture' is related to attitudes, values and norms within a territory, whereas 'operational structures' are aimed at the organisation or the arrangements between potential actors in road safety policy. 'Physical structure' factors can either be static or dynamic. This means that the outcome of