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Road safety comparisons with international data on seriously injured

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ABSTRACT

Reducing the number of fatalities is a key objective of road safety policy. As road safety improvements in Europe have decreased the number of fatalities, more focus has been directed to seriously injured. The aim of this study is to compare the different definitions of and international data on seriously injured, combine this data with fatality data and investigate the results and the conclusions for road safety policy. Particularly, a combined indicator of killed and seriously injured (KSI) is used in analysis. For comparing the amount of seriously injured in different countries, the definition recommended by the European Commission, the Maximum Abbreviated Injury Scale (MAIS) level 3+ was adapted. Based on the comparisons the use of a KSI indicator is recommended as it widens overall awareness of road safety performance. When analysing the amount of seriously injured and KSI, the results highlight bicycle, moped and motorcycle users compared to fatalities as an indicator. As sustainable mobility and urbanisation shape the future transport systems and increase the importance of cycling, adopting KSI indicator is increasingly important, but further research is needed to identify the best practices and define guidelines for gathering, reporting and analysing international data on seriously injured.

1. Introduction

Road safety strategies typically emphasise reducing fatal accidents and fatalities. The number of road fatalities is the most important road safety performance indicator worldwide (European Commission, 2013; OECD, 2011). However non-fatal injuries, especially serious injuries, cause also considerable impacts on public health and economic costs for society (OECD, 2008; Bambach and Mitchell, 2015). Road safety policies have been traditionally developed to decrease fatalities, but more actions are required for effective prevention of serious injuries (Breen et al., 2017). There are typically some deficiencies in injury statistics, which presents a challenge for monitoring the situation and setting targets. The number of fatalities is usually the most reliable indicator concerning the severity of accidents (Elvik and Mysen, 1999; OECD, 2011). Recent recommendations on accident statistics, especially concerning serious injuries aim to create a more detailed understanding of the current road safety performance in different countries (European Commission, 2013; OECD, 2011).

The concepts of safe system, Vision Zero and Sustainable Safety aim at eliminating fatalities and serious injuries in road traffic (OECD, 2008; Tingvall and Haworth, 1999). These concepts have been widely adopted in national policies in e.g. Sweden, the Netherlands, Norway and Finland (OECD, 2016). As Vision Zero is a long-term vision, there is also a need for shorter-term targets and measures (OECD, 2008). E.g., European Union's (EU) goal to reduce road fatalities by 50% in ten years by 2020 is one step towards the road safety vision, but target for seriously injured is also called for (European Commission, 2010; European Commission, 2015a). In 2017, transport ministers of the EU member states undertook to set a target for seriously injured, i.e. halving serious injuries in the EU by 2030 from the 2020 baseline (Valletta Declaration on Road Safety, 2017).

The long term trend in the number of road fatalities in the EU is looking positive, but there has been a stagnation during 2013–2016 (CARE, 2018). The amount of serious injuries is still somewhat unclear because of statistics' heterogeneity (CARE, 2018; ETSC, 2016). European road safety stakeholders have had a common interest to develop serious injury data and its comparability (Papadimitriou and Yannis, 2014). In 2017, transport ministers of the EU member states undertook to report reliable and comparable data by using a common definition by 2018 (Valletta Declaration on Road Safety, 2017). Despite the comparability problems, the European Commission (2017) estimates that 135 000 people are seriously injured on EU roads.

Most studies on seriously injured in road traffic have focused on certain features of the accidents, e.g. age groups, pedestrians or roundabouts (De Brabander and Vereeck, 2007; Fredriksson et al., 2010; Newgard, 2008; Weiss et al., 2014). Most of the country comparisons

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concerning road safety performance discuss fatalities (e.g. Hermans et al., 2009; Page, 2001; Shen et al., 2012). Eksler (2010) stated that road safety performance should be described by the amount of killed or seriously injured, KSI, when the amount of fatalities is small. In recent years, the KSI indicator has increasingly been applied in road safety studies (Aarts and Houwing, 2015; Høye, 2016; Thompson et al., 2013; Nishimoto et al., 2017). Shen et al. (2014) and Kukic et al. (2016) used the KSI indicator to compare road safety performance in European countries and found changes in countries' rankings when the number of seriously injured was added up with fatalities. Tingvall et al. (2013) compared different definitions of seriously injured but did not consider KSI. By now, however, different definitions of seriously injured and their suitability from KSI point of view have not been analysed.

This study aims to compare the different definitions of and international data on seriously injured, combine this data with fatality data and investigate the results and the conclusions for road safety policy. In order to compare and combine the data, the following questions are analysed in three EU member states, i.e. in Sweden, the Netherlands and Finland:

- How and what data on seriously injured is reported?
- How is the data collection method affecting the results, i.e. how many seriously injured are there and in which road user groups?
- How is the outlook on road safety changing when the data on seriously injured is combined with data on fatalities to killed or seriously injured, KSI?

Sweden and the Netherlands are selected as countries for comparison as these are among the best performing countries in road safety and their injury statistics involving serious injuries are also advanced (Hermans et al., 2009; OECD, 2016). Compared to Sweden and the Netherlands, Finland is closer to the EU average in terms of road fatalities per population (OECD, 2016). Finland started its statistical procedure to published data on seriously injured late compared to many other EU countries and the first official annual data was released for year 2014. The three countries have dissimilar definitions for the official amount of seriously injured. From these points of view, it is interesting to see what can be learnt from the country comparisons.

The study is carried out by analysing accident data supported by a literature study. This paper compares the different definitions of seriously injured and their outcomes and describes the characteristics of seriously injured according to different definitions in the three analysed countries. Furthermore, the use of KSI indicator is presented and its additional value compared to using data solely on fatalities is discussed.

2. The value and use of data on seriously injured in road traffic

Road fatalities enable only limited view to road safety situation. Underestimation and biased information of road safety problems are challenges when analysis cover solely fatalities (Shen et al., 2014). Scarcity of fatal accidents even emphasise these challenges. Eksler (2010) stated that in analysis at the local level the relative change in amount of fatalities needs to be enormous in order to achieve a statistically significant change. Therefore local and international road safety comparisons should include seriously injured as well as fatalities (Eksler, 2010; Shen et al., 2014). According to Shen et al. (2014) and Kukic et al. (2016) countries that were best-performing in the country comparison of fatalities had a lower ranking when fatalities and seriously injured were combined.

As a safety performance indicator killed or seriously injured (KSI) takes into account the two most severe accident outcomes, it enables analysing safety situation more precisely. KSI is used for instance in Norway at national level, in the United Kingdom at local level and in city of Stockholm, Sweden to guide road safety actions (Department for Transport, 2011; Institute of Transport Economics, 2014; Norwegian Public Roads Administration, 2014). As a consequence of Vision Zero adopted nationally, road safety target in Norway is to decrease the number of killed or seriously injured. The amount of KSI should be no more than 500 in 2024 (Norwegian Public Roads Administration, 2014). KSI as a target or an indicator proposes that a death and a serious injury are equivalent from the perspective of road safety. This can be reasoned by e.g. the slight difference between these severities - a serious injury could have turned fatal if some minor detail would have altered and vice versa. Because of the inconstancies between these severities, the indicators of road safety performance should include seriously injured as well as fatalities.

Another reason for developing indicators that include also injuries is the remarkable human suffering and public health impact resulting from injuries (WHO, 2015). Serious injuries also cause enormous costs for society (Methorst et al., 2016). For instance, lifelong injuries for young people affect long-term tax losses and treatment costs. In Finland, the costs of accidents with serious injuries (MAIS 3+) were 412 million euros while costs of fatal accidents were 634 million euros in 2014 (Tervonen, 2016). The costs of accidents with serious injuries are actually higher because the official injury statistics based on police records does not include all accidents where outcomes are serious. In the Netherlands, the costs from accidents with serious injuries (5.2 billion euros) were almost three times the cost of fatal accidents (1.9 billion euros) in 2011 (OECD, 2016). This is partly due to the fact that in the Netherlands the definition of serious injuries (MAIS 2+) includes a larger share of injuries compared to Finland.

3. Data and methods

3.1. Definitions of road fatalities and seriously injured

The definition of a road fatality, death as a consequence of and within 30 days after a crash, is widely used and enables comparability between different countries (OECD, 2011). However, in Sweden the official amount of fatalities excludes suicides since 2010 (Trafikanalys, 2016). For proper comparison in this study, suicides are included in the annual fatality numbers of Sweden. Unlike for fatalities, there is not a common definition for seriously injured even though recent policy actions aimed at adopting one (European Commission, 2013; OECD, 2011; Valletta Declaration on Road Safety, 2017).

There has been a vast range of definitions of injury severity in the EU countries. Criteria for severity has been based e.g. on length of hospitalisation, type and level of injury, the inability to work, the length of recovery or long-term disability caused by the accident (European Commission, 2015b). In 2012, the high level group on road safety proposed a common definition for serious injuries in EU member states in order to standardize procedures and to make data from different countries comparable. Based on the proposition European Commission recommended a definition of Maximum Abbreviated Injury Scale (MAIS) for commissioning in the member states (European Commission, 2013.). Impairment of an injured person is given a score from one to six on Abbreviated Injury Scale (AIS) and in the case of multiple impairments, the most severe impairment determines the total severity of injury (OECD, 2011). Score of MAIS three or more (MAIS 3+) is classified as serious injury. The most recommended way to apply the new definition is to create a link between hospital and police data (European Commission, 2013). European Commission (2013) also proposed other possibilities to gather the amount of seriously injured including the use of coefficients in police data or to use only hospital data. These methods are not as advisable as linking police and hospital data but they can act as first steps towards a proper injury statistics strategy. There are some difficulties of using the common definition in some member states. Based on European Commission (2016) and European Transport Safety Council (ETSC, 2016), 12 European countries including Austria, Czech Republic, England, France, Germany, Italy, the Netherlands, Poland, Portugal, Spain, Sweden and Finland have published serious injury data on MAIS 3+.

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