



Social costs of road crashes: An international analysis



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ABSTRACT

This paper provides an international overview of the most recent estimates of the social costs of road crashes: total costs, value per casualty and breakdown in cost components. The analysis is based on publications about the national costs of road crashes of 17 countries, of which ten high income countries (HICs) and seven low and middle income countries (LMICs). Costs are expressed as a proportion of the gross domestic product (GDP). Differences between countries are described and explained. These are partly a consequence of differences in the road safety level, but there are also methodological explanations. Countries may or may not correct for underreporting of road crashes, they may or may not use the internationally recommended willingness to pay (WTP)-method for estimating human costs, and there are methodological differences regarding the calculation of some other cost components.

The analysis shows that the social costs of road crashes in HICs range from 0.5% to 6.0% of the GDP with an average of 2.7%. Excluding countries that do not use a WTP- method for estimating human costs and countries that do not correct for underreporting, results in average costs of 3.3% of GDP. For LMICs that do correct for underreporting the share in GDP ranges from 1.1% to 2.9%. However, none of the LMICs included has performed a WTP study of the human costs.

A major part of the costs is related to injuries: an average share of 50% for both HICs and LMICs. The average share of fatalities in the costs is 23% and 30% respectively. Prevention of injuries is thus important to bring down the socio-economic burden of road crashes.

The paper shows that there are methodological differences between countries regarding cost components that are taken into account and regarding the methods used to estimate specific cost components. In order to be able to make sound comparisons of the costs of road crashes across countries, (further) harmonization of cost studies is recommended. This can be achieved by updating and improving international guidelines and applying them in future cost studies. The information regarding some cost components, particularly human costs and property damage, is poor and more research into these cost components is recommended.

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1. Introduction

Information about the social costs of road crashes is important for evidence-based policy making. It provides insight into the consequences of road crashes for the economy and social welfare. The high socio-economic burden of road crashes is often stressed

in (policy) documents of international organizations such as the World Health Organization (WHO, 2015), World Bank (2013) and European Commission (EC, 2010), as well as in documents on the national level, to emphasize the need to improve road safety also from an economic point of view. Information about the costs is also useful for comparing costs of road crashes with costs in other policy areas, as an input for priority setting across policy areas. Furthermore, information about costs of road crashes is needed in cost-benefit analyses (CBA) that are used to estimate the social return of investments in road infrastructure and road safety, and to help prioritizing (road safety) measures. In CBA the costs per casualty or crash are used to estimate the benefits of road safety

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Table 1
Overview of the countries included in this review: GDP per capita, motorization rate, year for which costs of road crashes have been estimated and references used.

Country	Country characteristics		Cost studies	
	GDP/capita (2013, US\$ PPP)*	Motorvehicles per 1000 people (2010)**	Year	Sources
<i>HICs</i>				
Australia	43,544	698	2006	BITRE (2009)
Austria	45,493	578	2011	Sedlacek et al. (2012)
Belgium	41,663	559	2002	de Brabander and Vereeck (2005), de Brabander (2005)
Germany	44,469	572	2005	Baum et al. (2007)
Netherlands	46,298	527	2009	de Wit and Methorst (2012), Wijnen (2012)
New Zealand	34,826	712	2012	Ministry of Transport (2006, 2013)
Singapore	78,763	149	2001	ADB (2005g)
Switzerland	56,565	566	2003	Sommer et al. (2007), ECOPLAN (2002)
UK	38,452	518	2012	DfT (2013), McMahon (1994), Hopkin and O'Reilly (1993)
US	53,042	782	2010	Blincoe et al. (2014), Trottenberg and Rivkin (2013)
<i>LMICs</i>				
Cambodia	3041	21	2002	ADB (2005b)
Indonesia	9561	66	2002	ADB (2005c)
Lao PDR	4822	22	2003	ADB (2005d)
Myanmar		7	2003	ADB (2005e)
Philippines	6536	30	2002	ADB (2005f)
Thailand	14,394	160	2002	ADB (2005h)
Vietnam	5294	14	2003	ADB (2005i)

* Source: World Bank (2015); not available for Myanmar.

** Source: World Bank (2015); Cambodia 2005 data, Lao PDR and Vietnam 2007 data.

improvements and compare these with the costs of the safety measure and with other benefits of e.g. infrastructure improvements.

International comparison of the costs of road crashes is useful to gain insight in differences in the economic burden of road crashes across countries, and is used as an input for estimating global road crash costs. Based on international comparisons, the social costs of road crashes have previously been estimated at about 1% of Gross Domestic Product (GDP) in low income countries to about 2%–3% in high income countries (Jacobs et al., 2000; Elvik, 2000). However, these estimates are based on costs studies in the 90s or earlier, and probably underestimate the costs of road crashes (WHO, 2004). Some other international comparisons (e.g. Elvik 1995; Trawén et al., 2002; Hakkert and Wesemann, 2005) are aimed at comparing the costs per fatality or per serious injury, which is useful for CBAs but which does not provide insight into the national social costs of road crashes including costs of minor injuries and property damage only crashes (Tay, 2002). Further, comparing the methods used to estimate these costs is very useful, since previous studies (Elvik, 1995; Trawén et al., 2002) show that methodological differences are an important explanation for differences in cost estimates.

The aim of this paper is to provide an international overview of the costs of road crashes and to describe (differences in) the methodologies. The most recent cost estimates in 17 countries are analyzed. In Section 2 the method used for this international comparison and the selection of countries is described. Section 3 provides an overview of the costs components that are taken into account in cost studies in these countries, and discusses the methods used to estimate these costs. In Section 4 the results of costs studies of 17 countries are compared, in particular the total costs of road crashes and the share in GDP, values per casualty, distribution of the total costs among crash severity and the breakdown in cost components. Section 5 contains a discussion of the main results and Section 6 gives conclusions and recommendations.

2. Method and selection of countries

The international comparison of the costs of road crashes in this paper is based on the most recent publications about these costs in specific countries. Only countries for which a sufficiently

detailed report or paper is available about the costs and the methods used to estimate these costs, written in English, German or Dutch, are included. This resulted in a selection of 17 countries, of which eight Asian countries, six European countries, Australia, New Zealand and the US. The costs of road crashes in the Asian countries, most of which are low or middle income countries, have been studied in the context of a larger study by the Asian Development Bank (ADB, 2005a). For each Asian country the costs of road crashes have been studied and published separately, enabling us to include these countries in this overview. Among the selected countries are ten high income countries, five middle income countries and two low income countries. Table 1 shows the countries that are included, the income level (GDP per capita) in these countries, motorization rate, the year for which the costs of road crashes have been estimated, and the reference(s) for each country.

Previous studies (Jacobs et al., 2000) found that the costs of road crashes as a share of GDP depend on national income per capita. Therefore, in this analysis the costs of road crashes in high income countries (HICs) will be compared to those in low and middle income countries (LMICs). Table 1 shows to which income category each country belongs, as classified by the World Bank on the basis of gross national income per capita.

3. Methods

3.1. Cost components

In international guidelines (Alfaro et al., 1994; BRS and TRL, 2003) five components of the costs of road crashes are distinguished:

- medical costs: costs resulting from the treatment of casualties, e.g. costs of hospital stay, rehabilitation, medicines and adaptations and appliances for the handicapped;
- production loss: loss of production and income resulting from the temporary or permanent disability of the injured, and the complete loss of production of fatalities; gross production loss includes consumption loss (see Section 3.2).
- human costs: immaterial costs through suffering, pain, sorrow and loss of life or of quality of life;
- property damage: damage to vehicles, freights, roads and fixed roadside objects;

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