



Proposal for territorial distribution of the 2010 EU road safety target

A. Tolón-Becerra^{a,*}, X. Lastra-Bravo^b, F. Bienvenido-Bárcena^c

^a University of Almería, Area of Engineering Projects, Ctra Sacramento s/n, La Cañada de San Urbano, 04120 Almería, Spain

^b University of Almería, Area of Engineering Projects, Junta de Andalucía Scholarship, Spain

^c University of Almería, Dept. of Computer Science, Spain

ARTICLE INFO

Article history:

Received 18 November 2008

Received in revised form 19 May 2009

Accepted 8 June 2009

Keywords:

Road mortality

Quantitative road safety target

EU transport policy

International comparisons

Europe

Spain

ABSTRACT

European Union (EU) road safety policies include reduction in road fatalities by 50% during 2000–2010. The original territorial distribution of this target is uniform, as all the territories have to halve the number of fatalities regardless of their previous record.

We propose a simple method of distributing the total effort required to reach the EU target of halving fatalities in a territory in such a way that those areas with a higher proportion of fatalities (relative to their populations) have the highest targets and the sum of all of the areas is the 50% reduction. The distribution function we use here is based on an inverse logarithmic function selected from among several alternative functions analyzed in an initial study. This use of weighted distribution functions has been applied since 2000 by the EU in other policies, such as the use of renewable energies.

We applied the proposed distribution function to two territorial aggregation levels in the EUROSTAT Nomenclature of Territorial Units for Statistics (NUTS): NUTS0 for EU-15 and EU-25 Member States, and NUTS3 for the 50 Spanish provinces, comparing the new and old targets with the real achievements for the 2000–2006 period, and new and old targets for the 2000–2010 period.

This is a simple proposal for modification of target distribution that can be further improved using other parameters, such as road or weather conditions.

© 2009 Elsevier Ltd. All rights reserved.

1. Introduction

1.1. Road mortality

Road accidents constitute a major public health problem worldwide, causing around 1.2 million deaths and over 50 million injuries each year. Around 16 000 people die every day as a result of injuries caused by accidents, representing 12% of mobility worldwide, which represent the third cause of overall mortality and the main cause of death in the age group 1–40 (WHO, 2004).

In the 25 Member States of the European Union (EU-25),¹ 52 536 people died in road accidents in 2000, and over 1 900 000 were injured, and the fatalities was 33 519 in 2006. It is the first cause of mortality in the population aged 14–25, and an estimated one in three people will be injured in a road accident in the course of their lives.

From 2003 to 2006 in Spain over 14 000 people died in road accidents while around 565 000 suffered injuries. The approximate cost per death was 1 000 000 Euros, and twice that amount for people suffering long-term injuries (DGT, 2007; AEC, 2007).

The vast majority of road accidents involve private traffic. This situation is not helped by the popular misconception that road accidents are isolated facts, rather than a social problem involving other economic, environmental, professional and emotional aspects (AEC, 2006).

Trawen et al. (2002) reported an increase of 6% per annum in the average cost per fatality in 11 developed countries, from US\$ 0.9 million in 1990 to US\$ 1.56 million in 1999. The EU estimated the direct cost of road accidents in 2000 at 45 000 million Euros. The indirect costs were three to four times higher, reaching a total of 160 000 million Euros, equivalent to 2% of the GNP of the 15-member European Union² (EU-15) (EC, 2001).

In short, road accidents constitute a serious public health problem requiring the political involvement of policy makers at regional and national levels, as well as of all the agents in the field of road safety (EC, 2001; WHO, 2004). The policies implemented must be

* Corresponding author. Tel.: +34 950015902; fax: +34 950015491.
E-mail addresses: atolon@ual.es (A. Tolón-Becerra), xlastra@ual.es

(X. Lastra-Bravo), fbienven@ual.es (F. Bienvenido-Bárcena).

¹ The member states of the European Union 25 (EU-25) are: Austria, Belgium, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Poland, Portugal, Slovakia, Slovenia, Spain, Sweden, and the United Kingdom.

² The member states of the former European Union 15 (EU-15) were Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, the Netherlands, Portugal, Spain, Sweden, and the United Kingdom.

effective, coordinated and sustainable measures, capable of achieving positive results in the reduction of road accidents and all the other aspects related to transport. Their performance and effectiveness should be assessed by comparisons between countries (Achterberg, 2006; Page, 2001; Richardson, 2005).

Despite the above, it is true that since the 1990s there has been a downturn in the number of accidents, fatalities and injuries on the road in Europe (CARE, 2008; EC, 2001). But further reduction is one of the biggest challenges in the field of the road safety. Important progress has been made in this field over the past 30–35 years, allowing us to develop and detect effective strategies to prevent collisions and injuries or reduce their number (Elvik, 2008a,b; WHO, 2004).

Road safety figures vary in both time and space. Variations in time have been the object of considerable study and analysis by researchers and policy makers. Despite the fact that most of the factors involved in road safety are linked to space, reducing the geographic scale in the spatial analysis of road accidents is an important tool for understanding regional differences and enabling us to focus on the measures to be implemented (Deboosere and Gadeyne, 2002; Eksler et al., 2008; Eksler and Lassarre, 2008; Hakim et al., 1991; Lassarre and Thomas, 2005).

1.2. Road mortality in Europe and in Spain in 2000

The analysis of road mortality in 2000 shows that the basic indicators are very heterogeneous, varying considerably among EU Member States, and even more so among Spanish provinces.

Of the 25 EU Member States, seven presented lower road mortality rates than the EU-25 mean. Malta, the United Kingdom, Sweden and the Netherlands stand out, with rates of 3.9, 6.1, 6.7 and 6.8 fatalities per 100 000 inhabitants, respectively. Analysing absolute values, countries with higher population and surface area (Germany, France, the United Kingdom, Italy, Spain and Poland) presented the highest numbers of fatalities.

However, Page (2001) established the elasticity of the population of these countries at 0.96, meaning that a 10% increase in population produces a 9.6% increase in the number of fatalities, as long as the remaining variables remain constant. Eksler et al. (2008) estimated the elasticity of the population density as -0.32 , that is to say a 10% increase in density means a 3.2% reduction in the number of fatalities.

Of the 50 Spanish provinces, Soria had by far the highest road mortality rate, with 84.7 deaths per 100 000 inhabitants. This is six times higher than the Spanish mean (14.4), while the remaining provinces varied between 7.5 and 37.3 fatalities. The effect of population can be observed in provinces with a low population such as Soria, Cuenca, Huesca, Burgos, Teruel and Zamora, which have a low absolute number of fatalities and a relatively high mortality rate. The opposite proves true for the most populated provinces like Madrid, Barcelona, Valencia, Sevilla or Vizcaya.

In the statistical analysis of the data, the mean and the standard deviation are the parameters that describe best and in the simplest way the variations of spatial data (Lassarre and Thomas, 2005). The differences between the means for the EU-15 and the EU-25 areas are not great, but they differ significantly in comparison to the average value for Spanish provinces. The standard deviation is greater when the number of regions (n) increases, and when the geographic scope is smaller, as in the Spanish provinces (Table 1).

1.3. Evolution of road mortality 2000–2006 in Europe and in Spain

Although the overall evolution of road mortality in the period 2000–2006 is quite irregular, the number of fatalities in most EU Member States follows a downward trend (Table 2). By 2006 the EU-

Table 1

Mean, standard deviation, minimum and maximum values of the mortality rate for NUTS^a regions in 2000.

Level	n	Population (hundred thousands)			Road fatalities		
		Avg.	Min.	Max.	Avg.	Min.	Max.
EU-25 states	25	180.85	3.80	821.64	2101.44	15	8079
EU-15 states	15	251.49	4.34	821.64	2733.93	76	8079
Spanish provinces	50	8.07	0.91	52.05	115.42	39	443

^a This analysis covers 25 and 15 EU Member States (NUTS0) and 50 Spanish provinces (NUTS3), and is geographically based on the EUROSTAT's NUTS 2003 regional classification (EUROSTAT, 2005).

25 Member States had achieved a reduction of 24.9% in the number of fatalities in comparison with 2000, with an average reduction per country of $22.3 \pm 15.95\%$. The EU-15 Member States had been more successful, achieving a reduction of 28.0% and a mean of $28.1 \pm 13.2\%$. While more than a third of the countries of the EU-25 had made significant progress, it should be noted that in some countries road mortality actually increased over this period.

The results for Spanish provinces over the period 2000–2006, shown in Table 3, present a more irregular evolution. Comparison of the road mortality data for 2000 and 2006 reveals heterogeneous results, ranging from a 68.8% decrease in Soria to a 13.8% increase in Huelva. The provinces of Huelva, Salamanca, Malaga, Almería and Cuenca increased or maintained their values of road mortality. The remaining provinces have made varying degrees of progress: in 9 provinces road mortality fell by less than 15%, in 15 provinces it fell by between 15% and 30%, in 14 provinces by 30–45%, and in 7 it fell by over 45%.

2. Desirable threshold and dynamic target values for the reduction of road mortality

In the field of road safety, quantitative targets represent the results that policy makers wish to achieve for a certain geographic area (group of countries, country, region, etc.) in a certain period

Table 2

Road mortality in the Member States of the EU-25 in the period 2000–2006. Index = 100 for year 2000.

	2000	2001	2002	2003	2004	2005	2006
EU-25	100	96.0	94.7	88.8	82.8	79.4	75.1
EU-15	100	97.2	94.1	87.4	79.6	76.5	72.0
Lithuania	100	110.1	108.7	110.6	117.3	118.6	118.4
Hungary	100	103.3	119.1	110.5	108.0	106.5	108.8
Estonia	100	97.6	109.3	80.4	83.3	82.8	100.0
Slovakia	100	97.8	97.1	102.7	96.0	89.2	92.2
United Kingdom	100	100.5	100.0	102.2	94.1	93.2	92.1
Ireland	100	98.6	90.0	80.6	89.5	95.5	88.0
Italy	100	100.6	101.4	91.2	85.6	87.5	85.3
Finland	100	109.3	104.8	95.7	94.7	95.7	84.9
Slovenia	100	88.8	85.9	77.3	87.5	82.4	83.7
Poland	100	87.9	92.6	89.6	90.8	86.5	83.3
Greece	100	92.3	80.2	78.8	82.0	81.4	81.4
Cyprus	100	88.3	84.7	87.4	105.4	91.9	77.5
Sweden	100	98.7	94.8	89.5	81.2	74.5	75.3
Austria	100	98.2	98.0	95.4	90.0	78.7	74.8
Belgium	100	101.1	88.8	82.6	79.1	74.1	72.7
Czech Republic	100	89.8	96.3	97.4	93.0	86.5	71.5
Spain	100	95.5	92.6	93.5	82.2	76.9	71.0
Germany	100	93.0	91.2	88.1	77.9	71.5	67.9
Netherlands	100	91.8	91.2	95.0	74.3	69.3	67.5
Malta	100	106.7	106.7	106.7	86.7	113.3	66.7
Latvia	100	87.9	88.0	83.8	81.3	69.6	64.1
Denmark	100	86.6	93.0	86.8	74.1	66.5	61.5
France	100	101.0	94.8	75.0	68.5	65.8	58.3
Portugal	100	89.0	88.2	82.2	68.9	66.4	51.6
Luxembourg	100	92.1	81.6	69.7	64.5	60.5	47.4

Download English Version:

<https://daneshyari.com/en/article/573370>

Download Persian Version:

<https://daneshyari.com/article/573370>

[Daneshyari.com](https://daneshyari.com)