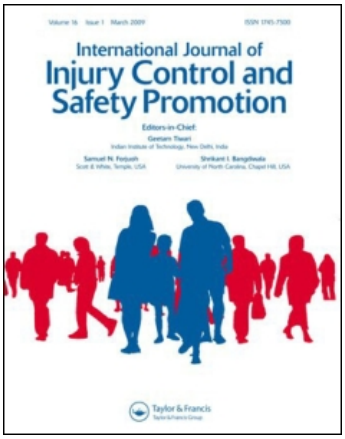

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National burden of road traffic injuries in Argentina

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National burden of road traffic injuries in Argentina

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More than 1.2 million people die and as many as 50 million people are injured or disabled due to road traffic injuries (RTIs) every year worldwide. The lack of reliable data hinders efforts to describe the characteristics of the issue and prioritise prevention activities. The objective was to provide a snapshot of fatal and non-fatal RTI in Argentina. We used the methodology proposed by the Global Burden of Disease Injury Expert group. External causes of deaths with unknown codes were proportionately redistributed over the known categories. In 2007 in Argentina, we estimated 5915 RTI deaths, compared with 3983 RTI deaths reported previously by the Ministry of Health, accounting for 1931 additional cases. The highest number of deaths occurred in young men (15–29 years old), although the highest RTI death rates were in the age group of 55 years and older. Four-wheeled vehicle occupants were the most common road user type killed (59.1%); vulnerable road users represented one third (29.5%) of deaths and 64% of non-fatal RTI. The national and regional estimates of RTI in Argentina should help policy makers and public-health researchers to understand the importance of RTI prevention and design specific interventions to further reduce these preventable deaths and injuries.

Keywords: road traffic injuries; burden of disease; Argentina; middle-income countries; RTI mortality

Introduction

Road traffic injuries (RTIs) kill more than 1.2 million people a year and injury or disable between 20 million and 50 million worldwide. It is estimated that 90% of these deaths occur in low- and middle-income countries (Peden et al., 2004a). Global estimates have predicted that by 2020, RTIs will rank as high as third among causes of disability-adjusted life years (DALYs) lost. In 2000, the Latin American region had an average per capita RTI fatality rate of 26.1 deaths/100,000 population, the highest in the world (Peden et al., 2004a).

RTIs are more likely to be fatal in developing countries because vulnerable road users are often unprotected, road construction may be inherently unsafe, dangerous road behaviours are common (i.e. non-seat belt use) and the access to pre-hospital and hospital care is deficient. Most crash victims are the primary source of household income and when injured or killed their families are left without economic support. In addition, those who survive often need immediate hospital care and many are left permanently disabled, becoming a financial burden to family and society. As a result, RTIs impose substantial economic costs on low- and middle-income countries such as Argentina.

A study by the Pan American Health Organization (PAHO) in 2004 analysed mortality data (1985–2001) on RTIs from 12 countries of the Americas – Argentina, Belize, Brazil, Canada, Chile, Colombia, Cuba, Guatemala, Mexico, Puerto Rico, United States and Venezuela (PAHO, 2004). The study found that the death rates in Argentina were lower compared to other countries; however, it appeared that these rates were based on underestimates of 30–50%.

Argentina is one of the countries in the Americas region with a high level of coverage of mortality data,

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similar to Chile and Uruguay; countries with similar cultural and social-economic realities. However, there are also differences. The proportion of unknown causes of death in Argentina (7.9%) is higher than those reported for Chile (2%) and Uruguay (7%), as well as the proportion of unspecified unintentional injury deaths, which is 32% for Argentina, 6% for Chile and 27% for Uruguay. On the other hand, the proportion of unspecified *road* injuries in Argentina (23.8%) is less than those in other countries (47% and 95%, respectively), but still higher than the desired threshold of 20%. The levels of unspecified unintentional injury and unspecified road injury introduce the potential for bias in the results when redistributing these codes (Mathers, Ma Fat, Inoue, Rao, & Lopez, 2005; WHO, 2004).

In Argentina, information about RTI deaths is periodically published at the national and regional levels by official sources. Nevertheless, a comprehensive national level estimation of RTIs has not been performed. Moreover, given the limitations of available data sources, different corrective methods could provide a better understanding of the burden of disease attributed to RTIs. This study was initiated to generate a snapshot of RTIs, using available data sources to estimate the incidence of fatal and non-fatal RTIs at the national and regional levels in Argentina.

Methods

Data sources

We used several available data-sets to estimate injuries due to road-traffic events. The first was fatality data from Statistics Department at the Ministry of Health (MoH) (DEIS) that collects death certificates in the country, with an estimated coverage of 95% of all deaths (Mathers et al., 2005). The second was the public hospital discharge data from DEIS, which has a coverage of nearly 38% of all hospitals in the country (Abramzón, 2005). The third source was National Register of Road Traffic Records (RENAT), which collects information about fatal and non-fatal RTIs from the police. The coverage of this source was not established and appears to vary by province (Ministerio del Interior (MI), 2007).

Fatality data

The DEIS has a data-set based on the death certificate, which is completed by physicians or in their absence by personnel from the judicial morgue. The death certificates are sent to local civil registration offices that confirm the information and send them to the provincial level court. If any discrepancy exists, it is corrected before submitted to the national level. This office also assigns the basic cause of death using the ICD-10 codes (ICD-10, 2004).

Morbidity data

DEIS also collects the hospital discharge data from all public hospitals around the country. Hospital discharge data are sent to the respective provinces and then forwarded to the national database maintained at the MoH. In 2004, an adjustment in the data collection process established a minimum discharge data-set, which improved the completeness of data, the quality of cause attribution and reduced missing values (Ministerio de Salud (MS), 2004). Information about five diagnoses is collected in this system, one corresponds to the principal diagnosis, two for other clinical diagnoses, one for surgical diagnosis and one for intentionality in external causes of injuries.

The coverage of hospital discharge data is different among the provinces; for example, the Buenos Aires province has around 90% coverage of all hospitalisations, the Tierra del Fuego province – located in the south of the country – has information reported from only official health institutions with hospitalisation services, and Entre Ríos province did not report discharge data for 2007 (MS, 2007a).

RENAT: fatal and non-fatal police data

RENAT is the Road Safety National Agency, which is a national institution in the Ministry of Interior. RENAT prepares the laws and decrees for road safety in the country and collects data related to road traffic events from the police. Data on RTIs are collected and recorded locally by the police, then transmitted to the jurisdictional level and later to the national level. Data are published monthly and are available at www.mininterior.gov.ar. RENAT reports data on fatal and non-fatal injuries aggregated at the provincial level and they use their own (not ICD-10) codes.

The police in Argentina record the RTI deaths that occur within one day of a crash, and RENAT applies a correction factor of 33% for estimating mortality based on police data. RENAT reports both the original and estimated data. This correction factor is an adjustment for deaths that occurred between 24 h and 30 days after the event; these deaths would not ordinarily be captured in this data collection system (MI, 2007; Peden et al., 2004b).

Data analysis

We estimated fatal RTIs using 2007 data from DEIS. For national estimates of non-fatal RTIs, 2006

hospital discharge data from DEIS, the most recent available were used. We also analysed and compared results with RENAT data for 2007, which provides a total count – not categorised by type of road user – for both fatal and non-fatal RTIs.

The following demographic variables were included for both fatal and non-fatal injury data in this study: age, gender, type of road user, nature of injury, cause of death (using ICD-10 codes), hospital discharge code, urban/rural zone of occurrence and distribution by province.

A common set of injury definitions and codes were used in the analysis as proposed by the Global Burden of Disease (GBD)-Injury Expert group. We estimated the national RTI incidence within age, sex and type of road user. All deaths classified to partially specified categories were proportionately redistributed (pro-rata) within age- and sex-matched groups to the fully specified categories. This method of handling deaths coded to partially specified causes of death has been commonly used in the GBD study (Bartels et al., 2010; Bhalla & Harrison, 2009; Bhalla, Shahraz, Bartels, & Abraham, 2009; Bhalla et al., 2010; Global Burden of Road Injuries, 2010).

We assessed the quality of cause of death attribution in the database by computing the fraction of deaths assigned to partially specified causes. The partially specified categories describe a hierarchy of information content characterised by their levels of specificity. For instance, the death of a four-wheeled vehicle occupant killed in a road traffic crash could be coded in the following hierarchy of partially specified categories within the ICD codes, from more to less specific within these categories:

(1) Unspecified road injury – vehicle occupant (ICD-10: V87-V88);
(2) Unspecified road injury (ICD-10: V89, Y85.0);
(3) Unspecified transport injury (ICD-10: V99, Y85.9);
(4) Unspecified unintentional injury (ICD-10: X59) and
(5) Unspecified mechanism – unspecified intent (ICD-10: Y89.9).

Thus, our assessment of quality relies on computing fractions of deaths in a particular partially specified category relative to the corresponding total number of deaths at that level of specification.

Data for non-fatal injuries from hospital discharges (from the MoH) were not redistributed, and rates were not calculated because these data only include public sector institutions and its representation within all health sub-sectors varies by province. Finally, we used population data from the National Institute of Statistics and Census (INDEC) in order to calculate mortality rates for 2007 (INDEC, 2009). The analysis was conducted using Epi-Info V 3.5.1 and SPSS version 11.51.

Results

Fatality data

DEIS reported a total of 315,852 fatalities in Argentina in 2007. Of those, 24,952 (7.9%) deaths corresponded to unknown causes (R90-R99) (MS, 2007b). None of these deaths were redistributed into the RTI category. There were 19,721 injury deaths that represent 6% of the total. Four injury deaths where categorised as 'unspecified intent' (0.02%) and 2546 (12.9%) as 'undetermined intent'. These two categories – unspecified/undetermined intent – could include RTI-related deaths. Unintentional injury deaths totalled 12,360 (62.7% of all injury deaths). There were 3838 unintentional deaths (31.1%) classified as 'unspecified mechanism', this category could also include RTI deaths. There were 4370 unintentional injury deaths classified as 'transport deaths', which included 990 (22.6%) deaths due to unspecified transport. There were 3983 deaths due to RTIs, of which 955 (23.8%) deaths were due to unspecified RTIs and 8 (0.2%) were cases of unspecified type of vehicle occupant-related deaths. The rest of unintentional injury deaths were grouped in the category 'non-transport' that includes 'home, recreational and work-related injury deaths' (Table 1).

In the category of RTIs, all cases classified as 'unspecified road injury and unspecified type of vehicle occupant' were proportionately redistributed. As a result, in Argentina in 2007, the number of road traffic deaths changed from 3983 to 5914, an increase of 1931 cases, which is equivalent to 16 more road traffic deaths per day, with an annual rate of 15.2 per 100,000 population. Redistributed RTI deaths accounted for 30% of all injury deaths, compared to 20% before the redistribution (Table 1). Data published by RENAT in 2007 indicated a total of 4175 RTI deaths, which increased to 7439 once they applied the correction factor (MI, 2007).

The distribution of leading causes of injury deaths in Argentina for the year 2007, using the redistributed numbers, showed that deaths due to RTIs were the leading cause of injury deaths. For those aged 5–64 years, these deaths accounted on average of 30% of the total. Besides that RTIs deaths were the second leading cause for age groups 1–4, 65–74 and >75 years old and the fourth leading cause in children under 1-year old (Table 2).

Distribution of RTI deaths by age group, using redistributed data, illustrated a higher number of cases

Table 1. Number and percentage of causes of deaths, Argentina, 2007: Pre- and post-redistribution of data.

	n (%)	
	Non-redistributed data	Redistributed data
All causes of death	315,852	
Unknown cause (R90-R99)	24,952 (7.9%)	
Injury deaths	19,721 (6%)	
Unspecified intent	4 (0.02%)	0.0%
Undetermined intent	2546 (12.9%)	0.0%
Unintentional injury deaths	12,360	13,507
Unspecified unintentional	3838 (31.1%)	0.0%
Transport deaths	4370	6445
Unspecified transport	35(0.8%)	0.0%
Road traffic injuries	3983	5914
Unspecified road injury	947 (23.8%)	0.0%
Unspecified type of vehicle occupant	8 (0.2%)	0.0%
Other transport	352	531
Non-transport deaths	4152	7062
Unspecified non-transport deaths	11 (0.3%)	0.0%
Intentional injury deaths	4812	6214
Interpersonal violence	1795	2493
Unspecified mechanism	262 (14.6%)	0.0%
Self-inflicted violence	3012	3719
Unspecified mechanism	94 (3.1%)	0.0%
Legal intervention	2	2
Collective violence	3	3

Source: DEIS (MoH), Vital Registration Data, Argentina, 2007.

in young people (15–34), and higher rates for people aged 70 years and older for both sexes (Figure 1). In our analyses of road user type, we found an increased risk of death for pedestrians aged 55 years and older and cyclists between the ages of 70 and 80 years old. Rates among two-wheeler riders were high between ages 15 and 25 years and then rates decreased gradually for older adults. After the age of 15 years, motor vehicle occupant risk varied little with age (Figure 2). Rates for men were 3.5 times higher than rates for women, with an average rate of 23.7 for men and 7.1 for women, both per 100,000 population.

Different data sources for fatality data

A comparison of the number of fatal RTIs among different data sources in Argentina and redistributed mortality data for the period 1981–2007 presented in Figure 3 indicates that for the period 2001–2005, data from INDEC (2009) and DEIS (without redistribution) showed similar results. For years 2000–2007, RENAT data (without applying the correction factor), registered similar results to both DEIS (without redistribution) and INDEC. Data from the National

Table 2. Number and percentage* of leading causes of injury deaths – redistributed – using the external cause of injury mortality matrix, by age group, Argentina, 2007.

Total ($N = 19{,}716$)	<1 ($N = 318$)	1–4 ($N = 475$)	5–14 ($N = 755$)	15–24 ($N = 3552$)	25–34 ($N = 3172$)	35–44 ($N = 2212$)	45–54 ($N = 2217$)	55–64 ($N = 2055$)	65–74 ($N = 1878$)	>75 ($N = 3082$)
RTIs, 30%	Suffocation, 66.4%	Drowning, 31.4%	RTIs, 36.8%	RTIs, 32.3%	RTIs, 33.3%	RTIs, 37.9%	RTIs, 37.6%	RTIs, 34.3%	Other UI, 28.2%	Other UI, 43.2%
Other UI, 19.7%	Other UI, 6.9%	RTIs, 21.9%	Other UI, 18.7%	SI Violence, 24.8%	SI Violence, 24%	SI Violence, 0.8%	SI Violence, 21%	Other UI, 21.8%	RTIs, 27.4%	RTIs, 13.5%
SI Violence, 18.9%	Fire, 6.4%	Other UI, 16.8%	Drowning, 13.7%	IP Violence, 18.8%	IP Violence, 19.9%	IP Violence, 17%	Other UI, 13.7%	SI Violence, 19%	SI Violence, 17%	SI Violence, 11.4%
IP Violence, 12.6%	RTIs, 6.2%	Suffocation, 10.4%	SI Violence, 12%	Other UI, 11.6%	Other UI, 11.4%	Other UI, 11.7%	IP Violence, 13%	IP Violence, 9.3%	IP Violence, 7.2%	Fire 9.5%
Fire, 4.8%	Poisoning, 5.9%	Fire, 8.6%	IP Violence, 6%	Drowning, 5.6%	Drowning, 3.6%	Drowning, 4.3%	Drowning, 4.1%	Fire, 5%	Fire, 6.1%	Falls, 8.7%
Drowning, 4.8%	IP Violence, 5.4%	IP Violence, 5.3%	Fire, 4.4%	Fire, 2.5%	Fire, 3.2%	Fire, 3.2%	Fire, 3.9%	Drowning, 3.5%	Poisoning, 3.7%	Suffocation, 4.4%
Suffocation, 3.8%	Drowning, 1.8%	Poisoning, 3.3%	Poisoning, 3.7%	Poisoning, 1.9%	Poisoning, 1.5%	Falls, 1.8%	Suffocation, 2.8%	Suffocation, 2.8%	Falls, 3.6%	Poisoning, 4.2%
Falls, 3%	Falls, 0.7%	Falls, 2.3%	Suffocation, 2.9%	Suffocation, 1.5%	Suffocation, 1.5%	Suffocation, 1.8%	Falls, 2.2%	Falls, 2.5%	Drowning, 3.4%	IP Violence, 3.7%
Poisoning, 2.5%	SI Violence, 0%	SI Violence, 0%	Falls, 1.9%	Falls, 1.1%	Falls, 1.5%	Poisoning, 1.6%	Poisoning, 1.7%	Poisoning, 1.8%	Suffocation, 3.4%	Drowning, 1.5%

Note: RTIs, road traffic injuries; SI Violence, self-inflicted violence; IP Violence, inter-personal violence; Other UI, other unintentional injuries. *Percentages are for column.
Source: DEIS (MoH), Vital Registration Data, Argentina, 2007.

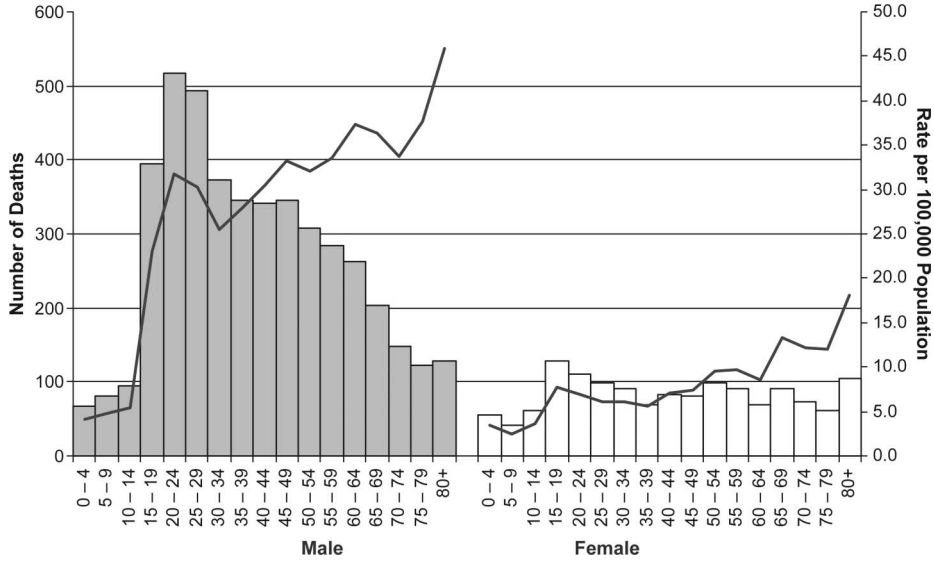

Figure 1. Number and rate of road traffic deaths by age group and gender. Argentina, 2007.
Source: DEIS (MoH), Vital Registration Data, Argentina, 2007.

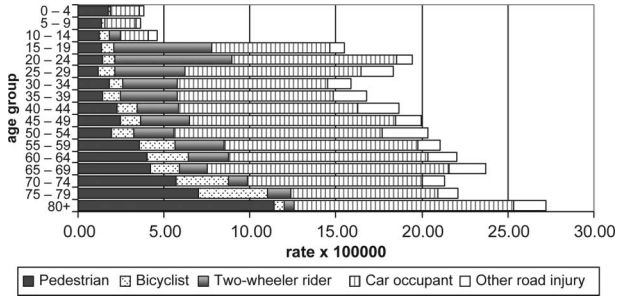

Figure 2. Road traffic deaths by age group and road user. Rates per 100,000 population Argentina, 2007.
Source: DEIS (MoH), Vital Registration Data, Argentina, 2007.

Directorate of Criminal Policy were available only for 2007, also showing similar results to the other data sources (Ministerio de Justicia, 2007). These findings indicated that the under registration of road traffic deaths was affecting all these data sources.

Nature of injury: discharge data

In Argentina, according to the MoH, 10.3% ($N = 217{,}004$) of hospital discharges in the public sector are from injuries. In 2006, 1.7% ($N = 3788$) of patients hospitalised for all external causes died during their hospital stay. This proportion (1.7%) was the same for RTIs, 618 died out of 36,220 RTI hospitalisations. Seventy-nine percent ($N = 28{,}528$) of RTI discharge data had a specific ICD code for the nature of injury. Fractures ($N = 5987$, 20.9%) and traumatic brain injuries (TBIs) ($N = 5917$) were the most common forms of injury accounting for 41.7% of the all RTIs. A total of 41% of patients with TBIs were motorcyclists and cyclists and 3.4% of records had missing data (residual).

Fatal and non-fatal RTI comparisons

The distribution of fatal (redistributed data) and non-fatal (non-redistributed data) RTIs differed by type of road user. Nearly, two thirds of all fatal RTIs in Argentina were among four-wheeled vehicle occupants (59.1%); yet, they accounted for only 26.3% of the non-fatal RTIs. Two-wheeler riders (motorcyclists) represented the highest percentage (29.6%) of non-fatal RTIs and only 17.7% of the fatal RTIs. Vulnerable road users (pedestrians, bicyclists and motorcyclists) represented more than one third (39.8%) of all RTI deaths and 64% of all non-fatal RTIs (Figure 4).

Location of occurrence

The distribution of fatal and non-fatal RTIs according to area of occurrence (urban/rural) using RENAT data for 2007 is presented in Figure 5. Throughout the country, nearly 9% of non-fatal RTIs and more than one third of RTI deaths were registered in rural areas. The provinces of Rio Negro, Santa Cruz, Corrientes and Entre Ríos had the highest percentage of fatal and non-fatal RTIs occurring in rural areas. On the other hand, there were at least five provinces that did not report non-fatal RTIs and deaths in rural areas such as

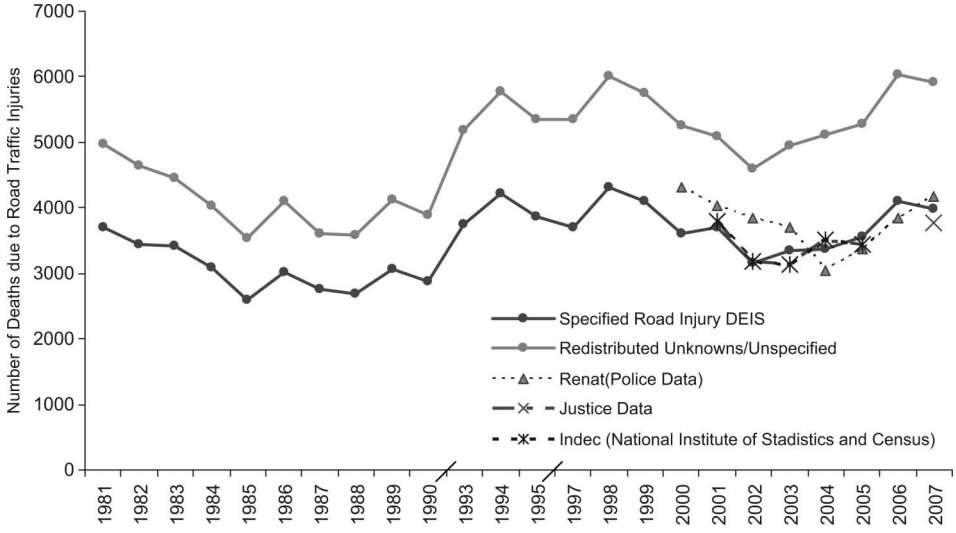

Figure 3. Number of road traffic deaths using different data sources Argentina, 1981–2007.
Sources: Specified Road Injuries DEIS (MoH) 1981–2007*, Redistributed Unknown/Unspecified: Based on our analysis of vital records DEIS (MoH) 1981–2007*, RENAT: publications based on the national register road injuries data without applying the correction factor, Justice data: National Directorate of Criminal Policy, 2007, INDEC: National Institute of Statistics and Census. *the years 1991, 1992 and 1996 were excluded.

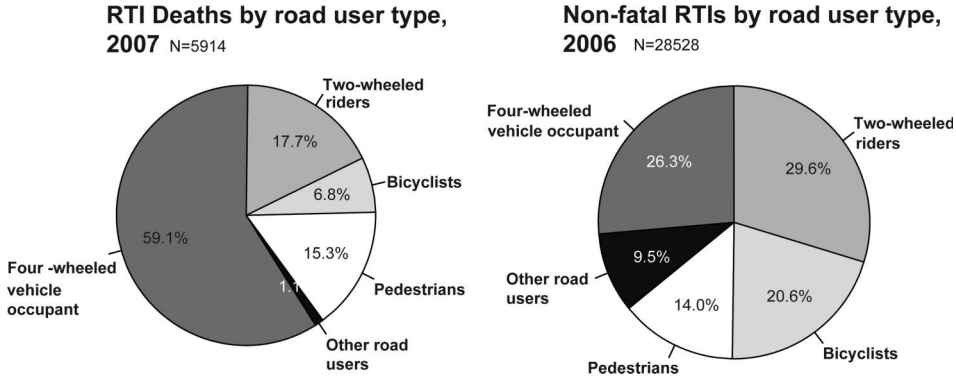

Figure 4. Fatal (2007) and non-fatal (2006) RTIs by road user type, Argentina.
Source: DEIS (MoH), Vital Registration Data, Argentina, 2007.

Córdoba, Neuquén, San Juan, San Luis and Santiago del Estero. There were no cases in Capital Federal, because it does not have rural areas. On the other hand, although Tierra del Fuego has rural areas, no rural cases were reported.

Discussion

This report is the first step towards a better understanding of the magnitude of RTIs in Argentina. It brings road injuries into line with other health issues in the country such as infectious diseases (influenza, dengue, etc.), chronic diseases (cancer, diabetes, etc) and other health problems, where most resources are invested.

This is the first time that GBD methodology has been used to increase the accuracy and completeness of the data in Argentina, with participation from three different research centers: the Harvard Group, the Division of Unintentional Injury Prevention at the US Centers for Disease Control and Prevention and the National Institute of Epidemiology in Argentina with the collaboration of the MoH. The key methodological innovation in this report is the process of bringing together information from multiple sources to develop a comprehensive country assessment of fatal and non-fatal RTIs, from the Ministries of Health, Interior and Justice. This methodology allows comparison of the burden of mortality across countries with different proportions of unspecified injury causes.

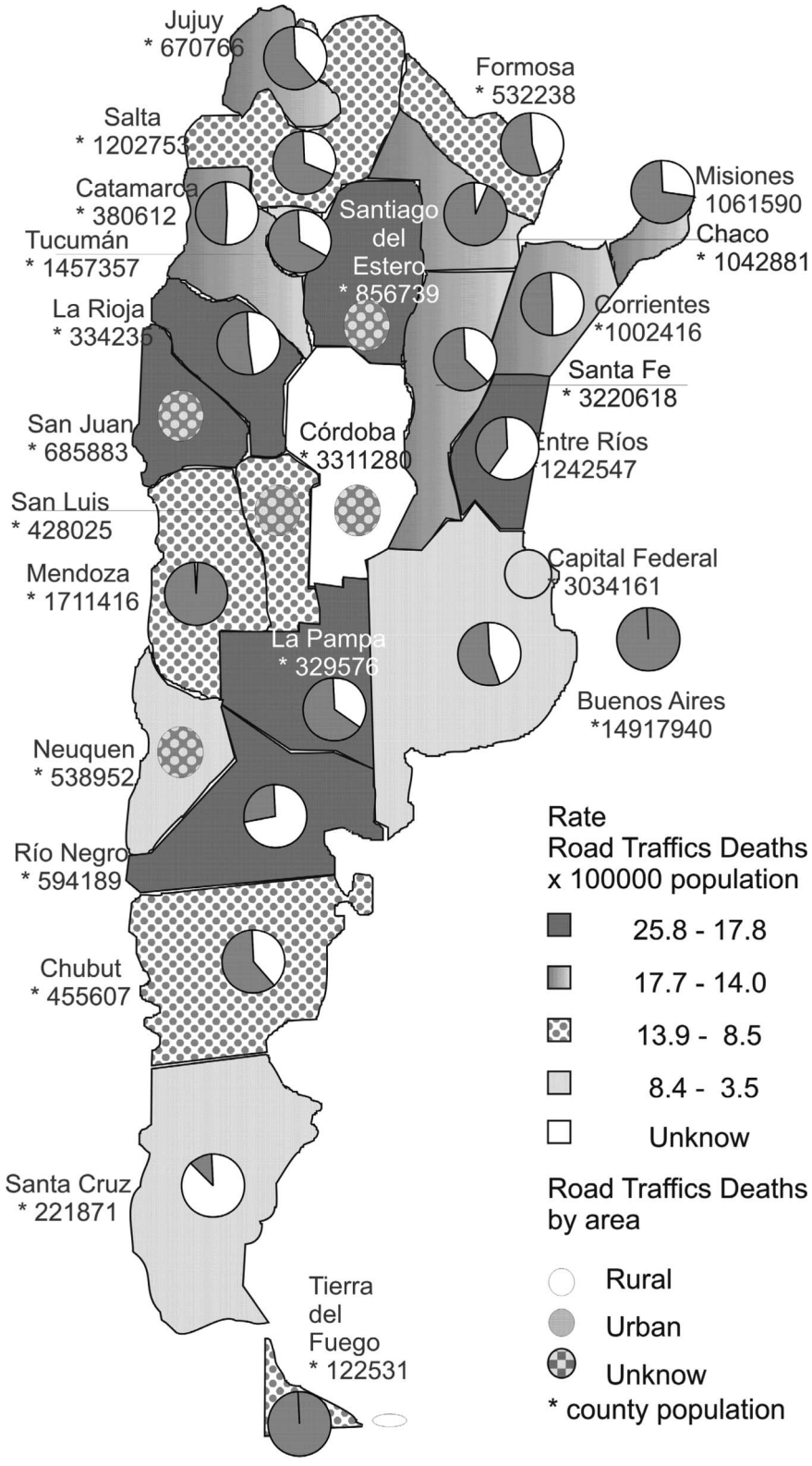

Figure 5. Road traffic injury death rates by province and percent of distribution by urban/rural occurrence, Argentina, 2007. Source: RENAT, Argentina, 2007.

In Argentina, although police collect data on deaths occurring at the scene of the collision, they reported 5% more than DEIS, which reported deaths using death certificate data. Using the GBD method, we assigned the road user type for around 2000 RTI deaths reported by DEIS, which had been classified as unspecified. This gives 6000 cases per year on average, and a rate of 15 per 100,000 population in 2007. However, this estimate is lower than RTI deaths reported by RENAT after applying the 30% correction factor to adjust for mortality up to 30 days after the event (MI, 2007). We consider our method of estimation to be more accurate than the correction factor, because we used real data, and assigned the codes to those deaths not correctly classified. According to the International Road Traffic and Accident Database (IRTAD) the correction factor should be tailored for use depending on the road user type and the period of time considered. For example, the correction factor is different for mortality within 24 h, 2 days or 1 week (IRTAD, 1996). The follow-up of victims during the 30-day period after the event is a method that has not been validated in Argentina or other countries in Latin America. In addition, the rate of mortality is also related to other factors such as pre-hospital care, healthcare accessibility and other characteristics that differ in high and low income countries. All of these factors make the correction factor more or less accurate.

In our analysis of road injury data sources, we validated national official statistics by comparing results from other sources. Specifically, we compared the road death statistics from police with estimates from death certificates. We found that the total road injury death count in Argentina from police statistics was reliable, before applying the correction factor. This differs from most developing countries, where estimates from death registries are substantially higher than deaths reported by the police (Bhalla et al., 2009).

Discharge data used in this study were not redistributed because they do not have a national coverage. It is necessary to find an appropriate methodology to make inferences to the country based on the existing discharge data, like those used in Iran, Mexico and Sri Lanka to estimate external causes from the distribution of injuries and improve the proportional age–sex allocation (Bartels et al., 2010; Bhalla, Naghavi, Shahraz, Bartels, & Murray, 2009; Bhalla et al., 2010).

As in other countries, young adult males accounted for the highest number of cases. The group of 15- to 34-year-old males dominated our tabulations of deaths, hospital admissions and outpatient visits. However, road injury death rates were highest among the elderly, especially pedestrians. Elderly pedestrians have problems due to their impaired motor, reflex, visual and auditive functions. This is aggravated by the fact that traffic signals and pedestrian crossings are not designed considering these conditions. These results indicate a need for improving and providing safe mobility options for the elderly population in Argentina.

Four-wheeled vehicle occupants and two-wheeler riders comprise the single largest road traffic victim category, and four-wheeled vehicle occupants alone comprised half of all RTI deaths. Four-wheeled vehicles were the impacting vehicle in more than 40% of these deaths. Half of the hospital discharge data for lesions of the public sector were two-wheeler riders or bicyclists (vulnerable road users). Controlling the threat posed by this type of vehicle is fundamental to reducing the burden of RTI deaths in Argentina. Significant reductions in RTI were observed at Rafaela city (province of Santa Fe Argentina) as a result of an injury prevention project. This project was based upon an epidemiological research and community involvement in injury prevention actions (Sambuelli et al., 2005).

RTI deaths were the leading cause of mortality in all age groups, for 5–64 years old, and for all ages combined. Based on these results, the MoH should focus on the prevention of RTI deaths of four-wheeled vehicle occupants, and RTIs of vulnerable road users (motorcyclist, bicyclists and pedestrians), especially in the group 15–55 years old.

The Risk Factor National Survey (RFNS) fielded in Argentina in 2005 reported a few findings about injuries and risk factors such as 52% of respondents have never used a seat belt and 17% of people who drove in the past 30 days had drunk alcohol before driving (MS, 2006). It is necessary to improve enforcement of drunk driving and seat belt use. It is also important to create a law on safe transport of children (OMS, 2009).

It is necessary that in future health surveys, more questions about injuries and risk/protective factors are incorporated. These household surveys are important for two reasons: first, they usually include questions about the type of medical care received for injuries (Ávila-Burgos et al., 2008; Instituto Colombiano para el desarrollo de la Ciencia y la Tecnología y Ministerio de la Protección Social, 2007), which is very useful to check the completeness of hospital records. Second, they provide estimates of the number of cases that may not have received any medical care because of the absence of medical infrastructure or limited access to care. These aspects were not considered in the RFNS Argentina 2005.

Our report reveals differences in RTIs at the provincial level. The risk of road traffic crash involvement was much higher in urban areas, indicating the need for safer urban transportation systems. Two-wheeler riders and pedestrians are high-risk groups in provinces with populations of 200,000 to 600,000.

According to the Global Status Report on Road Safety (WHO), just 13% wear a motorcycle helmet in Argentina, and the RFNS reports 85.7% of respondents who used bicycles or motorcycles never used a helmet. The enforcement of existing helmet legislation should be a leading priority.

In Argentina, there are additional data sources not used in this analysis that are included here for the purpose of providing a comprehensive picture of data sources. External causes of injuries are collected using two strategies:

(1) The National System of Epidemiological Surveillance (SINAVE) that collects information about all diseases including some external causes of injuries like work-related, home-related, RTIs, animal bites and poisoning. Information is recorded at the provincial level and it is sent to the national level where a dataset is aggregated. A report is prepared electronically with predefined analysis.
(2) External Causes of Injury Surveillance System (SIVILE) is a sentinel system that provides specific information for external causes of injuries attended for the first time in emergency departments (ED) in the health institutions where the system was established. Although this system is not population based, it is important for detecting trends, to identify the burden and type of injuries attended in ED, to make comparisons of the magnitude of the problem from one year to another and to inform strategies at the local level. The current monitoring system is not adequate enough to give a picture of the problem nationwide. At the time of this publication, the Ministry is evaluating another population-based surveillance strategy. This new strategy involves the recording of information from public and private institutions across the country.

This study has some limitations: The method applied to redistribute the mortality ICD codes could introduce bias due to regional variations in certain characteristics such as road user and age of the injured person. Besides that, the quality of the information collected by the different sources in Argentina could affect the redistribution of RTI deaths. In addition, the coverage of hospital discharge data (38%) and the lack of national health surveys could affect the estimation of the national burden of RTIs. Finally, data were not available for the same year for mortality and discharge data, which could affect the comparisons.

In conclusion, we confirm that RTIs and deaths account for a significant burden of disease in Argentina. Improving data collection should be mandatory in the country, in order to have a better view of the problem. Other data collection systems like SIVILE, which collects information about the characteristics of injured persons, should be improved in order to complement the RTI information gathered by other data sources.

The MoH in collaboration with the National Road Safety Agency is designing an integrated surveillance system to cope with the limitations described above. Information is vital to the design, implementation and evaluation of evidence-based interventions to prevent RTIs. Due to the public health impact associated with RTIs, this problem is now being prioritised in the public health agenda. Currently, a new information system is being designed and an 'observatory of road safety' has been created in the Ministry of Interior, with the collaboration of the MoH.

Further analysis using this methodology will include estimation of the burden of disease (DALYs) and costs. Additional analysis of unspecified cases of RTI deaths (code X59), and misclassified cases (codes R00 – R99) should be conducted in order to improve the quality of data and contribute to the selection of prevention strategies.

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