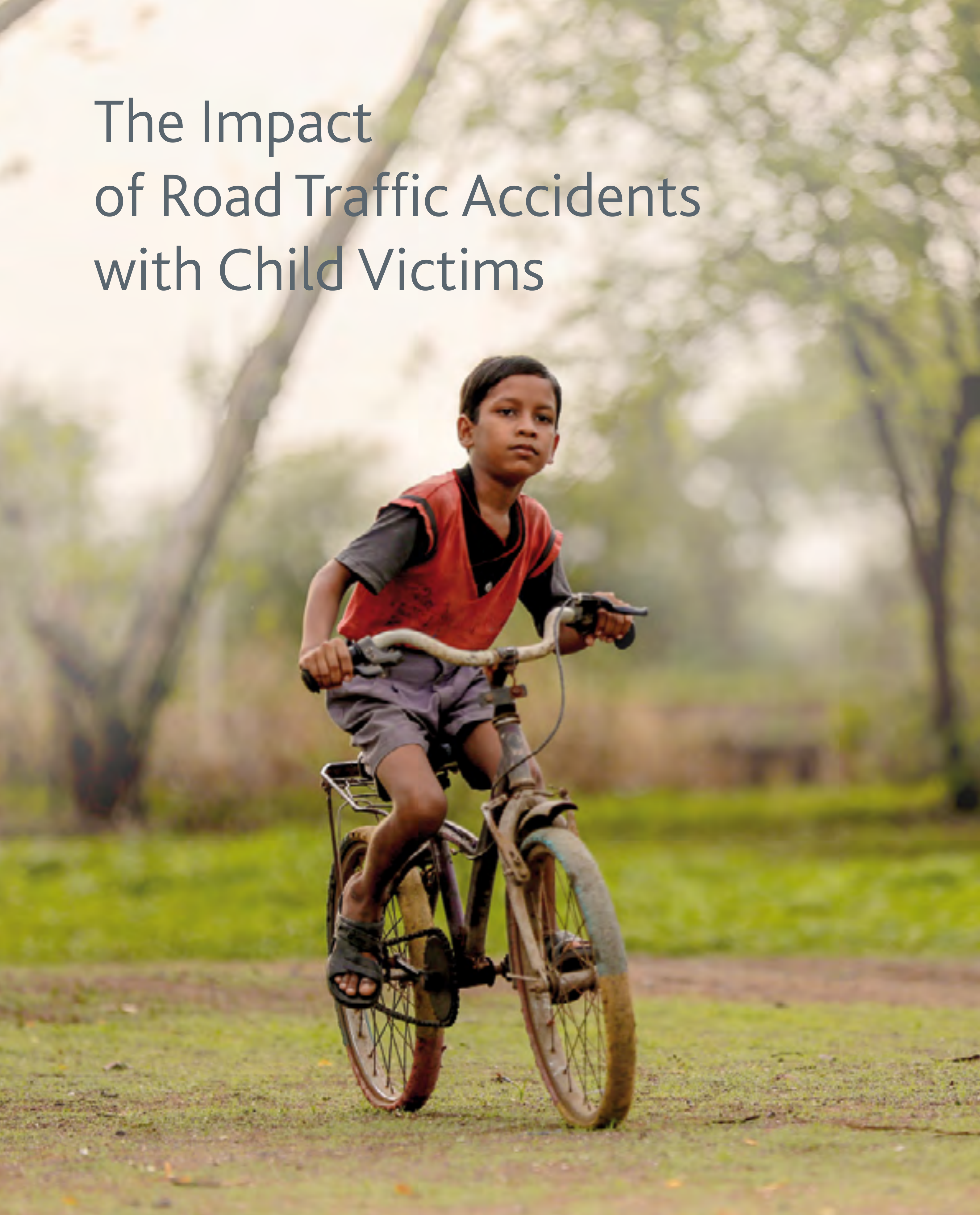
The Impact of Road Traffic Accidents with Child Victims



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LETTER BY ABERTIS

As the number of vehicles on the road rises globally, road safety is an ever more important to us at Abertis. A lack of road safety causes 1.35 million deaths per year globally and a further 20-50 million life-changing injuries. With 90% of traffic accidents occurring in low and middle-income countries, and children remaining a particularly vulnerable group, we're committed to bringing this number down. That's why as a leading global operator of toll roads, we've joined forces with UNICEF and the Guttmann Institute in the Rights of Way initiative to ensure all children have a safer journey to and from school.

As well as the Road Safety actions and programs that are already underway as part of our alliance, and the great number of separate initiatives aiming to reduce fatalities and injuries, our commitment at Abertis is to know more about the impacts of this global public health issue. That's why we've partnered with the London School of Economics (LSE) to investigate the socioeconomic costs of road traffic accidents involving children in France, Spain, Italy, Chile, Brazil, Argentina, Puerto Rico and India.

With this report, we want to highlight the profound medical, production and human cost that these incidents have for nations, as well as contribute to finding the best ways to reduce the incidence and impact of road accidents for children. This in turn we hope will motivate governments, their policy and decision-makers, to act – and to act fast. Greater investment in educational campaigns and infrastructure is needed to ensure that child road traffic deaths and injuries don't continue to increase at their current alarming rate.

I hope you find the report insightful and useful.

José Aljaro
Chief Executive Officer

EXECUTIVE SUMMARY

Road traffic accidents can have a catastrophic effect on individuals, their families, and the community. They 'steal' social and economic contributions and reflect inequality in distribution, with the majority occurring in low-middle income countries.

Children up to 17 years of age are a particularly vulnerable group. In poorer countries, serious injuries and disabilities to children from road traffic accidents often 'pull' families into poverty or worsen their position, as families are often forced to use savings, sell possessions or forfeit employment to care for an affected child, in many cases permanently.

This research seeks to address a lack of information on the socioeconomic cost of traffic accidents affecting children, despite this being the primary cause of death amongst this group globally. A ground-up detailed analysis of in-country data has been utilised across eight countries, with these a proxy for many other low-medium and higher income countries. The results confirm that the effects from fatalities, serious injuries and disabilities 'ripple' wide into the community and beyond, generating a higher cost versus adults due to the young age at which victims are affected.

Despite traffic accident rates reducing for a number of years in many countries, opportunities exist to reduce road traffic accidents through new or improved road infrastructure; education targeting both children and the wider community; the enforcement of penalties, and other programmes.

The road safety of children must be a high priority for policy makers, communities, other road users, families and children themselves. A multi-pronged approach that reaches the appropriate groups to affect change and maintain this is essential. Although an estimation of the socioeconomic costs of fatalities, injuries and disability can occur, it is far more problematic to do so for the trauma and emotional scars that ensue.

This research should be viewed as a starting point for additional effort that can reduce road traffic accidents in a vulnerable group dependent to a large degree upon others for its safety. This responsibility should not be optional, but mandatory.

Dr Alexander Grous
Author of the report

THE LONDON SCHOOL OF ECONOMICS AND POLITICAL SCIENCE

Dr Alexander Grous

Dr Alexander Grous teaches and researches in the Department of Media and Communications at the London School of Economics and Political Science (LSE). He has worked in a number of other departments since 2007 including the Centre for Economic Performance (CEP), one of Europe's leading economic research centres, and the Department of Management.

Dr Grous has a focus on socioeconomic analysis and the quantification of both economic and social factors, including road safety. He has recently been engaged in traffic accident forums with the government of the Basque Country, following research since 2010 assessing contributing factors in mortality rates globally and in Spain including amongst vulnerable groups such as children. He also has an interest in health economics including sport, with his report on the socio-economic benefits of cycling on the UK economy remaining one of the LSEs most downloaded reports with 15,000 downloads to date.

Dr Grous works with both private and public sector agencies in applied research and teaches on innovation, digital disruption and digital practices, management practices, health economics and others. Recently, Dr Grous' two reports on the global economic impact of inflight connectivity in the aviation sector ('Sky High Economics') assisted the global marketing and advertising agency Ogilvy to win the prestigious best B2B campaign award at the International Content Marketing Awards 2018.

Dr Grous maintains an active interest in road traffic safety and interventions that can reduce the incidence of accidents. Before the LSE, Dr Grous held a number of industry roles at CEO/COO level in technology and consumer goods companies internationally.

The London School of Economics and Political Science

The London School of Economics and Political Science (LSE) is one of the foremost social science universities in the world and a global centre for advanced research. The School is ranked 2nd in the world for Social Science and Management subjects (QS World University Rankings 2018) and had the highest percentage of world leading research of any UK university according to the 2014 UK Research Excellence Framework (REF).

LSE's teaching is informed by world-class research, a global outlook and its highly international student and faculty composition. The School has one of the largest concentrations of applied economic, financial and social science analysis of any University. LSE faculty are often asked to give evidence to UK and foreign governments, supranational entities, international financial institutions and corporations around the world. LSE graduates and alumni are active in all areas of public and business life, and many of them count amongst the world's leading civil servants, politicians, media figures and business leaders. 18 Nobel Prize winners (inclusing George Bernard Shaw and Professor Christopher Pissarides) and 37 past or present world leaders (from George Papandreu and Pierre Trudeau to Queen Marghrethe of Denmark and Shri KR Narayanan) have studied or taught at LSE. The School has an influential network of 160,000 alumni, many of whom occupy senior positions in government in the UK and world-wide.

VEHICLE DENSITY AND NATIONAL INCOME INFLUENCE THE SOCIOECONOMIC IMPACT OF ROAD TRAFFIC ACCIDENTS WITH CHILD VICTIMS

Country	Vehicles per 100,000 inhabitants	GDP per capita	Socioeconomic impact per capita
France	63,756	$ 38,870	$ 28.44
Spain	70,034	$ 26,617	$ 16.68
Italy	84,671	$ 30,669	$ 21.96
Chile	67,053	$ 30,833	$ 31.03
Brazil	44,851	$ 8,639	$ 32.44
Argentina	32,753	$ 12,654	$ 92.16
Puerto Rico*	26,863	$ 13,961	$ 155.76
India	17,177	$ 1,717	$ 4.39

1.35 MILLION PEOPLE LOSE THEIR LIFE ON THE ROAD EVERY YEAR (WHO)

- Road traffic accidents cause a further 20 to 50 million non-fatal injuries.
- Fatalities have a catastrophic effect on individuals, their families, and the community.
- Accidents reflect global inequality, with the majority occurring in low-middle income countries.

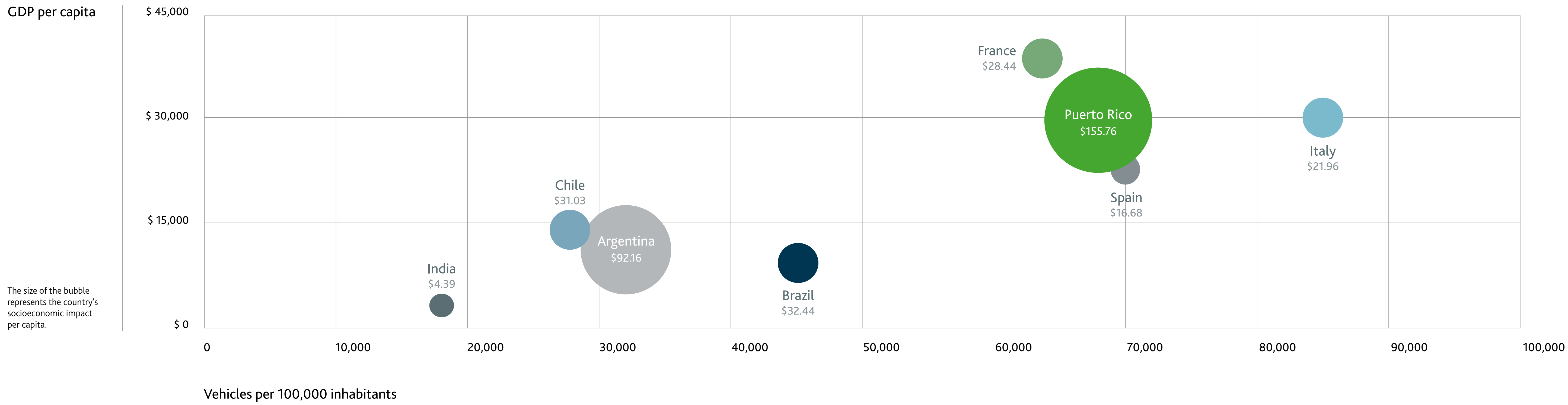
CHILDREN UP TO 17 YEARS OF AGE ARE PARTICULARLY VULNERABLE

- 22% of child injury deaths are caused by road traffic accidents.
- Traffic accidents affecting children are the primary cause of death amongst this group globally.
- Fatalities, serious injuries and disabilities generate a higher cost versus adults due to the young age at which victims are affected.

OPPORTUNITIES EXIST TO REDUCE ROAD TRAFFIC ACCIDENTS

- The world needs new or improved road infrastructure; education and the enforcement of penalties.
- The road safety of children must be a high priority for policy makers, communities, other road users, families and children themselves.

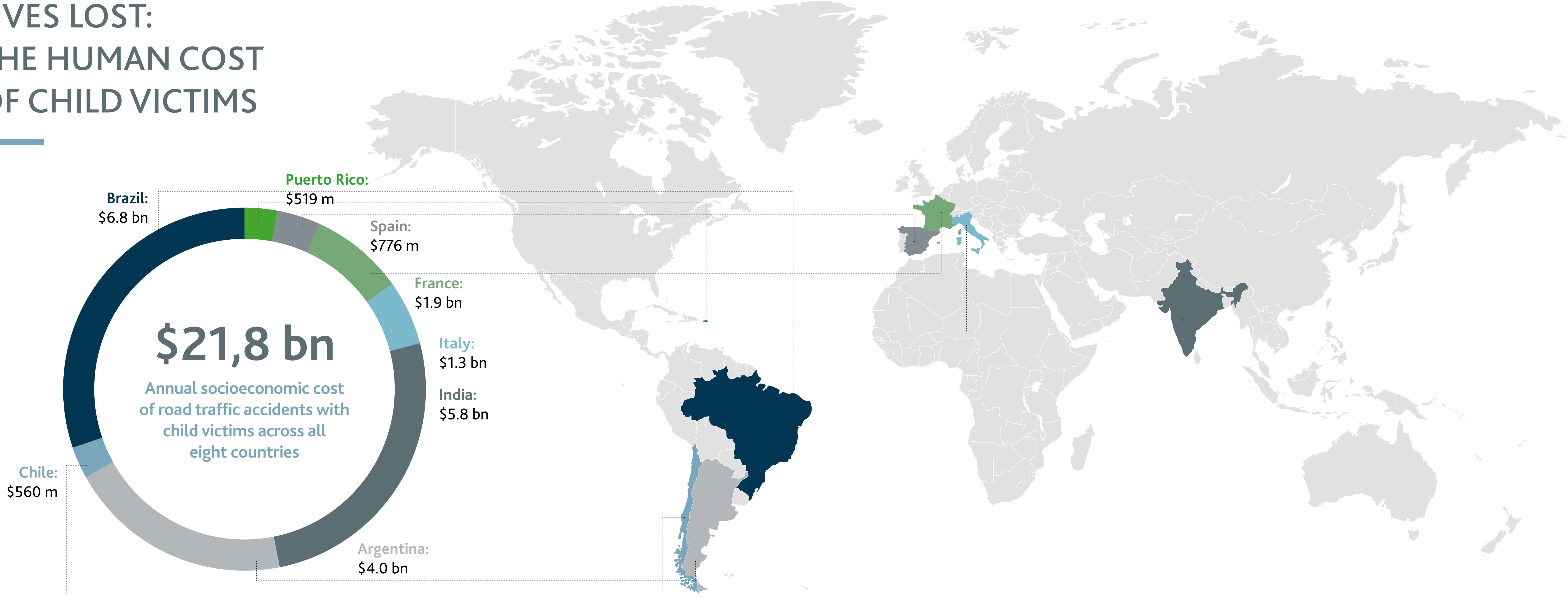
Economic impact of child road accidents per capita in U.S. dollars



The size of the bubble represents the country's socioeconomic impact per capita.

* Puerto Rico is a self-governing unincorporated territory of the United States. For the purpose of this report, it is examined alongside other countries with the intent of assisting the comparative analysis of the sample.

LIVES LOST: THE HUMAN COST OF CHILD VICTIMS



PUERTO RICO
Impact: $519 m
Per capita: $155.76

Population: 3.5 m
Road fatality: 12.4 per 100K
Children: 7.80% of fatalities
GDP: $103 bn
Vehicles: 2.2 m
Roads: 26,800 km

Speeding continues to be the main cause of road fatalities, but the total was halved between 1994 and 2007, notably through successful educational campaigns.

CHILE
Impact: $560 m
Per capita: $31.03

Population: 18 m
Road fatality: 11.9 per 100K
Children: 7.46% of fatalities
GDP: $247 bn
Vehicles: 4.8 m
Roads: 12,500 km

Road crashes are the primary cause of death for children aged 0-14 in Chile, where 61% of road traffic fatalities occur on rural roads. Vehicle registrations climbed 124% between 2000 and 2014. Motorbikes alone grew 515%.

ARGENTINA
Impact: $4.0 bn
Per capita: $92.16

Population: 43 m
Road fatality: 12.4 per 100K
Children: 14.59% of fatalities
GDP: $545 bn
Vehicles: 13.8 m
Roads: 182,000 km

Motorcycle registrations doubled between 2009 and 2015, contributing to Argentina's large number of youth road fatalities. Traffic crashes are the leading cause of accidental death for 15 to 24-year-olds.

BRAZIL
Impact: $6.8 bn
Per capita: $32.44

Population: 207 m
Road fatality: 24.80 per 100K
Children: 8.35% of fatalities
GDP: $1.7 tn
Vehicles: 94 m
Roads: 1,700,000 km

At 24.8, Brazil's fatality rate is significantly higher than that of its neighbours. 25% of emergency room treatments are the result of road traffic accidents.

SPAIN
Impact: $776 m
Per capita: $16.68

Population: 46 m
Road fatality: 3.6 per 100K
Children: 3.37% of fatalities
GDP: $1.2 tn
Vehicles: 32.6 m
Roads: 683,000 km

Spain leads the EU28 in achieving the largest reduction in road traffic fatalities between 2001 and 2015, despite vehicle kilometres increasing by more than 80% and the vehicles in circulation nearly doubling.

FRANCE
Impact: $1.9 bn
Per capita: $28.44

Population: 67 m
Road fatality: 5.4 per 100K
Children: 6.50% of fatalities
GDP: $2.4 tn
Vehicles: 42.7 m
Roads: 1,020,000 km

Fatalities and crashes have reduced by 70% in France since 1990, despite a growth in motor vehicle use and GDP of nearly 40%.

ITALY
Impact: $1.3 bn
Per capita: $21.96

Population: 60 m
Road fatality: 5.6 per 100K
Children: 5.91% of fatalities
GDP: $1.8 tn
Vehicles: 51 m
Roads: 487,000 km

With the introduction of the National Plan for Road Safety in 1999, fatalities in Italy reduced by 55% between 1990 and 2015, even as vehicle registrations grew 50%.

INDIA
Impact: $5.8 bn
Per capita: $4.39

Population: 1.3 bn
Road fatality: 11.9 per 100K
Children: 7.04% of fatalities
GDP: $2.2 tn
Vehicles: 230 m
Roads: 2,200,000 km

GDP growth has brought more vehicles. Pedestrians and two-wheelers account for 84% of fatalities. The 2016 national Road Safety Policy and the 2017 Motor Vehicles Bill aim at curbing accidents.

OVERVIEW

"A recent research in the United States has shown that the medical costs and losses in productivity as a result of all injuries to 0-14 year olds are in the range of $50 billion. There is thus a great need for cost-effective and well-targeted responses."

WORLD HEALTH ORGANIZATION, 2018. WORLD REPORT ON CHILD INJURY PREVENTION, (P20).

This report investigates the socioeconomic cost of fatalities and injuries that result from road traffic accidents in the vulnerable age group of children up to 17 years of age, across eight countries: France, Spain, Italy, Chile, Brazil, Argentina, Puerto Rico and India. These countries display a significantly different incidence of road traffic fatalities and injuries and varying degrees of intervention by policy makers to address road safety.

The countries collectively represent 10 million kilometres of roads, 472 million vehicles and over $10 trillion in Gross Domestic Product (GDP).[1] This research estimates that around 15,621 fatalities occurred in 2016 in these countries for this age group, which represents 7% of the total 2016 fatalities (214,259) in these eight countries. The research examines 41,728 serious injuries and 408,796 mild injuries that represent 8% and 9% of the total reported figures of 498,820 and 4.53 million respectively for these eight countries. It is likely that injuries are under-reported, however. The figures utilised for this research represent a starting point based on available reported data.

90%
OF ALL DEATHS AND DALYs AMONGST CHILDREN IN DEVELOPING COUNTRIES ARE LOST DUE TO TRAFFIC ACCIDENTS

GDP growth in many middle- and lower-income countries has accelerated car ownership, with a doubling of motorisation rates in countries like India.[2] Caution needs to be exercised, however, in attributing higher fatality rates to vehicle growth. This is reflected in India in the study, which has lower vehicle ownership, but a high fatality rate.[3] This contrasts with other countries that have significantly higher vehicle ownership rates but lower road traffic injury fatality rates. Increases in vehicle ownership do not necessarily equate to an increase in fatality rates.[4] This highlights a need to assess road traffic accidents holistically and implement best-practices measures that address all possible contributing factors.

Injuries and fatalities caused by road traffic accidents are a major public health issue in developing countries where more than 90% of all deaths and disability-adjusted life years are lost from road traffic injuries.[5] This research estimates that the number of disability-adjusted life years (DALYs)[6] lost annually through traffic accidents for the 0-17-year old age group is 3.9 million across the eight countries assessed. This equates to an estimated annual socioeconomic cost of $21.8 billion. If best-practices in traffic accident prevention were adopted, an estimated 1,342 children's lives could be saved, utilising a 5% and 10% reduction in High Income Countries (HICs) and Low-middle Income Countries (LMICs) respectively, based on reported traffic accidents and in-country data. This equates to a $1bn reduction in the overall socioeconomic cost.

As GDP continues to rise in many of the assessed countries, vehicle registrations are likely to continue to increase, along with the construction of new roads and the enhancement of infrastructure. This report is a starting point in the estimation of the social cost of road traffic accidents amongst children. This level of detail is absent in the available research on road traffic accidents.

[1] All economic figures in this study are expressed in United States dollars ($).
[2] Shoukrallah, R. (2017), "Road Safety in Five Leading Countries (and Lessons for Developing Countries)," http://www.codatu.org/wp-content/uploads/Road-safety-in-five-leading-countries-Rifaat-SHOUKRALLAH.pdf.
[3] Mallikarjuna, G.P., et al. (2017), "Prevalence of Road Traffic Accident in Children: Retrospective Study in Tertiary Centre," International Journal of Contemporary Pediatrics, V(4)2, pp. 477-481.
[4] Ibid.
[5] Gopalakrishnan, S. (2012), "A Public Health Perspective of Road Traffic Accidents," Journal of Family Medicine and Primary Care, V1(2), pp. 144-140, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3893966
[6] A standard mode of measuring the impact of fatalities and injury, per the World Health Organization (2014), "World Report on Road Traffic Injury Prevention," http://apps.who.int/iris/bitstream/handle/10665/42871/9241562609.pdf

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Traffic fatalities, injuries and vulnerable groups: children aged up to 17

IT’S A GLOBAL ISSUE

"About three quarters (73%) of all road traffic deaths occur among young males under the age of 25 years, who are almost three times as likely to be killed in a road traffic crash as young females."

THE WORLD HEALTH ORGANIZATION

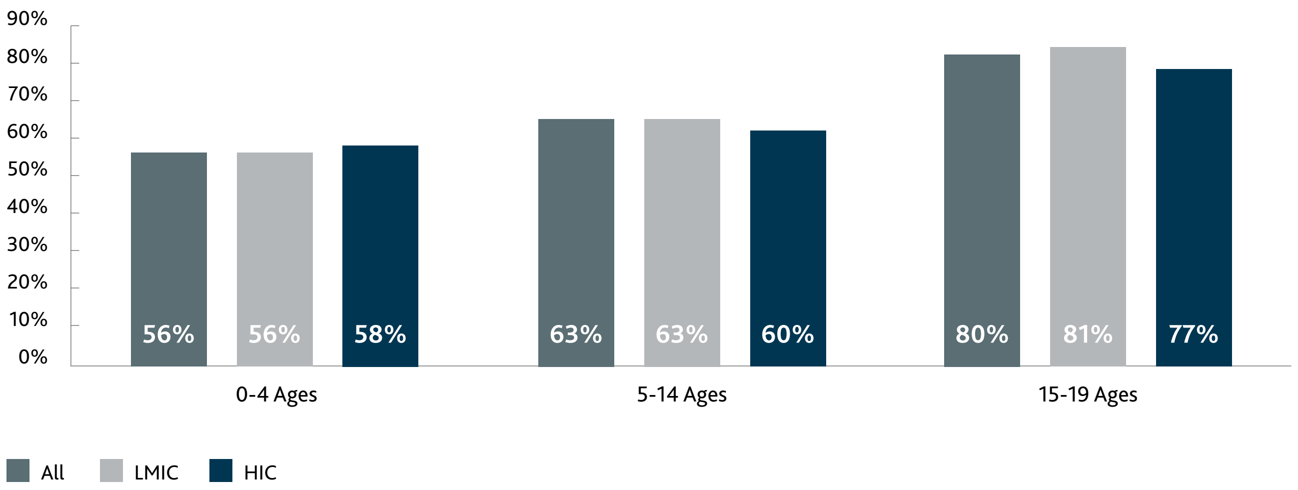
Road crashes cause approximately 1.35 million deaths per year globally, with more than 90% occurring in low- and middle-income countries (LMICs). A further 20 to 50 million non-fatal injuries per year are caused by road crashes.[7] Fatalities are not evenly distributed between males and females: males make up three quarters of fatalities globally.[8] The rate also varies by age. Chart 1 depicts the breakdown of male fatalities by age group.

Male fatalities are only marginally higher than female fatalities in the 0-4-year-old age group (56% male) but the gap between male and female fatalities widens significantly as males reach the 5-14-year-old age group (63% male) and the 15-19-year-old age group (81% male).[10]

The World Health Organization (WHO) states, "From a young age, males are more likely to be involved in road traffic crashes than females. About three quarters (73%) of all road traffic deaths occur among young males under the age of 25 years who are almost three times as likely to be killed in a road traffic crash as young females."[11]

The global cost of road traffic accidents is estimated to be over half a trillion dollars annually, which is equivalent to the Gross Domestic Product (GDP) of Argentina. Sixty five billion dollars of this total is attributed to LMICs.[12] This figure is marginally higher than the aid these countries currently receive.[13] Road traffic accidents often have a greater impact on lower-income individuals, families and those in poverty who have limited access to emergency funds and healthcare.[14] These accidents also account for approximately 10% of all hospital treated injuries, or 4.2 million victims annually.[15] This figure varies significantly from the estimated 1.7 million injuries reported by police, which is likely under-reported in government road traffic statistics.[16]

Chart 1: Proportion of male fatalities for children by age group [9]



Without further action to reduce current accident fatality and injury rates, 12 million people may be killed –and another 120 million injured– over the next decade on the world’s roads. That’s the equivalent of the population of Paris, Rome, Madrid and Puerto Rico combined.

Globally, traffic accidents are the leading cause of death for children aged 10-19, while in some developed countries they are the leading cause of death in children 5-19 years of age.

Without further action to reduce current accident fatality and injury rates, 12 million people could be killed over the next decade on the world’s roads –the equivalent of the population of Paris, Rome, Madrid and Puerto Rico combined– with an additional 120 million people injured.[17] Globally, traffic accidents are the leading cause of death for children aged 10-19,[18] while in some developed countries they are the leading cause of death in children 5-19 years of age[19]. Children are fatally or seriously injured in traffic accidents as a result of both their own actions and those of other road users.[20] This disparity in global road traffic accident fatalities by age highlights the urgency to adopt best practices, particularly in LMICs, to protect this vulnerable group.

Africa displays the highest rate of fatalities in the world, with 26.6 fatalities per 100,000 population. This region is followed by Eastern Mediterranean countries, which count 19.9 fatalities per 100,000 inhabitants, followed by 17.3 in the Western Pacific; 17.0 in South East Asia; 15.9 in the Americas, and 9.3 in Europe.[21]

These figures highlight the need for road safety programmes that can be delivered as expediently and widely as possible. Traffic accidents are both a leading cause of death for young people in LMICs, and a key cause of death for young people in many industrialised countries. In France, they are the leading cause of death among 15-24-year-olds, representing 20-30% of road deaths.[22] Children, young adults, and the elderly are the age groups most vulnerable to road traffic accidents.

[7] "Factsheet: Road Traffic Injuries and Rehabilitation," Humanity and Inclusion, https://humanity-inclusion.org.uk/sn_uploads/document/2017-02-factsheet-rehabilitation-road-traffic-injuries-web.pdf.
[8] Wegman, F. (2016), "The Future of Road Safety: A Worldwide Perspective," IATSS Research, V(40), pp. 66-71, https://www.sciencedirect.com/science/article/pii/S0386111216300103?via%3Dihub
[9] World Health Organization (2004), "World Report on Road Traffic Injury Prevention," http://apps.who.int/iris/bitstream/handle/10665/42871/9241562609.pdf
[10] Ibid.
[11] World Health Organization (2018), "Road Traffic Injuries Factsheet," http://www.who.int/news-room/fact-sheets/detail/road-traffic-injuries.
[12] Centers for Disease Control and Prevention (2016), "Road Traffic Injuries and Deaths—A Global Problem," https://www.cdc.gov/features/globalroadsafety/index.html.
[13] Dueck, A., et al., (2014), "Cost Factors in Canadian Pediatric Trauma," Canadian Journal of Surgery, V(44):2, pp. 117-121, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3695105
[14] Guruaj, G., (2008), "Road Traffic Deaths, Injuries and Disabilities in India: Current Scenario," National Medical Journal of India, V(22)1, pp. 14-20, https://www.ncbi.nlm.nih.gov/pubmed/18472698
[15] European Association for Injury Prevention and Safety Promotion (2013), "Injuries in the European Union: Summary of injury statistics for the years 2008-2010," https://ec.europa.eu/health/sites/health/files/data_collection/docs/idb_report_2013_en.pdf
[16] Ibid.
[17] World Health Organization (2018), "Children and Road Traffic Injury." http://www.who.int/violence_injury_prevention/child/injury/world_report/Road_traffic_injuries_english.pdf
[18] Ibid.
[19] Ibid.
[20] Organisation for Economic Co-operation and Development (OECD) (2017), "Road Safety Annual Report," https://www.oecd-ilibrary.org/transport/road-safety-annual-report-2017_irtad-2017-en
[21] McKibbin, D. (2016), "Examining Best Practice in Road Safety Management," Northern Ireland Assembly, Research and Information Service Research Paper, http://www.niassembly.gov.uk/globalassets/documents/raise/publications/2016-2021/2016/infrastructure/6416.pdf.
[22] Ibid.

CHILDREN: A VULNERABLE GROUP

The greatest burden of road traffic injuries falls on the young and the economically active.[23] Globally, 22% of child injury deaths are caused by road traffic accidents (RTA).[24] The incidence of fatalities does not occur equally between HICs and LMICs, however: an average fatality rate of 7% and 11.1% per 100,000 children occurs respectively. This is 58% higher in LMICs than HICs.[25] Eleven per cent of all child injuries occur on public roads and often result in severe consequences, including fatalities or life-changing injuries. Head injuries occur in 23% of all transport related child injuries.[26] Children travelling as riders account for 60% of accidents, as passengers for 29% of accidents, and as pedestrians, for 10% of accidents.[27] Traffic mortality for children is substantially higher in LMICs than in HICs, with an incidence of 11.4 fatalities and 2 fatalities respectively per 100,000 children aged 5-14.[28]

TRAFFIC MORTALITY FOR CHILDREN IS SUBSTANTIALLY HIGHER IN LOW AND MIDDLE-INCOME COUNTRIES

Injury rates peak between the ages of 15 and 24, with traffic accidents being the number one death cause in this age group.[29] In addition to causing fatalities, injuries as a result of traffic accidents are responsible for significant socioeconomic cost. In the European Union (EU), around 1.7 million road traffic users are injured annually. 1.4 million of these sustain mild injuries, and 300,000 sustain serious injuries.[30] This research indicates that children represent between 3-7% of fatalities and injuries in EU countries, equating to 42,000 to 98,000 mild injuries per annum and 9,000 to 21,000 serious injuries respectively.

Injuries such as paraplegia and tetraplegia are the result of spinal cord injuries (SCI) and have particularly traumatic long-term effects and consequences on individuals and their families. Traffic accidents are the primary cause of these injuries amongst adults and children in HICs and in many LMICs, along with falls.[31] Some data exist for SCIs, but limited data exist for the incidence of paraplegia and tetraplegia.[32] This is particularly pronounced in the case of children, with estimates for SCI incident rates varying between 12.1 and 57.8 cases per million inhabitants in developed countries, and between 12.7 and 29.7 in developing countries.[33] Limited research on the incidence of tetraplegia and paraplegia from SCI indicates an incidence rate of 53% and 42% respectively.[34] Similar rates are applicable to children but they account for around 5% of SCI cases. [35]

Vehicle growth is one factor that contributes to traffic accidents and can cause serious injuries such as SCIs and brain injuries. Other factors include driver behaviour, road condition and vehicle type.[36]
A higher number of vehicles can increase the chances of traffic accidents in addition to the prevalence of other contributing factors. A statistically significant growth exists between the number of vehicles per capita and GDP per capita,[37] moving positively with GDP in many cases. Chart 2 depicts this trend, illustrating GDP per capita in the eight countries against vehicle registrations per 100,000 inhabitants.

The data indicate that higher vehicle density is associated with higher GDP. These factors provide a backdrop for quantifying the socioeconomic cost of road traffic accidents for 0-17-year-olds in the eight countries assessed. Table 1 and Chart 3 depict the reported fatalities for each country and the estimated fatalities for the 0-17-year-old age group.

Chart 2: Vehicles per 100,000 inhabitants vs GDP per capita

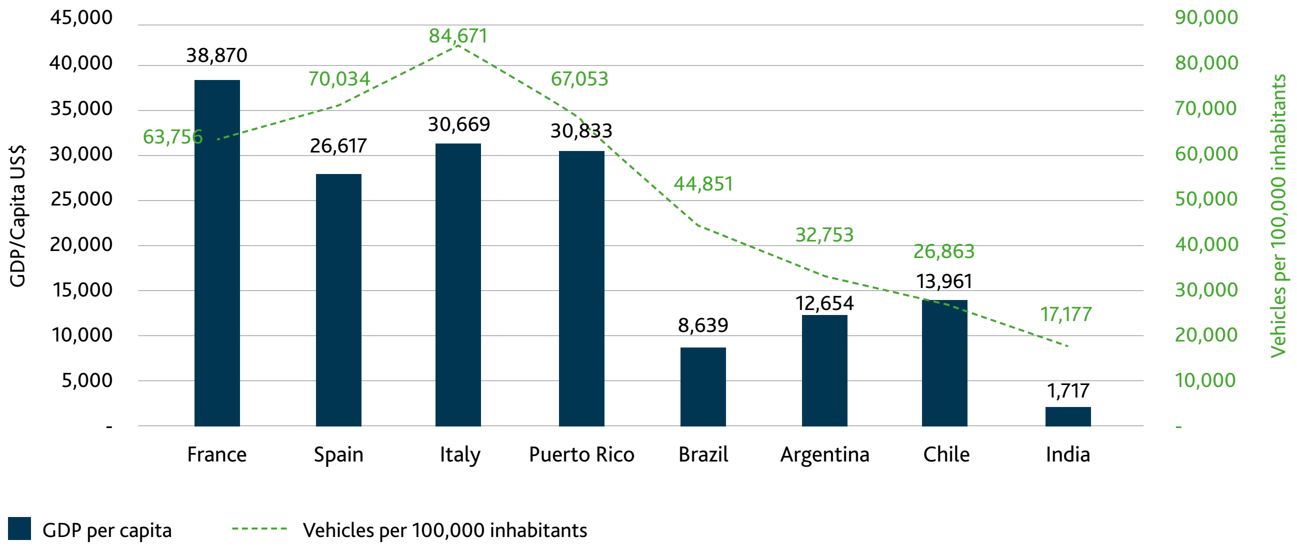


Table 1: Total fatalities vs fatalities for children

Country	All Fatalities	Fatalities for 0-17-year-olds
France	3,477	226
Spain	1,810	61
Italy	3,283	194
Chile	2,140	160
Brazil	46,935	3,527
Argentina	5,550	810
Puerto Rico	279	22
India	150,752	10,622
Total	**214,259**	**15,621**

23 Wolf, L.L., et al. (2017), "Factors Associated with Paediatric Mortality from Motor Vehicle Crashes in the United States: A State-Based Analysis," The Journal of Paediatrics, https://www.ncbi.nlm.nih.gov/pubmed/28552450
24 World Health Organization (2008) "European Report on Child Injury Prevention" http://www.euro.who.int/__data/assets/pdf_file/0003/83757/E92049.pdf.
25 Ibid.
26 World Health Organization (2016), "Road Safety in the Western Pacific Region 2015," http://iris.wpro.who.int/bitstream/handle/10665.1/13412/WPR-2016-DNH-022-eng.pdf.
27 Ibid.
28 Ibid.
29 Ibid.
30 Ibid.
31 Øderud, T. (2014), "Surviving Spinal Cord Injury in Low Income Countries. African Journal of Disability, V(32)2, https://ajod.org/index.php/ajod/article/view/80
32 Singh, A., et al. (2014), "Global Prevalence and Incidence of Traumatic Spinal Cord Injury," Clinical Epidemiology, V6, pp. 309-331, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4179833
33 Pérez, K., et al. (2012), "Trends of Traumatic Spinal Cord Injury Incidence in Spain, 2000–2008," Accident Analysis and Prevention, V 46, pp. 37-44, https://www.sciencedirect.com/science/article/abs/pii/S0001457511003320
34 Popa, C., et al. (2010), "Vascular Dysfunctions Following Spinal Cord Injury," Journal of Medicine and Life, V(3)3, pp. 275-285, https://www.ncbi.nlm.nih.gov/pubmed/20945818
35 Ibid.
36 Clark P. and Letts, M. (2001), "Trauma to the Thoracic and Lumbar Spine in the Adolescent," Canadian Journal of Surgery, V(44)5, pp. 337-345, https://www.ncbi.nlm.nih.gov/pubmed/11603746
37 Button, K., et al. (1993), "Modelling Vehicle Ownership and Use in Low Income Countries," Journal of Transport Economics and Policy, V(27)1, pp. 51-67, https://www.jstor.org/stable/20034977

Chart 3: Total fatalities vs fatalities for 0-17-year-olds

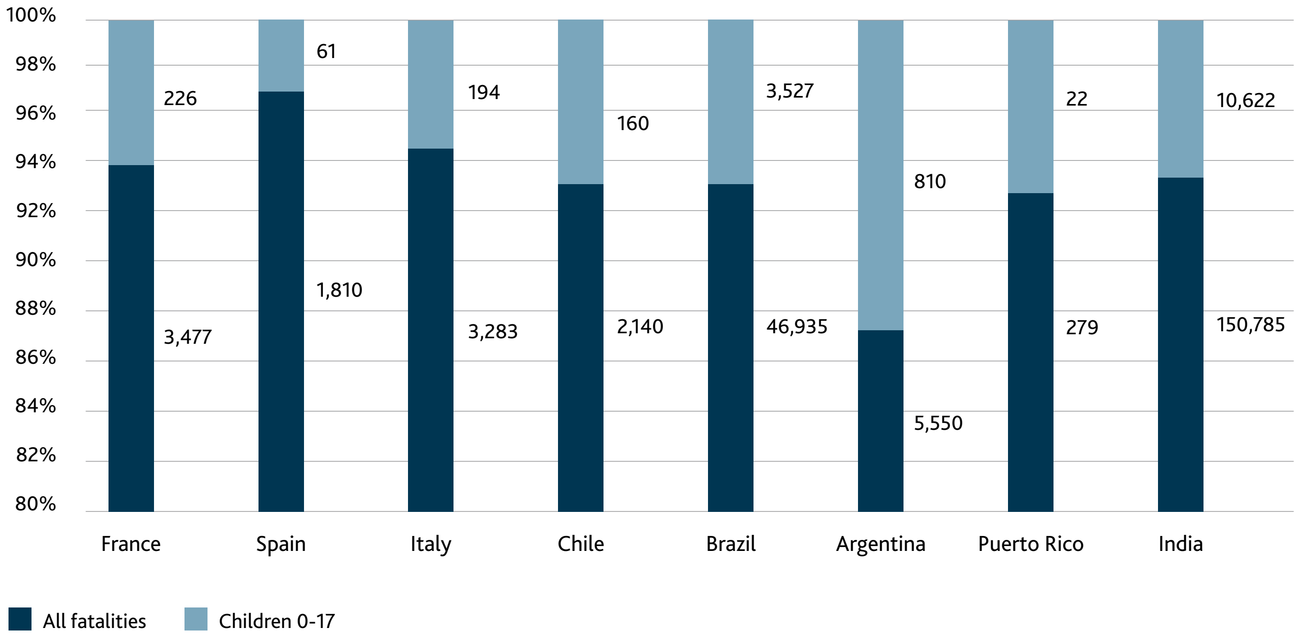


Chart 4 depicts the estimated traffic accident fatality rates for 0-17-year-olds as a proportion of the total reported traffic accident fatalities in each country.

Chart 4: Traffic accident fatalities for 0-17-year-olds as a proportion of total reported fatalities

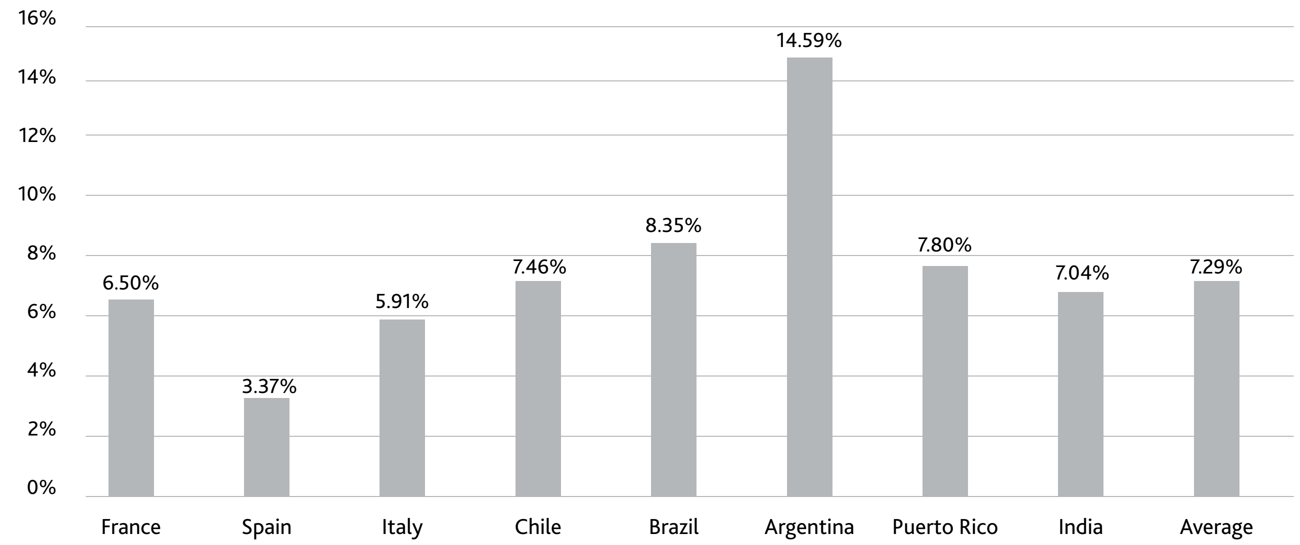


Chart 5 incorporates total traffic accident fatalities per 100,000 inhabitants and for children up to 17 years of age for the eight countries, against the number of vehicles per 100,000 inhabitants. Chart 6 depicts vehicle density against traffic accident fatalities for children only.

Chart 5: Traffic accident fatalities per 100,000 inhabitants including children aged 0-17 vs vehicles per 100,000 inhabitants

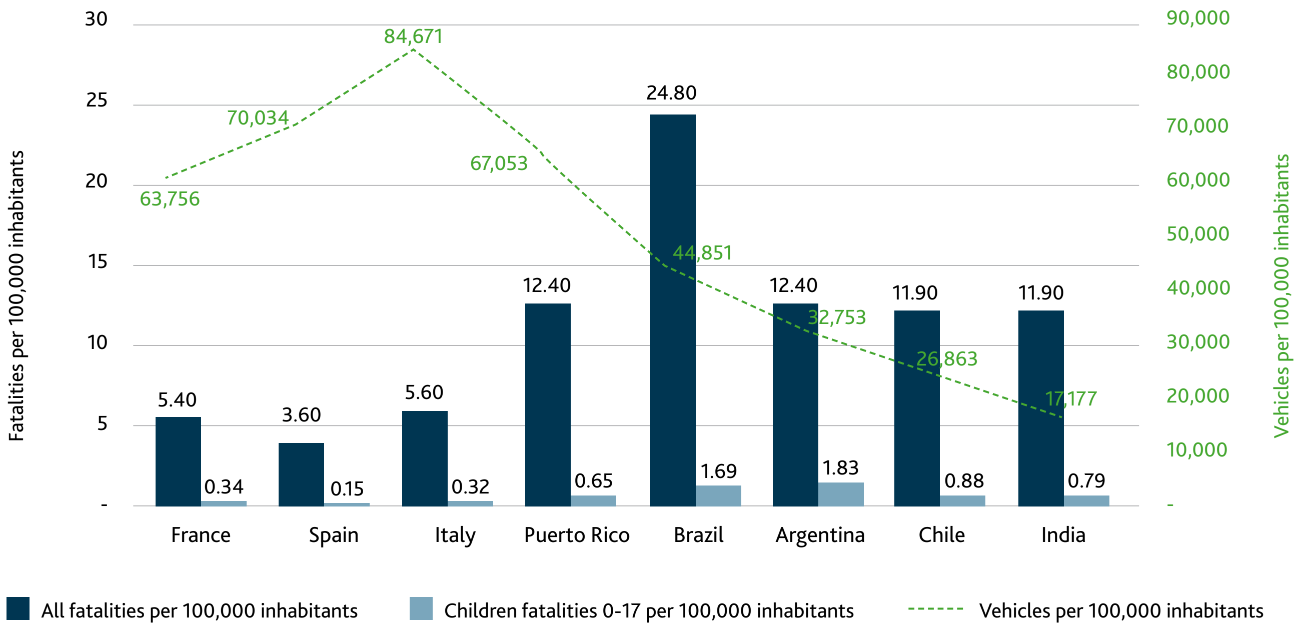
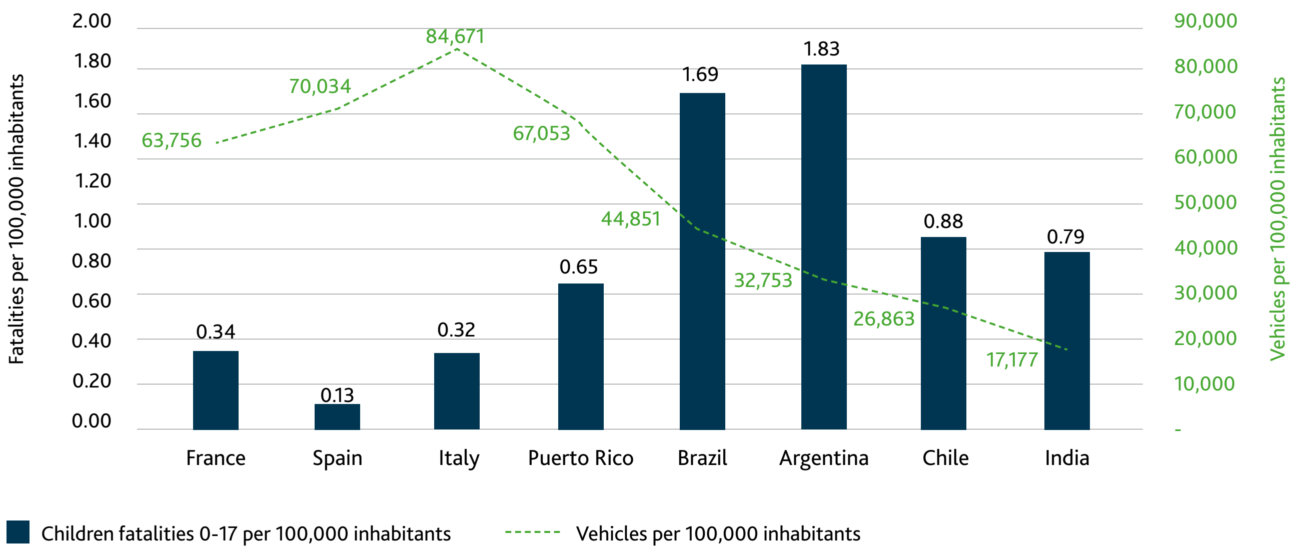


Chart 6: Traffic accident fatalities for children aged 0-17 per 100,000 inhabitants



Child fatalities mirror trends observed for adult fatalities:

- Fatalities do not appear to be correlated to vehicle density: countries with high vehicle density, such as Italy, Spain, France and Puerto Rico, do not have higher fatality rates than countries with low vehicle density, such as India.
- The four countries with the lowest vehicle density –India, Chile, Argentina and Brazil– display the four highest rates of traffic accidents.
- India has the lowest vehicle density in the sample, 392% lower than Italy's vehicle density, but traffic accident fatalities that are 108% higher than Italy's.
- Spain has the lowest reported traffic accident fatalities in the sample, but the second highest vehicle density.

Data were obtained from numerous publicly available sources to estimate the socioeconomic costs for traffic accidents for 0-17-year-olds in each of the eight countries assessed. This was required to address considerable challenges including a lack of data that impeded the use of common data sources across all eight countries. Extensive secondary research was undertaken as a result, to acquire relevant data and information. Where data were not available within a country, data were obtained from comparable countries within the same region; through the extrapolation of other information that was relevant, or from specific journals, reports and other specialised sources. A further challenge resulted from the heterogeneity of reported medical results from traffic accidents in countries with large geographic areas, such as India and Brazil. These often depicted large variations in results across the Regions. Additional analysis and a harmonisation of results occurred to ensure that 'outlier' indicators were not utilised to skew results, and that the estimated effect of traffic accidents was a true representation of the impact of road traffic accidents through in-country influencing factors.

These factors necessitate a degree of subjectivity in areas of the research. This includes defining assumptions that address the lack of data, bridged in some cases through the use of additional information such as research journals, country statistics, and other information required to model the impact of road traffic accidents in 0-17-year-olds.

This study has also sought to extend the current commonly used approaches to the estimation of the socioeconomic impact of traffic accidents by utilising granular 'ground-up' methodology and applying this to children aged 0-17. This comprehensive analysis builds on previous traffic accident analyses, extending the results in order to develop detailed models that encompass influencing variables in each country. This research extends the degree of analysis lacking in many other estimates of socioeconomic impact by estimating the effects of disability, serious and mild injuries, including psychological injuries. Many of these can have a life-long impact resulting in higher 'lost days' than are often estimated, with this research capturing a wider socioeconomic cost of road traffic accidents. The results should be treated as a starting point for further research and as a potential aid for policymakers engaged in developing measures to address traffic accidents.

02

Consolidated socioeconomic cost and methodology

> "Road traffic injuries can be predicted and avoided. The magnitude of social burden can be brought down down by focusing on human, machine, and environmental components like lifestyle, condition and type of vehicle, and road condition, attitude of driver, talking in mobile phones while driving, age of driver, knowledge of traffic rules, not using road safety precautions are some of the influential factors which lead to road traffic injuries. As the children are in growing age and in the stage of social and intellectual development, succumbing to injuries has impact on social development"
>
> G.P. MALLIKARJUNA, ET AL. (2017)[38]

CONSOLIDATED SOCIOECONOMIC COST: METHODOLOGY AND RESULTS

OVERVIEW

Fatalities, serious injuries and disabilities often have lasting effects. Their social and economic cost is greater when they occur at a younger age.[39] The wider social ramifications are more significant due to the age of the individual, resulting in a longer period of impact. Road traffic injuries often result in devastating intangible 'costs' including shock and grief, an inability to work for both victims and family members immediately following an accident, and the need for lifelong care, when injuries result in permanent disability.[40]

The social and economic impact of road traffic injuries is particularly significant for families from lower to middle income countries. This impact includes forfeited income, halted career progression and job loss by family members who become primary carers for injured or disabled children.[41] Lower to middle income countries often lack a developed social support system that includes access to rehabilitation facilities, subsidised or free prosthetics, ongoing specialist care and other types of care.[42] The economic impact of road traffic injuries can be high both to the health care system[43] in terms of the amount of time a victim spends recovering. A concomitant reduction in productivity is also more pronounced if victims and their families are unable to work or cannot do so at the level that occurred before a traffic accident.[44]

The loss of a child or young adult who is 17-years-old or younger has different consequences than the loss of a breadwinner. When a breadwinner is fatally injured, lower-income families in LMICs can quickly descend into poverty or experience deeper poverty.[45] In developing countries, the burden of care primarily falls on the family. This is in contrast to HICs in which extensive social and rehabilitation facilities often exist.[46] Families without this access in lower and middle-income countries are often forced to sell possessions, utilise savings, or borrow funds.[47] The lost output from fatalities, disability or breadwinner withdrawal from the workforce results in a potential loss to the economy due to productive time lost because of an accident.[48] In the case of more severe injuries, such as paraplegia, estimates of the average first year cost following the accident in HICs begin at $152,000 for paraplegia and $417,000 for tetraplegia,[49] and increase to twice this figure.[50] Variation exists in the cost of the lifetime cost of these injuries, with estimates varying from $4m to $10m for adults. The cost for children can be significantly higher depending on the age of injury.

RESEARCH RESULTS: LOSS OF LIFE AND INJURIES FOR CHILDREN AND YOUTH AGED 0-17 YEARS

The disability adjusted life year (DALY) is a way of quantifying the combined quantity and quality of life of a population while measuring the burden of disease from mortality and morbidity.[51] It is a standard measure in the quantification of the socioeconomic impact of death and injury.[52] The World Health Organization (WHO) defines the use of DALY as: *"One DALY can be thought of as one lost year of 'healthy' life. The sum of these DALYs across the population, or the burden of disease, can be thought of as a measurement of the gap between current health status and an ideal health situation where the entire population lives to an advanced age, free of disease and disability"*.[53]

DALYs for a disease or health condition are calculated as the sum of the Years of Life Lost (YLL) due to premature mortality in the population and the Years Lost due to Disability (YLD) for people living with the health condition or its consequences. DALYs are expressed in the formula: DALY = YLL + YLD.[54] One DALY represents the loss of one year of equivalent full health. The value of DALYs lost due to injuries are calculated by multiplying the estimated DALYs loss due to injuries by the per capita GDP.[55]

[38] Op. cit.
[39] Dalal K. and Svanström, L. (2015), "Economic Burden of Disability Adjusted Life Years (DALYs) of Injuries," Health. V(7), pp. 487-494. http://dx.doi.org/10.4236/health.2015.74058.
[40] Ibid.
[41] Ibid.
[42] Lindqvist, K. and Dalal, K. (2012), "The Impact of Child Safety Promotion on Different Social Strata in a WHO Safe Community," Journal of Injury and Violence Research, V(4), pp. 20-25, http://www.jivresearch.org/jivr/index.php/jivr/article/view/83
[43] Dalal K. and Jansson, B. (2007), "Cost Calculation and Economic Analysis of Violence in Low-Income Country: A Model for India," African Safety Promotion: A Journal of Injury and Violence Prevention, V(5), pp. 45-56, https://www.ajol.info/index.php/asp/article/view/31633
[44] Chin, H.C., et al. (2006), "An Estimate of Road Accident Costs in Singapore," Conference: International Conference on Road Safety in Developing Countries, At Dhaka, Bangladesh, pp. 28-35, https://www.researchgate.net/publication/268152486_An_estimate_of_road_accident_costs_in_Singapore
[45] World Health Organization (2008) "European Report on Child Injury Prevention," http://www.euro.who.int/__data/assets/pdf_file/0003/83757/E92049.pdf
[46] Aeron-Thomas, A., et al. (2004), "The Involvement and Impact of Road Crashes on the Poor: Bangladesh and India Case Studies," Report 010, prepared for Global Road Safety Partnership and TRL, https://assets.publishing.service.gov.uk/media/57a08cbced915d622c001533/R7780.pdf.
[47] Ibid.
[48] European Transport Safety Council (2007), "Social and Economic Consequences of Road Traffic Injury in Europe," https://etsc.eu/wp-content/uploads/Social-and-economic-consequences-of-road-traffic-injury-in-Europe.pdf.
[49] "Spinal Cord Injury Facts & Statistics," Sci-Info-Pages, https://www.sci-info-pages.com/facts.html
[50] Villines, Zawn, "What's the Real Spinal Injury Cord Cost," Spinalcord.com, January 6, 2016, https://www.spinalcord.com/blog/what-is-the-real-spinal-cord-injury-cost.
[51] "Disability-Adjusted Life Years (DALYs)" Society, the Individual, and Medicine (University of Ottowa), https://www.med.uottawa.ca/sim/data/DALY.htm.
[52] Ibid.
[53] "Metrics: Disability-Adjusted Life Year (DALY)," World Health Organization website. http://www.who.int/healthinfo/global_burden_disease/metrics_daly/en/

This study calculates DALYs using the 'human capital' approach, a commonly utilised method.[56] The approach does not apply a discount rate and is not age-standardised.[57] Age weighting has received a degree of criticism due to the higher valuation placed on young adults compared to other age groups, such as children and the elderly.[58] The total DALY estimate across these eight countries is 3.96 million, summarised in Table 2.

Table 2: YLL, YLD and DALY for up to 17 age group for the 8 countries assessed

Country	YLL	YLD	DALY
France	15,423	27,387	42,810
Spain	4,331	23,436	27,767
Italy	13,698	24,690	38,387
Chile	11,034	22,791	33,825
Brazil	240,255	390,716	630,971
Argentina	51,529	169,301	220,830
Puerto Rico	1,418	14,021	15,439
India	583,077	2,372,615	2,955,693
Total	**933,045**	**3,055,626**	**3,965,722**

Each DALY represents the loss of one year of equivalent full health and measures the impact of death and injuries. Table 3 depicts DALYs per 100,000 inhabitants, and the total cost for the eight countries.

Table 3: DALYs per 100,000 inhabitants

Country	DALY	Population	DALY Per 100,000 inhabitants
France	42,810	67,118,650	64
Spain	27,767	46,572,030	60
Italy	38,387	60,551,420	63
Chile	33,825	18,054,730	187
Brazil	630,971	209,288,280	301
Argentina	220,830	44,271,040	499
Puerto Rico	15,439	3,337,180	463
India	2,955,693	1,339,180,130	221
Total	**3,965,722**	**1,788,373,460**	**222**

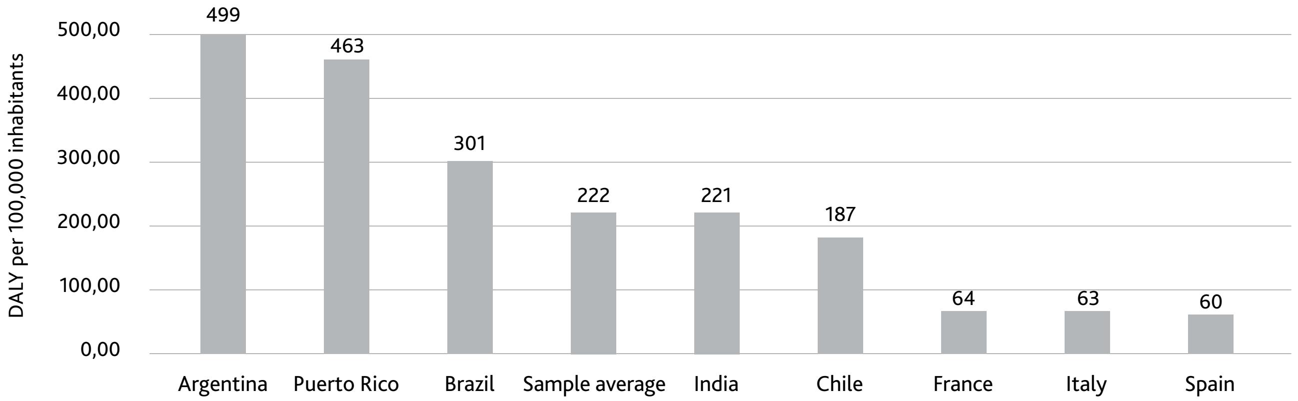
[54] Ibid.
[55] Dalal, K., and Svanstrom, K. (2015). Op. cit.
[56] Weisbrod, B. (1961), Economics of Public Health: Measuring the Impact of Diseases. 2nd Edition. Philadelphia: University of Pennsylvania Press.
[57] Dalal, K., and Svanström, L. (2015), "Economic Burden of Disability Adjusted Life Years (DALYs) of Injuries," Health. V(7), pp. 487-494, https://file.scirp.org/Html/11-8203288_55994.htm
[58] Prüss-Üstün, A., Mathers, C., Corvalán, C., Woodward, A., "Environmental burden of disease series No. 1: Introduction and methods: 3. The Global Burden of Disease concept, http://www.who.int/quantifying_ehimpacts/publications/9241546204/en, http://www.who.int/quantifying_ehimpacts/publications/en/9241546204chap3.pdf

The social and economic cost is more significant when injuries occur at a younger age, since the cost is accrued over a greater number of years than for older members of society.

The social and economic impact of road traffic injuries is particularly significant for families from lower to middle income countries.

These results are summarised in Chart 7, in descending order.

Chart 7: DALYs per 100,000 inhabitants



On a per 100,000 inhabitant basis, the estimated DALYs indicate that some countries with a high absolute number of fatalities and injuries, such as India, have a lower DALY compared to countries with a lower number of fatalities, such as Chile. EU countries display similar DALYs per 100,000 inhabitants, while Latin American countries display higher DALYs. India's per 100,000 inhabitant DALY figure is similar to the average DALY for the eight sample countries.

Total DALYs for each country were calculated by adding the applicable YLLs and YLDs. These reflect the years of life lost, and the years lived with disability respectively, utilising WHO guidance.[59] The resulting DALY figure is multiplied by per capita income to obtain the human cost of road traffic accidents: this is a key component of total socioeconomic cost.[60]

[59] Ibid.
[60] http://www.who.int/healthinfo/global_burden_disease/GBD_report_2004update_full.pdf

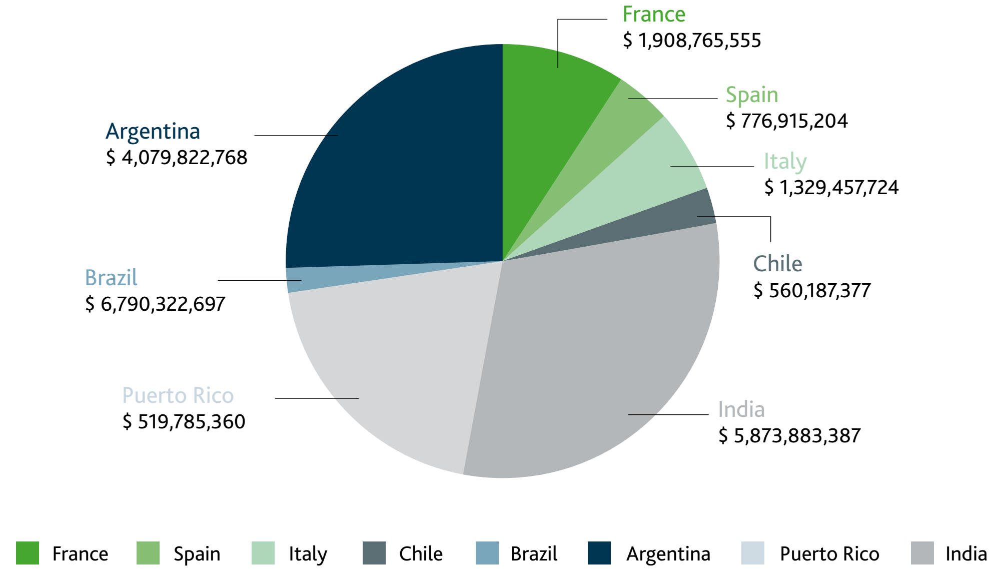
Table 4 depicts the estimated total human cost of $17.8 billion for traffic accidents for 0-17-year-olds for the eight countries.

Table 4: The human cost of road traffic accidents for 0-17-year olds

Country	YLL	YLD	DALY	GDP/Capita	Cost
France	15,423	27,387	42,810	$ 38,870	$ 1,664,028,159
Spain	4,331	23,436	27,767	$ 26,617	$ 739,072,780
Italy	13,698	24,690	38,387	$ 30,669	$ 1,177,304,040
Chile	11,034	22,791	33,825	$ 13,961	$ 472,226,880
Brazil	240,255	390,716	630,971	$ 8,639	$ 5,451,190,853
Argentina	51,529	169,301	220,830	$ 12,654	$ 2,794,462,686
Puerto Rico	1,418	14,021	15,439	$ 30,833	$ 476,030,527
India	583,077	2,372,615	2,955,693	$ 1,717	$ 5,076,325,305
Total	**933,045**	**3,055,626**	**3,965,722**		**$ 17,850,641,230**

Brazil's estimated human cost of $5.4 billion represents 30% of the total human cost estimate for the sample; the largest of any sample country. This is followed by India, with a human cost of $5.0 billion that represents 28% of the total. Argentina reflects the third highest human cost at $2.7 billion (15% of the total), followed by: France with $1.6 billion cost (9.2%), Italy with $1.17 billion cost (6.5%), Spain with $0.7 billion cost (4.1%), Puerto Rico with $0.47 billion cost (2.67%), and Chile with a cost of $0.47 billion (2.64%). Human costs represents the majority of the total socioeconomic cost incurred from road traffic accidents. Chart 8 depicts the total estimated socioeconomic cost of $21.83 billion, segmented by country.

Chart 8: Total socioeconomic cost of traffic accidents by country for 0-17-year-olds

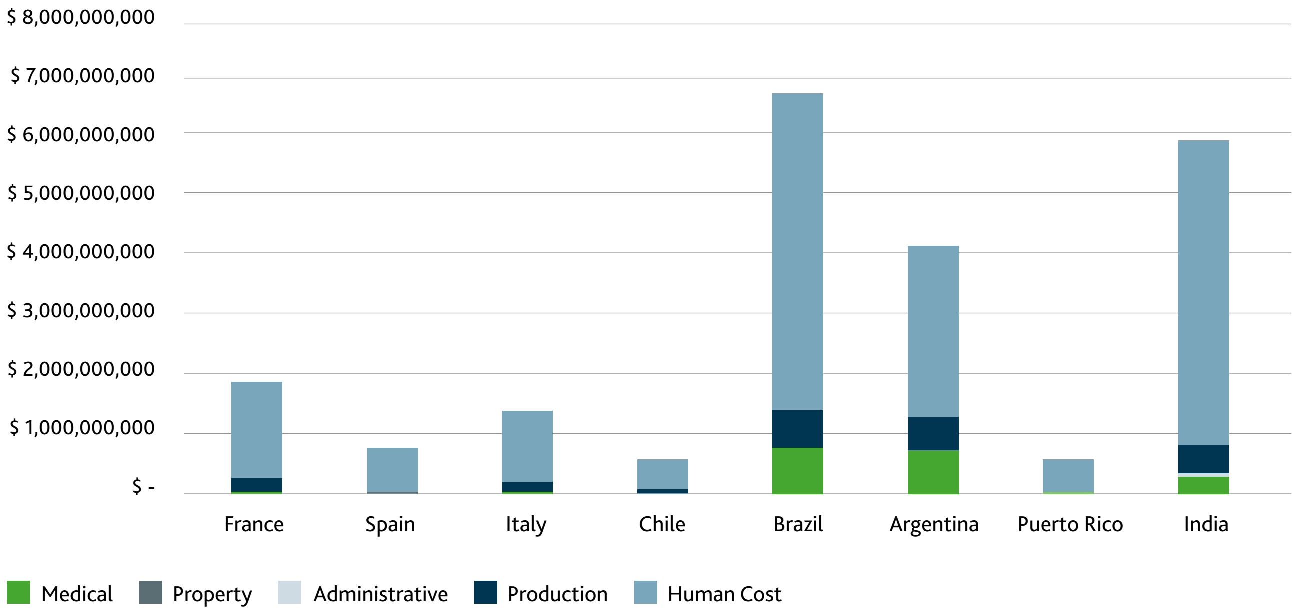


The calculation of total socioeconomic cost incorporates four additional commonly utilised categories: Medical Costs, Property Damage, Administrative Costs, and Production Costs[61] (these are defined further in the subsequent section). These costs capture the impact that traffic accidents have on the community and the economy encompassing medical treatment (both immediate and longer term); the damage that occurs both to vehicles (two and four wheeled) and infrastructure; the administrative costs that are generated for an accident encompassing insurance, Police attendance; the loss of income and productive earning capability. Table 5 and Chart 9 depict the estimated costs for these categories that result in a total forecast socioeconomic cost of $21.83 billion for the eight countries.

Table 5: Socioeconomic cost estimate by country

Country	Medical	Property	Administrative	Production	Human Cost	TOTAL
France	$ 43,539,513	$ 6,393,167	$ 4,653,289	$ 190,151,426	$ 1,664,028,159	$ 1,908,765,555
Spain	$ 32,871,772	$ 2,839,505	$ 2,066,743	$ 64,403	$ 739,072,780	$ 776,915,204
Italy	$ 36,873,100	$ 4,523,181	$ 3,292,213	$ 107,465,189	$ 1,177,304,040	$ 1,329,457,724
Chile	$ 9,346,514	$ 907,144	$ 608,845	$ 77,097,995	$ 472,226,880	$ 560,187,377
Brazil	$ 766,842,875	$ 20,943,380	$ 15,243,712	$ 536,101,877	$ 5,451,190,853	$ 6,790,322,697
Argentina	$ 731,221,736	$ 5,368,138	$ 7,814,436	$ 540,955,772	$ 2,794,462,686	$ 4,079,822,768
Puerto Rico	$ 13,592,123	$ 914,450	$ 613,749	$ 28,634,511	$ 476,030,527	$ 519,785,360
India	$ 248,428,455	$ 9,751,576	$ 14,195,438	$ 525,182,613	$ 5,076,325,305	$ 5,873,883,387
Total	$ 1,882,716,088	$ 51,640,542	$ 48,488,427	$ 2,005,653,786	$ 17,850,641,230	$ 21,839,140,072

Chart 9: Socioeconomic cost estimate by country



[61] Delft, CE. (2016). The cost of road crashes in the Netherlands: An assessment of scenarios for making new cost estimates. https://www.government.nl/binaries/government/documents/reports/2016/11/16/the-cost-of-road-crashes-in-the-netherlands/The+Cost+of+Road+Traffic+Accidents+in+the+Netherlands.pdf

The highest socioeconomic cost resulting from traffic accidents amongst 0-17-year-olds is Human Cost. This is followed by Production Cost, Medical Cost, Property and Administrative Cost. Medical and Production Costs are closely integrated with Human Costs, while Property and Administrative costs are significantly lower than Human Costs, reflecting the narrower nature of these costs.

Table 6 consolidates the total socioeconomic costs resulting from road traffic accidents amongst 0-17-year-olds on a per capita basis.

Table 6: Socioeconomic cost per capita of traffic accidents by country for 0-17-year-olds

Countries	Socioeconomic Cost/Capita
France	$ 28,44
Spain	$ 16,68
Italy	$ 21,96
Chile	$ 31,03
Brazil	$ 32,44
Argentina	$ 92,16
Puerto Rico	$ 155,76
India	$ 4,39

The results indicate that Puerto Rico has the highest per capita costs, at $155. This is followed by Argentina with a per capita cost of $92. The sample is subsequently segmented, with Brazil and Chile displaying a per capita cost of just over $30. The remaining countries are grouped below this figure with a per capita cost between $4-$28. The results highlight the higher per capita cost of road traffic accidents in LMICs versus HICs. This is due to a number of factors including a lack of low-cost health care; a lack of low-cost prosthetics and long-term rehabilitation facilities; a loss of income due to breadwinners caring for children with injuries or disabilities, and other factors.[62]

[62] Kruk, M.E., (2018). Mortality due to low-quality health systems in the universal health coverage era: a systematic analysis of amenable deaths in 137 countries. The Lancet. V(392); 10160; pp:2,203-2,212.

Chart 10 depicts the per capita socioeconomic costs in ascending order.

Chart 10: Socioeconomic cost per capita of traffic accidents by country for 0-17-year-olds

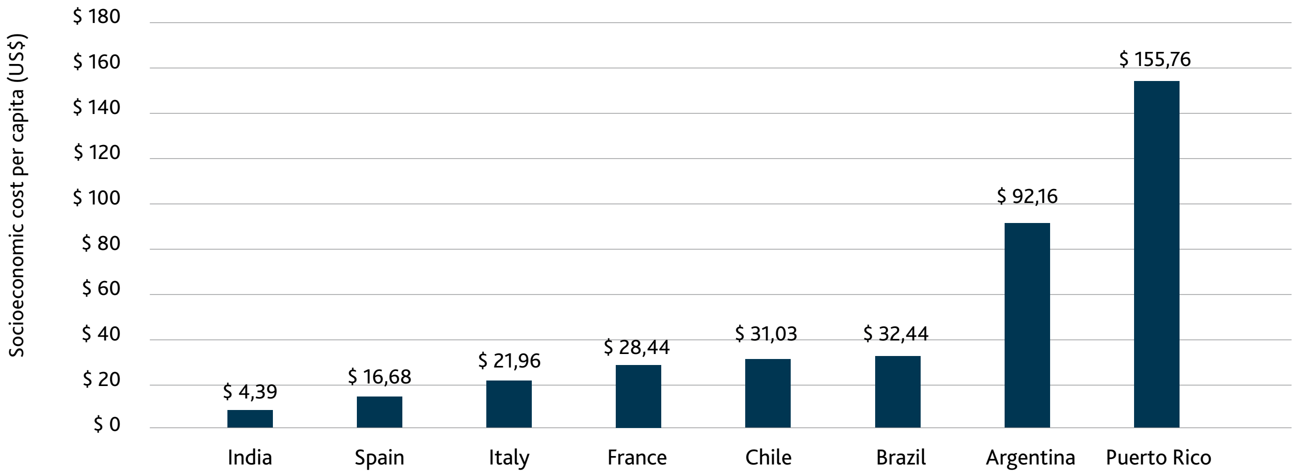


Table 7 depicts the per capita socioeconomic cost per country and the contributing cost by category.

Table 7: Socioeconomic cost per capita of traffic accidents by category per country for 0-17-year-olds

Cost Category	France	Spain	Italy	Chile	Brazil	Argentina	Puerto Rico	India
Medical	$ 0,65	$ 0,71	$ 0,61	$ 0,52	$ 3,66	$ 16,52	$ 4,07	$ 0,19
Property	$ 0,10	$ 0,06	$ 0,07	$ 0,05	$ 0,10	$ 0,12	$ 0,27	$ 0,01
Administrative	$ 0,07	$ 0,04	$ 0,05	$ 0,03	$ 0,07	$ 0,18	$ 0,18	$ 0,01
Production	$ 2,83	$ 0,00	$ 1,77	$ 4,27	$ 2,56	$ 12,22	$ 8,58	$ 0,39
Human Cost	$ 24,79	$ 15,87	$ 19,44	$ 26,16	$ 26,05	$ 63,12	$ 142,64	$ 3,79
Total	$ 28,44	$ 16,68	$ 21,96	$ 31,03	$ 32,44	$ 92,16	$ 155,76	$ 4,39

Puerto Rico, Argentina, Brazil, and Chile display the highest per capita socioeconomic costs for road traffic accidents for children aged 0-17. These are significantly higher than the lowest per capita cost of India, with the latter also displaying a high population. Spain's per capita cost is 40% lower than France's per capita cost (the highest amongst the EU countries included) and is the lowest amongst the three EU countries assessed. France's per capita cost is 18% of the value of Puerto Rico's per capita cost, which is the highest in the sample.

PSYCHOLOGICAL IMPACT

The calculation of the total socioeconomic cost from road traffic accidents for 0-17-year-olds incorporates the impact of 'psychological injuries'. This contrasts the majority of road traffic accident research that provides a consolidated view of medical costs. Table 8 presents the total estimated number of days lost by 0-17-year-olds from traffic accidents, distributed across four major categories of psychological injury.

Table 8: Total days lost due to psychological injuries incurred from road traffic accidents for 0-17-year-olds

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
8 Country Total	42,954	24,862	5,365	5,127	78,308

These categories were reflected in medical studies, hospital admission data and other information utilised to estimate the psychological impact of traffic accidents. The largest number of estimated lost days are due to psychiatric disorders (42,954 days), with this classification incorporating a number of conditions not assessed in other categories including trauma, personality changes, mood disorders and other disorders with research indicating: *"Psychiatric symptoms and disorder are frequent after road accident injury… Post-traumatic symptoms are common and disabling."*[63] Depression accounts for the second highest number of estimated days (24,862) followed by post-traumatic stress (5,365), and anxiety (5,127).

[63] Mayou, R., et al. (1993), "Psychiatric Consequences of Road Traffic Accidents," British Medical Journal, 307(6905), pp. 647-651, https://www.bmj.com/content/307/6905/647

03

A 'Ground up' methodology: defining losses and costs

In addition to Human Costs, this research encompasses the granular assessment of a number of areas that contribute to the socioeconomic cost resulting from road traffic accident, identified in the previous section. Extensive analysis was undertaken to define Medical Costs, with a significant number of areas assessed in detail. In addition, Production Loss, Administrative Costs and Property Costs were assessed, representing categories commonly utilised to define socioeconomic cost.[64]

Medical Costs: Medical treatment is a hallmark of traffic accidents, with the degree of treatment varying with severity of injury. It is a key contributor to the socioeconomic cost incurred. Data on the Medical Costs associated with traffic accidents is not readily available, or is sometimes provided at a consolidated level, particularly in HICs. This is further compounded in the case of children, with often only cursory information provided. This gap in children's traffic accident data has resulted in extensive in-country data use from alternative sources including hospital data, medical journals, associations that raise awareness and support victims of specific injuries, medical reports and other sources. The approach utilised to bridge these data gaps includes:

- The definition and modelling of more accurate end-to-end costs for serious and mild injuries. Research and data were utilised to assess medical and follow-on tasks, including the length of trauma stays, hospital time on the ward, rehabilitation time, and other areas that comprise the type of treatment given by country.

- Medical Costs have been reviewed in the context of each country, using country-specific attributes and costs acquired through extensive secondary research, including medical sources and journals that address traffic accidents in each country and the identified injuries.

Medical Costs were segmented into major injury headings that were observed in fatalities and serious injuries:

- *Traumatic Brain Injury (TBI)*: Various effects of TBI were assessed and modelled using standard approaches in Trauma, including the Maximum Abbreviated Injury Score (MAIS) and the Glasgow Coma Scale (GCS) that consider the nature of treatment and cost relevant to the disability categories of vegetative, severe, moderate and mild disability.

- *Traumatic Spinal Injury (TSI)*: This encompassed 'complete' and 'incomplete' paralysis, including tetraplegia and paraplegia, and its short-and long-term treatment and costs, as well as non-paralysis spinal trauma and its degree of severity. An incidence of 31% and 16% was utilised for paraplegia and tetraplegia respectively in this study. These incidence rates are applicable to both LMICs and many HICs. In some countries with a high incidence of road traffic accidents, such as Saudi Arabia, road traffic accidents cause 90% of TSCI's, with complete paraplegia and tetraplegia occurring in 37% and 16% of victims respectively.[65]

- *Amputees:* Estimates were made on the degree of amputation and limb type as a result of traffic accidents in children aged up to 17. This encompasses unilateral and bilateral amputation, and the hospital and follow-on rehabilitation treatment involved (length of time and cost), and prosthetic device incidence and cost (region dependent). This area in particular lacks data with considerable in-country research and analysis undertaken, utilising medical sources in particular, to define amputee rates by the limb affected and the forecasting of incidence rates.

- *Fractures:* Fractures vary in their severity and impact on the individual. Following a detailed literature review, several fracture types were defined: skull fractures, simple and compound fractures, ribs and pelvic fractures (short and long term) and crush injuries.

For each injury type, assumptions were made and modelled, including whether surgical intervention was required; whether the degree of intervention resulted in post-operative complications, and other factors. Estimates for the number days spent in trauma units, intensive care units and the ward were defined. In addition, the Human Cost assessed several psychological effects of road traffic accidents in children aged up to 17:

- Psychiatric disorder
- Depression
- Post-traumatic stress disorder
- Anxiety

For each of these categories, medical journals and other reference material were analysed in order to: (1) estimate the incidence of each condition within each country; (2) define the days lost and the severity of impact using disability weights defined by the WHO;[66] (3) utilise the data in order to estimate the Human Cost. Several additional medical costs were identified as being relevant and were quantified, including:

- Out of pocket (OOP) Medical Costs: The literature identified some Medical Costs that were out of pocket. Their incidence and value were estimated.

- Catastrophic health expenses: In some cases, for lower income patients and their families, the burden of additional medical costs can have a more profound impact, including the onset of poverty or a more pronounced poverty. The degree to which OOP health expenses precipitated this in the population was defined.

- Health Insurance: Additional health insurance costs were included where relevant.

A number of additional categories were assessed in the estimation of a total socioeconomic cost from traffic accidents in 0-17-year-olds:

- Production Loss: This category encompasses the loss of production that occurs when a victim suffers temporary or permanent disability caused by a road traffic accident, in addition to the complete loss of production due to a fatality. In addition, this category includes the loss of income that can occur within the injured person's family encompassing:

  - the inability of the primary income earner to work due to the need to care for the injured or disabled child;
  - the loss of a second income if both parents or other family members are employed but are required to provide care to the injured or disabled child.

- Administrative Costs: The cost of police and emergency services were estimated, along with other administrative costs for treatment, loss of production, and loss of income resulting from temporary or permanent disability or complete loss of production as a result of fatality. Gross production loss includes consumption loss.

- Property Damage: Damage to vehicles and road infrastructure were estimated. The absence of data across the severity of crashes (severe, moderate and mild) in some instances resulted in the requirement to utilise an average cost, derived from an assessment of in-country research and data, cross-checked against other comparable countries (GDP, population, road length, accident instances, and other criteria).

[64] Delft, CE. (2016). Op cit.
[65] Alhumaid, M.H. (2017), "Traumatic Brain Injuries in the Kingdom of Saudi Arabia," Graduate School Research Paper, Southern Illinois University, Carbondale, https://opensiuc.lib.siu.edu/cgi/viewcontent.cgi?referer=&httpsredir=1&article=2035&context=gs_rp
[66] World Health Organization (2004), "Global Burden of Disease 2004 Update: Disability Weights for Diseases and Conditions," http://www.who.int/healthinfo/global_burden_disease/GBD2004_DisabilityWeights.pdf

04

Areas to address in road traffic management: possible solutions for reducing accidents

"Spending in maintenance is effective in reducing both fatalities and casualties; a result that remains valid with the inclusion of regulatory variables"

(ALBALATE ET AL, 2013, P232)[67]

Road traffic accidents can occur as the result of three factors, as reflected in the Haddon Matrix that defines the interaction between three contributing factors in road traffic accidents: (1) roadway factors specific to the traffic environment; (2) human factors and, (3) vehicle factors.[68] Public authorities address road safety improvements through: (i) investing in new or better infrastructure and; (ii) regulatory intervention.[69] A holistic strategy to road traffic management addresses these elements, including the widely utilised '3E' strategy (Engineering, Enforcement and Education) and the 'Safe System Approach', which encompasses Safer Streets, Safer People, Safer Vehicles and Safer Speeds.[70] Significant studies on improving road safety highlight the importance of improved infrastructure as an overarching factor that affects road safety, in addition to being a complementary factor that affects other road safety areas including human factors and vehicle factors.[71] Road design often incorporates the concept of 'positive guidance' which highlights that certain road locations can place a high demand on drivers to process information with minimal time to react.[72] Roads that are designed from a driver's perspective, including inherent limitations and expectations when driving, can reduce this risk and result in fewer accidents.[73] Key areas that can enhance road safety include infrastructure, regulation, and education.

USE OF RESTRAINTS CAN REDUCE INJURIES AMONGST INFANTS BY

70%

INFRASTRUCTURE

Providing an environment for safe driving

- **The cross-section of roadway:** Several elements can contribute to road safety: the width of the travel lane, the width and type of the shoulder, and the skid resistance of the travel way. "The width of the travel lane does not only influence the comfort of driving and operational characteristics of a roadway, but is also an important parameter affecting the road crash frequency as well as crash severity" (I. Ahmed, 2013).[74] Research indicates that the cross-section of the roadway can affect safety in a number of areas:
  - A lane width increase from 2.65m to 3.65m can reduce the probability of head-on crashes by 50%;
  - Shoulder width and type have been found to affect crash frequency. A shoulder with a 60cm width on either side of a two-lane road can result in a 30% higher crash risk than a road with a 1.6m wide shoulder on either side. A paved shoulder has been found to be the most optimal with respect to crash safety, followed by a gravel shoulder, and a composite shoulder. A turf shoulder has been found to cause 10% more crashes.

- **The condition of the roadside:** In addition to the cross-section of the roadway, the presence of several other elements can enhance road safety. A number of these are particularly relevant for rural crashes. Studies in countries such as Australia, with a high prevalence of rural roads, indicate: "The most common types of rural accidents are run-off road crashes and head on collisions. Research has suggested that 30 to 45% of rural fatalities are due to run-off road collisions," (I. Bishop, 2013, p5).[75] This is particularly significant to children living in rural areas both in LMICs and HICs, who face a greater number of potential risks before they can reach their school. Head-on crashes on country and rural roads account for less than 5% of total crashes in more developed countries and some middle-income countries, but they can be responsible for half of all fatalities.[76] These figures are often even higher in less developed countries.[77] The condition of roadside elements can assist to reduce the severity and incidence of road crashes through a number of initiatives:
  - Clear zone: The presence of a clear zone can result in road safety enhancement by permitting the removal of broke-down vehicles, stranded passengers, or by separating cyclists from traffic.[78] This is important when considering that the bicycle is the most frequently used transport mode by the vulnerable group 12-17 years of age, with the EU advocating, "the planning, design and operation and use of the road network, such as separation of motorised traffic from non-motorised traffic, area-wide speed reduction, the provision of walking and cycling networks…" (EU, 2015, p6).[78]
  - Median strip: Research indicates that the implementation of a verge and median strip can reduce road accidents through the physical segregation of traffic.[81] The degree to which safety can be enhanced depends on the width of the area: a multi-lane divided highway with a 3m wide median strip can result in a 4% greater probability of a crash than a 9m median strip.[82] The provision of a median can also reduce the likelihood of head-on collisions by up to 90% through the physical separation of incoming traffic.[83]

- **Sight distance:** A driver's ability to see the road ahead is a key factor determining safe driving.[84] Three sight distance elements are applicable for a driver: (i) stopping sight distance ('SSD') that reflects the distance that a driver can safely control the vehicle to avoid impact with another vehicle or object; (ii) passing sight distance ('PSD') that reflects the safe use of the oncoming traffic lane to safely pass a vehicle, and; (iii) decision sight distance ('DSD') that reflects drivers controlling their vehicles in the event of an unforeseen swift stop.[85] The provision of DSDs in particular along a roadway utilising references such as the ASHTOO Green Book, can improve safety by informing drivers of the need to adhere to safe distances and reinforcing a message of safe driving.[86]

- **Road curvature:** Excessive speed can result in instability at points where road curvature exists.[87] In addition, the transition between straight and raised areas of the road can contribute to road safety: a steeper inclined highway can result in 15% more crashes than a level highway, while the presence of an additional lane for climbing can result in 25% road crashes occurring for a two-lane road.[88]

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70 PwC/Loughborough University (2016), "A Guide for Policy Makers: On Reducing Road Fatalities," https://www.pwc.com/m1/en/publications/guide-on-reducing-road-fatalities.html
71 Ahmed, I. (2013), "Road Infrastructure and Road Safety'" Transport and Communications Bulletin for Asia and the Pacific, No. 83, https://www.unescap.org/sites/default/files/bulletin83_Article-3.pdf.
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74 Ibid.
75 Bishop, I.A. (2013) "Assessing our National Highway Network: Highway Reviews and AusRAP – A Combined Approach," 2013 Australasian College of Road Safety Conference, http://acrs.org.au/files/papers/49%20Bishop_NPR.pdf
76 Garder, P. (2006), "Segment Characteristics and Severity of Head-on Crashes on Two-lane Rural Highways in Maine," Accident Analysis Prevention, V(38)4, pp. 652-661, https://www.ncbi.nlm.nih.gov/pubmed/16423319
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80 Ibid.
81 Ibid.
82 Ahmed, op. cit.
83 Bishop, I.A., op. cit.
84 Ibid.
85 Ahmed, op. cit.
86 American Association of State Highway and Transportation Officials (2001),"A Policy on Geometric Design of Highways and Streets," http://www.bestmaterials.com/PDF_Files/geometric_design_highways_and_streets_aashto.pdf.
87 Othman, S. and Thompson, R. (2007), "Influence of Road Characteristics on Traffic Safety," http://publications.lib.chalmers.se/records/fulltext/221966/local_221966.pdf.
88 Ibid.

REGULATION

'Forcing' behavioural change

"Comprehensive legislation—which incorporates strict, appropriate penalties, backed by consistent, sustained enforcement and public education—has been proven to be a strong catalyst for changing behaviour, norms and public perceptions about road safety," (WHO, 2013, p1).[89]

Research indicates that improvements in infrastructure can enhance safety, although some views suggest that better road infrastructure leads to higher speeds and potentially greater risk-taking, due in particular to driver confidence as a result of the quality of the infrastructure:[90] *"Vehicle regulations may have an inverse effect (referred to as 'offsetting behaviour' or the Peltzman compensating effect) on final safety outcomes. As such, risky behaviour must be at the baseline of any regulatory policy to fight road accidents, since infrastructure improvements or better performance of in-vehicle safety devices are not sufficient to alleviate the problem. The willingness to comply with the law is an essential element for ensuring policy effectiveness,"* (Albalate et al, 2013, p228).[91] This perspective highlights that investment in infrastructure should be accompanied by regulatory measures to mitigate 'risky behaviour' and result in aggregate road safety improvements.[92]

Spending on maintenance can reduce fatalities and casualties, with this strengthened further when combined with regulatory factors.[93] Legislative measures can originate within a country, from regional legislation (e.g., the EU, OECD), or be drawn from elsewhere in the world: "Legislation was the most common intervention evaluated with the best outcomes when combined with strong enforcement initiatives or as part of a multifaceted approach," (C. Staton et al, 2016, p1).[94]

Major road safety programmes have been implemented in numerous countries and include *Vision Zero and Sustainable Safety*, applicable in the EU and the OECD respectively, which regulate the behaviour of road users.[95] The Safe System and the Decade of Action for Road Safety 2011–2020, strengthen institutional capacity on road safety management, improve the health system for post-crash response[96] and formulate a road safety target for 2020.[97] The United Nation's Sustainable Development Goal 3, Target 3.6 states: *"By 2020, halve the number of global deaths and injuries from road traffic accidents."*[98] In addition, road safety infrastructure measures are being legislated in some cases, such as Directive 2008/96/EC of the European Parliament that confers a legal obligation for road safety processes.[99]

The key legislative measures identified in the countries in this research are varied. Road traffic accident studies that encompass multiple LMICs highlight the combined effects that road safety policy, laws and higher penalties have on an overall reduction in road traffic injuries from 1.8-33.5% for road users and 10.5% for motorcyclists.[100] In some countries, increasing the enforcement of legislative road traffic policies combined with a greater use of technology and training, and the setting of enforcement targets, resulted in the reduction of road traffic accident fatalities by 18%, and a 58% decrease in crash frequency.[101] The major road traffic accident management areas targeted by legislation in both HICs and LMICs include:

- Seat belt usage, including front and rear seats and child restraints
- Speed limits
- Blood alcohol concentration limit reduction
- Changes to the minimum drinking age
- Helmet use
- Mobile phone use

Legislative measures have been found to be effective in reducing fatalities and injuries.[102] Results include the reduction of head injuries between 16% and 33%, hospital stays by 14%, emergency room road traffic admissions by 17%, and alcohol-related fatalities by 5%[103] to 24%.[104] Alcohol-related road traffic accidents are of particular relevance to young drivers. A further mode utilised to address traffic accidents amongst this and other groups is enforcement: *"Most of the cost-effectiveness strategies to reduce the RTI burden in low and middle-income countries are linked to legislative interventions… An integrated juridical effort is needed that includes the regulation of alcohol impaired driving, prohibition of talking on handheld phones while driving, verification of the use of retention devices by drivers and occupants, and high penalties for offenders,"* (E. Murillo-Zamora et al, 2017, p5).[105] An example of the difference between how HICs and LMICs address road safety is child restraint legislation: around 90% and 30% respectively of these country types have national laws on child restraints.[106] The low incidence in some countries persists despite evidence that use of these restraints can reduce injuries amongst infants by 70%, and by 54% for children aged 1-4.[107]

EDUCATION

'Conditioning' behavioural change

"Evidence-based studies have shown that education is crucial to developing safer people and safer communities; therefore, road safety must be taught in schools as well as through driver trainings and safety campaigns" (PwC/Loughborough University, 2013, p13).[108]

Education can occur through campaigns to enforce road safety laws, or through wider social programmes that target the population including children, through road safety efforts delivered within schools.[109]

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89 World Health Organization (2013), op. cit.
90 Albalate, et al., op. cit.
91 Ibid.
92 Persia, L., et al. (2016), "Management of Road Infrastructure Safety," Transportation Research Procedia, V(14), pp. 3436 -3445, https://www.sciencedirect.com/science/article/pii/S235214651630309X
93 Staton, C., et al. (2016), "Road Traffic Injury Prevention Initiatives: A Systematic Review and Metasummary of Effectiveness in Low and Middle Income Countries," Public Library of Science (PLOS ONE), https://journals.plos.org/plosone/article/figure?id=10.1371/journal.pone.0144971.g001
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95 Persia, L., op. cit.
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107 Ibid.
108 PWC/Loughborough University, op. cit.
109 Ibid.

SIGNIFICANT STUDIES ON IMPROVING ROAD SAFETY POINT TO THE IMPORTANCE OF IMPROVED INFRASTRUCTURE AS AN OVERARCHING FACTOR THAT AFFECTS ROAD SAFETY.

ROADS THAT ARE DESIGNED WITH A DRIVER'S PERSPECTIVE, LIMITATIONS AND EXPECTATIONS IN MIND CAN REDUCE THIS RISK AND RESULT IN FEWER ACCIDENTS.

The majority of road users in LMICs do not have education or training on road safety.[110] Where this occurs, it supports legislation to maximise the effect of regulatory intervention: *"Anti-speed enforcement (has) a significant impact on safety outcomes… investment in safety programmes (e.g., enforcement and advertising campaigns against drink-driving, speeding or seat belt wearing) produces high incremental returns… existing drink-driving enforcement efforts have successfully contributed to reductions in casualty crashes at all severity levels"* (D. Albalate et al, 2013, p228). An example of education campaigns supporting legislation occurred in the implementation of helmet-wearing laws in India and Vietnam.[111] These were accompanied by campaigns to reinforce the key message that helmet wearing required 'strapping'. The European Commission has reinforced the significance of safety actions, pointing out that "A mix of measures is required: measures we know work well, like education and enforcement; as well as new and innovative solutions, especially when it comes to vehicles and infrastructure. Education is crucial. Human error is a contributing factor to 90% of fatal crashes."[112] Road safety education can address these by targeting vulnerable groups such as schoolchildren directly and drivers who have the potential to endanger their lives:

- Schoolchildren: Road safety education targeting children can have immediate and long-term benefits: "Road safety education in schools aims to promote a better understanding of traffic rules/ regulations. Hence, road safety courses should be embedded in both private and public school curriculums and should target children as young as four to five years of age, then continue through primary and secondary school. Evidence has proven that road safety education at school tends to positively affect children's attitude towards road safety and increase their awareness towards personal safety and the safety of others."[113]

- Inexperienced drivers: This group has the highest risk of being involved in an accident.[114] Road safety education through campaigns continues to be an effective way to target this group, using different channels and campaign types to maximise the reach to this group: "Communications and education efforts are also important, in order to alter the fundamental attitudes that exacerbate risk. Such campaigns should target, in particular, inexperienced drivers, groups with high-risk behaviours, and males. Parents have an important role to play too, since many safety related attitudes are established well before the driving age and are highly susceptible to the influence of role models."[115]

- General population: Road safety campaigns targeted at the general population provide a broad reach across all segments of the community. Research indicates that the most effective campaigns targeting road safety use both mass communication and personal influence, in contrast to campaigns that utilise one or the other approach:[116] "The prevention of road traffic accidents should be considered a serious public health concern, since they are the eighth leading cause of death globally and the main cause of death for young people aged 15-29. Evidences from many countries show that successes in preventing road traffic injuries can be achieved through concerted efforts at national level."[117]

IF BEST PRACTICE INITIATIVES WERE IMPLEMENTED, 1,342 CHILD FATALITIES COULD BE PREVENTED. THIS REDUCTION WOULD YIELD AN ESTIMATED $1 BILLION LOWER SOCIOECONOMIC COST DUE TO REDUCED FATALITIES AND INJURIES.

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[111] WHO (2013), op. cit.
[112] European Commission (2017), "Safer Roads for All: the EU Good Practice Guide," https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/safer_roads4all.pdf
[113] PWC/Loughborough University, op. cit.
[114] Organisation for Economic Co-Operation and Development (OECD) (2006), "Young Drivers: The Road to Safety," http://www.oecd.org/itf/37556934.pdf.
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[116] Trje, T.V., et al. (2004), "Effects of Information Campaigns on Behaviour and Road Accidents –Conditions, Evaluation and Cost Effectiveness," Institute of Transport Economics (TØI) Report 727/2004, https://www.toi.no/getfile.php/131122/Publikasjoner/T%C3%98I%20rapporter/2004/727-2004/sum-727-2004.pdf.
[117] Porchia, B.R., et al. (2014), Effectiveness of Two Interventions in Preventing Traffic Accidents: A Systematic Review," Annali di igiene : medicina preventiva e di comunità (Ann Ig), V(26), pp. 63-75, http://www.seu-roma.it/riviste/annali_igiene/open_access/articoli/36179a46e36619bcc6a84b9fff1a2891.pdf.

05

Applying best practices to reduce injuries and fatalities in children

Countries with lower road safety accidents display several common high-level factors that incorporate infrastructure, regulation, education, and other facilitating elements:

- A comprehensive, synchronised policy on road traffic injuries.[118]
- Coordination on initiatives between agencies to maximise their impact.[119]
- An active research base that shares information and initiatives with other countries.[120]

The previous section highlights traffic accident improvement statistics attributed to in-country initiatives, or estimates identified by industry assessments. A narrower range of these has been applied to the fatalities and injuries forecasted in this report to highlight possible road safety improvement practices. A reduction of 10% and 5% have been utilised for LMICs and HICs respectively. The higher improvement rate for LMICs reflects the often less-advanced stage of infrastructure, road safety campaigns, initiatives, and enforcement,[121] in contrast to many HICs that have engaged more actively to achieve initial results with further larger benefits likely to be less forthcoming but incremental.[122] It is recognised that applying these scenarios requires a degree of subjectivity as some LMIC have made progress in the reduction of traffic accidents.[123] Table 9 depicts the estimated reduction in total fatalities and for children aged 0-17.

Table 9: Estimated reduction in fatalities from best practices traffic accident initiatives

Country	All fatalities	Children 0-17	Reduction rate	% of reduction
France	174	11		0,84%
Spain	91	3	5,00%	0,23%
Italy	164	10		0,72%
Chile	214	16		1,19%
Brazil	1,994	150		11,17%
Argentina	600	88	10,00%	6,52%
Puerto Rico	28	2		0,16%
India	15,079	1,062		79,17%
Total	18,342	1,342		

If best practice initiatives were implemented, 1,342 child fatalities could be prevented using the 5% and 10% reduction in fatalities for HICs and LMICs respectively. Around 80% of this is accounted for by India, followed by Brazil (11.17%), Argentina (6.52%) and Chile (1.19%), with the remaining countries distributed below 1%. Table 10 depicts that this reduction would yield an estimated $1 billion lower socioeconomic cost due to reduced fatalities and injuries, with a reduction from $21.8 billion across the eight countries to $20.8 billion.

Table 10: Forecast reductions in socioeconomic costs from best-practices road traffic initiatives

Country	Medical Costs	Property Damage	Administrative Cost	Production Loss	Human Cost	TOTAL
France	$ 643,577	$ 185,267	$ 134,847	$ 4,211,630	$ 48,221,714	$ 53,397,034
Spain	$ 59,924	$ 25,055	$ 18,237	$ 481	$ 6,521,455	$ 6,625,151
Italy	$ 276,776	$ 101,679	$ 74,008	$ 659,022	$ 26,465,304	$ 27,576,789
Chile	$ 395,323	$ 60,526	$ 40,623	$ 5,407,212	$ 31,507,586	$ 37,411,270
Brazil	$ 21,742,065	$ 801,027	$ 583,030	$ 21,775,711	$ 208,493,097	$ 253,394,930
Argentina	$ 47,542,208	$ 441,245	$ 642,323	$ 49,528,406	$ 229,696,306	$ 327,850,487
Puerto Rico	$ 853,336	$ 74,970	$ 50,317	$ 2,519,552	$ 39,026,649	$ 42,524,825
India	$ 3,882,429	$ 479,599	$ 698,156	$ 28,553,294	$ 249,662,320	$ 283,275,798
Total	$ 75,395,638	$ 2,169,368	$ 2,241,540	$ 2,005,653,786	$ 839,594,432	$ 1,032,056,284

[118] PWC/Loughborough University, op. cit.
[119] World Health Organization (2006), "Formulating and Implementing Road Safety Policy," WHO Road Safety Training Manual, Unit 7, http://www.who.int/violence_injury_prevention/road_traffic/activities/roadsafety_training_manual_unit_7.pdf.
[120] Ibid.
[121] Hyder, A.A., et al. (2012), "Addressing the Implementation Gap in Global Road Safety: Exploring Features of an Effective Response and Introducing a 10-Country Program," American Journal of Public Health, V(102)6, pp. 1061-1067, https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3483956
[122] Commission for Global Road Safety (2006), "Make Roads Safe: A New Priority for Sustainable Development," http://www.who.int/management/programme/health_promotion/MakeRoadsSafe.pdf.
[123] World Health Organization (2004), "World Report on road traffic injury prevention" http://www1.paho.org/hq/dmdocuments/2011/World%20Report%20on%20Road%20Traffic%20Injury%20Prevention.pdf.

06

Country summaries: socioeconomic cost of traffic accidents with children aged 0-17

COUNTRY SUMMARIES

"Because speed control is crucial to crash and injury prevention, road improvement interventions in LMIC settings should carefully consider how their impact will affect speed and traffic flow. Further road traffic injury prevention interventions should be performed in LMICs with patient-centred outcomes in order to guide injury prevention in these complex settings."

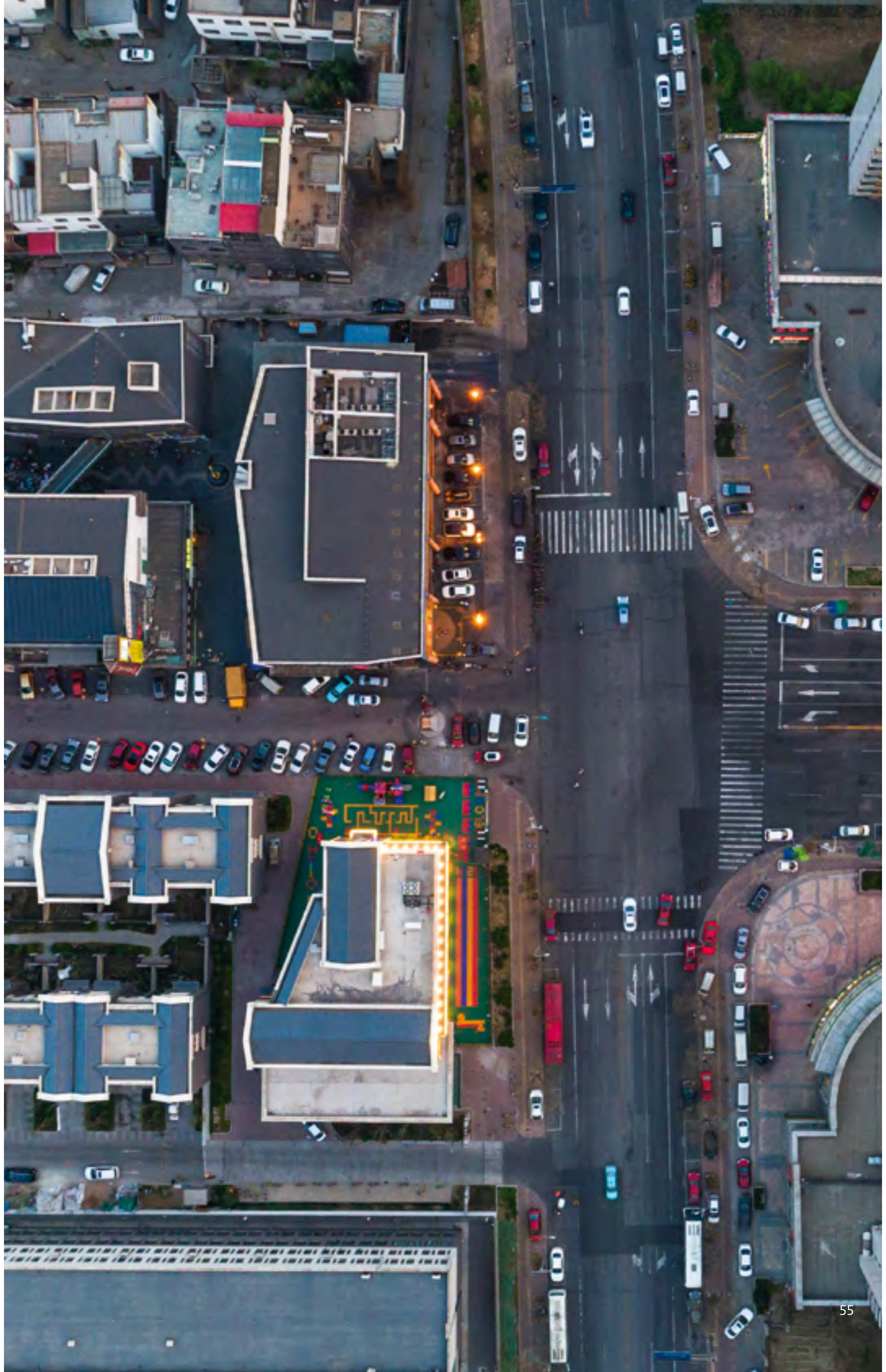
C. STATON, 2016.[124]

Eight countries have been included in this study, reflecting three regions: France, Spain and Italy within the EU; Chile, Brazil, Argentina and Puerto Rico within Latin America, and India within South Asia. Variations exist between countries in each region, with the enclosed countries providing some common indicators while varying in others. Even within a country, variations in traffic accident mortality, injury rates, emergency treatment facilities and services can vary.[125] A number of the key road traffic attributes are summarised, in addition to elements that encompass child road traffic accidents.

The following country summaries provide key estimated socioeconomic results for the vulnerable age group of 0-17 years. Considerable data were acquired to define a 'ground-up' assessment for major areas including medical costs, while some areas required assumptions to be made to bridge gaps in data. These summaries are intended to provide a 'snapshot' for each country with a synopsis of the key data and results relevant to the estimation of socioeconomic costs for traffic accidents in this age group.

A granular and wide assessment of medical costs included the analysis of psychological 'injuries' in the short and long term, with the impact on productivity and quality of life estimated and incorporated within the development of total socioeconomic cost.[126]

The detailed review and development of health and social costs undertaken in this report contrasts with the approach undertaken by most existing research on the impact of traffic accidents that utilises a more consolidated approach. The lack of more detailed 'bottom-up' studies on the effects of traffic accidents on 0-17-year olds highlights the need for further work in this area.



FRANCE

France has a Gross Domestic Product (GDP) of $2.4 trillion in 2016, and a population of 66.9 million.[127] Around 42.7 million vehicles are registered in the Country, which has a fatality rate of 5.4 per 100,000 inhabitants, reflecting an annual road death rate of 3,461. This figure has remained relatively stable since 2016.[128] The fatality rate is around one third of Argentina's, and has reduced by 75% since 1990 when fatality incidence was almost 20 per 100,000.[129] The Country has over 1 million km of paved roads, which include 11,416 km of expressways,[130] with the French Prime Minister citing that "Unsafe roads are not unavoidable." As a result, the Country's Road Safety Council has initiated new measures to reduce road fatalities.[131]

70%
REDUCTION OF ROAD ACCIDENT FATALITIES IN FRANCE SINCE 1990

Deaths to pedestrians rose 19.4% in 2016, with policies being implemented to address this, including greater use of cameras to fine drivers and safer crossings for pedestrians.[132] Since 1990, both fatalities and crashes have reduced by 70%, including a 35% reduction for motorcycle deaths and a 45% reduction for pedestrians and cyclist fatalities, in contrast to motor vehicle growth and GDP, which have grown by almost 40%: these depict progress on reducing road accident deaths despite vehicle growth.[133]

Fatalities for children aged up to 17 represent 6.5% of all fatalities, marginally smaller than Chile.[134] Rural area fatalities represent 64% of the total fatalities. Road safety measures implemented from 1990 combined to reduce annual fatalities, with the majority of this decrease attributed to a reduction in the speed limit, with the current high risk group remaining powered two-wheel riders accounting for over 40% of fatalities, with car occupants accounting for 25%, and cyclists and pedestrians accounting for 14% and 12% respectively.[135] While fatalities have reduced since 1990, motor vehicle registrations increased by almost 50%, along with accident numbers.[136] Over this period, GDP showed similar growth.[137]

Road traffic accidents caused half of the severe traumatic brain injuries (TBI) in France in the 1990s, with figures higher than in many other European countries.[138] Intervention by the French Government with numerous initiatives has assisted to reduce road trauma incidence by 25% between 2003 and 2008 compared to the previous six-year period (1996–2001), but the incidence of SCIs did not decrease.[139] Efforts to reduce this type of injury can directly decrease the incidence of tetraplegia and paraplegia. The earlier incidence of these injuries amongst children incurs the highest long-term cost due to the age of onset, and can have the most debilitating impact on education, and social interaction.

124 Op. cit.
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133 World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
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136 World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
137 The World Bank, GDP growth (annual %), World Bank website (data.worldbank.org), https://data.worldbank.org/indicator/ny.gdp.mktp.kd.zg.
138 UK National Statistics (2013), "Reported Road Casualties Great Britain: Annual Report 2013," https://www.gov.uk/government/statistics/reported-road-casualties-great-britain-annual-report-2013.
139 Lieutaud, T., et al. (2010), "The Decrease in Traumatic Brain Injury Epidemics Deriving from Road Traffic Collision Following Strengthened Legislative Measures in France," Public Library of Science (PLOS ONE), https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0167082

Total forecast fatalities for children aged up to 17 from road traffic accidents in France in 2016 were 226, representing 6.5% of total fatalities of 3,477. Table 11 depicts these summary traffic accident results.

Table 11: Summary traffic accidents France - total and 0-17 years of age

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	**57,251**	72,199	27,214	44,985	3,477	226	169	56
			38%	62%		6.50%	75%	25%

The total socioeconomic cost from injuries and fatalities in the up to 17-year age group in France is forecast to be $1.90 billion, as depicted in Table 12. This table also includes earlier highlighted per capita costs for each contributing category.

Table 12: Socioeconomic cost of road traffic accidents: France, 0-17 years of age

France	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 43,359,513	$ 6,393,167	$ 4,653,289	$ 190,151,426	$ 1,664,028,159	$ 1,908,765,555
Per capita	$ 0.65	$ 0.10	$ 0.07	$ 2.83	$ 24.79	$ 28.44
Population	67,118,650					

The largest component of the total cost is Human Cost, followed by Production and Medical Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research utilises data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 13.

Table 13: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
France	553	318	72	67	1,010

SPAIN

Spain has a Gross Domestic Product (GDP) of $1.2 trillion in 2016 and a population of 46 million.[140] Around 32.6 million vehicles are registered, with 683,000 km of roads and a fatality rate from road accidents of 3.6 per 100,000 inhabitants: one of the lowest amongst the eight countries assessed.[141] Spain has reduced its fatalities by 71% and the number of hospitalised injuries by two-thirds between 2000 and 2015, despite vehicle kilometres increasing by more than 80% on the road network, and the vehicles in circulation nearly doubling between 1990 and 2011.[142] From 1990 to 2015, Spain's GDP increased by 60%, during which time policy-driven initiatives in road transport included education and training; the introduction of driver penalty points; speed reductions; seat belt wearing, and other behavioural elements.[143] Serious injury statistics indicate that Spain has halved the reported serious injuries from road traffic accidents between 2000 and 2015.[144]

SPAIN HALVED THE REPORTED SERIOUS INJURIES FROM ROAD TRAFFIC ACCIDENTS BETWEEN 2000 AND 2015

Spain's road traffic fatalities and injuries for children and young people have reduced 92% over time, with fatality incidence now congruent with other parts of the population.[145] Spain leads the EU28 in achieving the largest reduction in road traffic fatalities between 2001 and 2015.[146] Spain's slower progress on reducing fatalities on rural roads mirrors the experience of countries in the European Union (EU) and elsewhere: around one-third of fatalities occur in this environment and this is an area receiving special attention from policy makers.[147] Drivers constitute 60% of fatalities across all environments, with pedestrians accounting for 20% and the remaining 20% accounted for by passengers and two-wheeled fatalities.[148] The Spanish government has defined its road safety strategy 2011-2020, targeting a lower rate of 37 deaths per million inhabitants by 2020. The 3.4% proportion of children and young people up to the age of 17, fatalities from total fatalities, is the lowest from the eight countries assessed, with continued education and programmes to occur as part of this strategy.[149]

Spain's road network has only grown by 6.15% between 1990 and 2010, with the existing infrastructure improved in the process, as the number of motorways have almost tripled from 3.8% in 1990 to 9.63% in 2010. Roads under 7m in width have reduced from 77.7% to 61.57% during the same period.[150] Roads that are wider than 7m have also increased from 18.9% to 38.43% of the total road network during this period.[151] Research indicates that road width is a factor enhancing road safety.[152]

140 O Maqueda, A. (2017), "Spanish economy outperforms expectations to grow 3.2% in 2016," El País, https://elpais.com/elpais/2017/01/30/inenglish/1485768479_753076.html.
141 Spanish Directorate-General for Traffic (DGT) (2016), "Main Figures on Road Traffic Accidents: Spain 2016," http://www.dgt.es/Galerias/seguridad-vial/estadisticas-e-indicadores/publicaciones/principales-cifras-siniestralidad/2017-2799_Summary_Main_figures_on_road_safety_data_Spain_2016_ACCESIBLE.pdf.
142 World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
143 Gómez Méndez, A. (2015), "The Experience of Spain in Reducing Road Deaths in Urban Areas," How to Improve Urban Road Safety conference, Cyprus, 2015, https://etsc.eu/wp-content/uploads/The-experience-of-Spain-in-reducing-road-deaths-in-urban-areas-%C3%81lvaro-G%C3%B3mez-M%C3%A9ndez-DGT.pdf.
144 Ibid.
145 European Transport Safety Council (2016), "Ranking EU Progress on Road Safety: 10th Road Safety Performance Index Report, June 2016," http://etsc.eu/wp-content/uploads/10-PIN-annual-report-FINAL.pdf
146 Ibid.
147 Spanish Directorate-General for Traffic (DGT) (2013), "Road Safety Data – Spain," http://www.dgt.es/Galerias/seguridad-vial/estadisticas-e-indicadores/publicaciones/principales-cifras-siniestralidad/Main-figures-on-Road-Safety-Data.-Spain-2013.pdf
148 Ibid.
149 Spanish Directorate-General for Traffic (DGT) (2016), "Spanish Road Safety Strategy 2011-2020," https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/pdf/20160107_estrategico_2020_006.pdf
150 Albalate, et al., op. cit.
151 Ibid.
152 Kapila, K. K., et al. (2013), "Safe Road Infrastructure Design for Highways," Transport and Communications Bulletin for Asia and the Pacific, No. 83, https://www.unescap.org/sites/default/files/bulletin83_Article-2.pdf

Total forecast fatalities for children aged up to 17 from road traffic accidents in Spain in 2016 were 61, representing 3.37% of total fatalities of 1,810. Table 14 depicts these summary traffic accident results.

Table 14: Summary traffic accidents Spain - total and 0-17 years-of age

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	**102,362**	140,390	6,968	130,635	1,810	61	43	18
			5%	95%		3.37%	71%	29%

The total socioeconomic cost from injuries and fatalities in the up to 17-year age group in Spain is forecast to be $776 million as depicted in Table 15. This table also includes earlier highlighted per capita costs for each contributing category.

Table 15. Socioeconomic cost of road traffic accidents: Spain, 0-17 years of age

Spain	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 32,871,772	$ 2,839,505	$ 2,066,743	$ 64,403	$ 739,072,780	$ 776,915,204
Per capita	$ 0.71	$ 0.06	$ 0.04	$ 0.0014	$ 15.87	$ 16.68
Population	46,572,030					

The largest component of the total cost is Human Cost, followed by Production and Medical Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has analysed data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 16.

Table 16: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Spain	468	286	55	52	861

ITALY

Italy has a Gross Domestic Product (GDP) of $1.85 trillion in 2016, and a population of 60.6 million.[153] Around 51 million vehicles are registered, with 487,000 km of road length, and a fatality incidence of 5.6 per 100,000 inhabitants.[154] Road deaths and injuries decreased marginally by 0.8% and 4.7% respectively in 2016 from 2015, with a total of 3,283 fatalities recorded, and around 17,000 serious injuries took place in this period.[155] Fatalities increased on motorways in 2016 by 6.3%, almost three times the fatalities on rural roads, with injuries up by around 6% to almost 17,000.[156] Following the introduction of compulsory helmets in 2000, fatalities fell by 83% for motorcycle riders, representing the largest reduction amongst a user group. Following the National Plan for Road Safety introduced in 1999, fatalities reduced by 55% between 1990 and 2015, while motor vehicle registrations increased by around 50%,[157] and GDP grew by 20%.[158]

83%
REDUCTION OF MOTORCYCLE RIDER FATALITIES FOLLOWING ITALY'S INTRODUCTION OF COMPULSORY HELMETS IN 2000

Children and young people up to the age of 17 accounted for 5.91% of total fatalities in Italy. This rate is congruent with the rate observed in a number of the other countries assessed. The reduction in fatalities in this age range showed the highest decrease, with available data from 2015 indicating a 37% and 18% reduction respectively for 0-14 and 15-17-year olds compared to the year before.[159] Data indicate that fatalities were almost evenly divided between urban and rural environments with highways accounting for a small proportion of the remaining fatalities (less than 10%).[160]

The Government is nearing the end of the National Road Safety Plan, *Horizon 2020*, with a targeted reduction of 50% in road fatalities by 2020, and a strategy of "No child should die on the road".[161] It is implementing multiple initiatives, such as the introduction of 30 km/h speed restrictions in urban areas and the implementation of around 1,600 road safety interventions related to infrastructure through targeted programmes.[162]

Total forecast fatalities for children aged up to 17 from road traffic accidents in Italy in 2016 were 194, representing 5.91% of total fatalities of 3,283. Table 17 depicts these summary traffic accident results.

Table 17: Summary traffic accidents Italy - total and 0-17 years-of age

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	**175,791**	249,175	17,309	231,866	3,283	194	138	56
			7%	93%		5.91%	71%	29%

[153] CEIC Data, GDP Per Capita Italy, CEIC website (ceicdata.com), https://www.ceicdata.com/en/indicator/italy/gdp-per-capita
[154] Istituto Nazionale di Statistica (ISTAT) (2017), "Road Incidents in Italy: 2016," https://www.istat.it/en/archive/202807
[155] World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
[156] Ibid.
[157] Ibid.
[158] Organisation for Economic Co-operation and Development (OECD), Country Profile: Italy, OECD website, https://data.oecd.org/italy.htm.
[159] World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
[160] Prati, G., et al. (2017), "Characteristics of Cyclist Crashes in Italy Using Latent Class Analysis and Association Rule Mining," Public Library of Science (PLOS ONE), V(12)2, https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0171484
[161] European Commission (2016), "Road Safety Country Overview: Italy," https://ec.europa.eu/transport/road_safety/sites/roadsafety/files/erso-country-overview-2016-italy_en.pdf.
[162] Ibid.

The total socioeconomic cost from injuries and fatalities in the up-to-17-year age group in Italy is forecast to be $1.32 billion as depicted in Table 18. This table also includes earlier highlighted per capita costs for each contributing category.

Table 18: Socioeconomic cost of road traffic accidents: Italy, 0-17 years of age

Italy	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 36,873,100	$ 4,523,181	$ 3,292,213	$ 107,465,189	$ 1,177,304,040	$ 1,329,457,724
Per capita	$ 0.61	$ 0.07	$ 0.05	$ 1.77	$ 19.44	$ 21.96
Population	60,511,420					

The largest component of the total cost is Human Cost, followed by Production and Medical Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research utilises data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 19.

Table 19: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Italy	412	234	56	51	752

CHILE

Chile has a Gross Domestic Product (GDP) of $247 billion in 2016 and a population of 17.91 million.[163] Around 4.8 million registered vehicles are in circulation, representing an exponential increase of 124% between 2000 and 2014, surpassed only by the accelerated growth in motorcycle registrations of 515% over the same period.[164] Over 77,000 km of road length exist in the Country, with 4.5% of these concessioned, primarily in urban highways in metropolitan regions.[165] It is forecasted that the current high vehicle growth requires an investment of $12.5 billion by 2024 to expand its road network from 12,500 km to 90,000 km, with an optimal size of 155,000 km.[166] The Government has continued infrastructure development, with a $28 billion expansion plan for the period between 2014 and 2020 that includes roads.[167]

61%
ROAD TRAFFIC FATALITIES ON ROADS OUTSIDE OF CHILE'S URBAN AREAS

Chile has a road fatality rate of 11.9 per 100,000 inhabitants, which is marginally lower than Argentina.[168] Fatalities have remained relatively stable at around 2,100 per annum, whilst crashes have increased by 25% since 2000, GDP has grown by 75% and motor vehicles have risen by 150% over the same time period.[169] This sharp increase in vehicle and motorcycle registrations has resulted in a dramatic 25% rise in one year alone between 2014 and 2015.[170]

The vulnerable group of children aged up to 17 accounts for 7.46% of all road fatalities, representing around half of the rate occurring in Argentina.[171] Road crashes remain the primary cause of death for children aged 0-14, with 61% of fatalities also occurring on roads outside of urban areas.[172] Road fatalities increased by 4.6% between 2010 and 2016. Only three countries displayed road fatality increases during this period: Chile, the United States and Sweden.[173] Chile also had one of the lowest seat belt wearing rates in the world at 14%.[174] The Country had the highest fatality rate amongst the eight sample countries assessed in this research on a per-vehicle basis, and ranked fourth globally behind South Africa, Morocco and Cambodia (which were not assessed in this study).[175] The next highest ranked sample country was Argentina, positioned ninth in the world for road fatalities: five countries below Chile.[176]

Government initiatives to curb child fatalities have resulted in the rules to restrain children up to 8 years of age in the rear seats being extended to children up to 12 years of age, and for all cyclists to wear helmets in urban areas only.[177] Amongst other programmes, the Government has adopted the United Nation's *#SaveKidsLives* initiative and implemented other vehicle safety and primary school education actions through CONASET, the National Road Safety Commission.

Total forecast fatalities for children aged up to 17 from road traffic accidents in Chile in 2016 were 160, representing 7.4% of total fatalities of 2,140. Table 20 depicts these summary traffic accident results.

Table 20: Summary traffic accidents Chile – total and for Children Aged up to 17

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2015	**38,843**	156,768	6,968	149,800	2,140	160	128	32
			4%	96%		7.46%	80%	20%

The total socioeconomic cost from injuries and fatalities in the up to 17-year-age group in Chile is forecast to be $560 million as depicted in Table 21. This table also includes per capita costs for each contributing category.

Table 21: Socioeconomic cost of road traffic accidents: Chile, 0-17 years of age

Chile	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 9,346,514	$ 907,144	$ 608,845	$ 77,097,995	$ 472,226,880	$ 560,187,377
Per capita	$ 0.52	$ 0.05	$ 0.03	$ 1.66	$ 26.16	$ 31.03
Population	18,054,730					

The largest component of the total cost is the Human Cost, followed by Medical Costs and Production Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has analysed data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 22.

Table 22: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Chile	409	236	53	49	748

[163] Central Intelligence Agency, Country Profile: Chile, The World Factbook, CIA website, https://www.cia.gov/library/publications/the-world-factbook/geos/print_ci.html.
[164] Organisation for Economic Co-operation and Development (OECD), International Transport Forum, op. cit.
[165] Deloitte (2016), "Point of View Infrastructure Industry and Concessions in Chile," https://www2.deloitte.com/content/dam/Deloitte/cn/Documents/international-business-support/deloitte-cn-ibs-chile-construction-and-concessions-170905.pdf.
[166] Lagorio, J. (2014), "Chile Must Plough US$12.5bn into Road Network – Study," BN Americas (bnamericas.com) website https://www.bnamericas.com/en/news/chile-must-plough-us125bn-into-road-network-study1.
[167] Ibid.
[168] Ibid.
[169] Ibid.
[170] Ibid.
[171] Organisation for Economic Co-operation and Development (OECD) (2015), "Road Safety Annual Report 2015," International Transport Forum, https://www.oecd-ilibrary.org/transport/road-safety-annual-report-2016_irtad-2016-en
[172] World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
[173] OECD (2017), op. cit.
[174] Ibid.
[175] World Health Organization (2004), "World Report on Road Traffic Injury Prevention," op. cit.
[176] Ibid.
[177] Ibid.

BRAZIL

Brazil has a GDP of $1.79 trillion in 2016, and a population of 207 million.[178] The Country also has 94 million vehicles registered and 1.7 million km of road.[179] Brazil's fatality incidence in 2015 was 24.8 per 100,000, which is significantly higher than that of Argentina or Chile.[180] The Government has over time taken steps to reduce this rate, including lowering the blood alcohol concentration limit for drivers from 0.06% to 0.02% in 2008 with Law 11.705, Lei Seca, or the *'Dry Law'*,[181] and fines for risk behaviour such as speeding and non-use of seatbelts and helmets.[182] The impact of road traffic accidents (RTA) on the hospital system in Brazil reflects the scenario of other developing and low-income countries: around 25% of emergency room treatments and 15% of hospitalisations.[183] Between 1990 and 2015, the mortality rate for traffic accidents decreased by 32.8% with the largest reductions registered in pedestrian (-47%) and vehicle occupant fatalities (-41%).[184] This was in contrast to an increase in the mortality rates for motorcycle riders (+49%) and cyclists (+39%).[185] Studies undertaken before and after the introduction of the 1998 Brazilian Traffic Code found a 24.7% drop in immediate road traffic fatalities and a 21.3% reduction in the incidence of RTAs.[186] Other studies indicated that while mortality rates from traffic accidents initially decreased, they began to rise after legislation had been in place for over a year.[187] Research from Brazil with wider applicability indicates that legislative measures implementing a single road safety measure can be effective: legislation decreasing the legal blood alcohol content level from 0.06 g/L to 0.02 g/L correlated significantly with a reduction in traffic fatalities from 16% to 7.2%, and injuries from 2.3% to 1.8%, with higher levels of police enforcement exhibiting more effective legislation.[188]

25%
EMERGENCY ROOM TREATMENTS IN BRAZIL THAT RESULT FROM ROAD TRAFFIC ACCIDENTS

Research indicates that Brazil, Russia, China, India and South Africa (BRICS)[189] all have higher DALY rates than other lower-income countries.[190] Brazil's Government has implemented legislation to tackle road traffic fatalities, including policies on helmet use, child carriage restraints, drink driving 'zero tolerance' and other initiatives.[191] Legislative measures implementing a single road safety measure have also proved effective. The change to Law 11.075, the 'zero tolerance' drink driving law, was credited with making a significant reduction in traffic fatalities and injuries.[192]

Total forecast fatalities for children aged up to 17 from road traffic accidents in Brazil in 2016 were 3,919, representing 8.35% of total fatalities of 46,935. Table 23 depicts these summary traffic accident results.

Table 23: Summary traffic accidents Brazil – total and for Children Aged up to 17

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	-	3,475,450	190,000	3,285,450	46,935	3,919	3,174	745
			5%	95%		8.35%	81%	19%

The total socioeconomic cost from injuries and fatalities in the up to 17-year age group in Brazil is forecast to be $6.79 billion as depicted in Table 24. This table also includes earlier highlighted per capita costs for each contributing category.

Table 24: Socioeconomic cost of road traffic accidents: Brazil, 0-17 years of age

Brazil	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 766,842,872	$ 20,943,380	$ 15,243,712	$ 536,101,877	$ 5,451,190,853	$ 6,790,322,697
Per capita	$ 3.66	$ 0.10	$ 0.07	$ 2.56	$ 26.05	$ 32.44
Population	209,288,280					

The largest component of the total cost is the Human Cost, followed by Medical Costs and Production Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has utilised data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 25.

Table 25: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Brazil	9,190	5,257	1,170	1,114	16,731

178 The World Bank, Country Profile: Brazil, World Bank website (data.worldbank.org), https://data.worldbank.org/country/brazil.
179 The World Bank, Current health expenditure (% of GDP), World Bank website (data.worldbank.org), https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS
180 Chandran, A., et al. (2012) "Road Traffic Deaths in Brazil: Rising Trends in Pedestrian and Motorcycle Occupant Deaths," Traffic Injury Prevention, 13, https://www.ncbi.nlm.nih.gov/pubmed/22414123
181 Campos, V.R., et al. (2013), "The Effect of the New Traffic Law on Drinking and Driving in São Paulo, Brazil," Accident; Analysis and Prevention, https://www.ncbi.nlm.nih.gov/pubmed/22818353
182 De Andrade L., et al. (2014), "Brazilian Road Traffic Fatalities: A Spatial and Environmental Analysis," Public Library of Science (PLOS ONE), https://doi.org/10.1371/journal.pone.0087244
183 Ibid.
184 Ibid.
185 Ibid.
186 Staton, et al., op. cit.
187 Ibid.
188 Ibid
189 Brazil and India are the only BRICS countries included in this study.
190 Ibid.
191 World Health Organization (2015), "Second Global High-level Conference on Road Safety: Time for Results Brasilia", http://www.who.int/violence_injury_prevention/road_traffic/Final_Brasilia_declaration_EN.pdf
192 Staton, C.,et al., op. cit.

ARGENTINA

Argentina has a Gross Domestic Product (GDP) of $545 billion in 2016, and a population of 43.8 million.[193] The Country has approximately 13.8 million vehicles in circulation, based on a per capita penetration of 314 vehicles per 1,000 inhabitants.[194] The Country also has an extensive road network of 182,000 km with 42,000 km part of the federal road network.[195] The three provinces of Buenos Aires, Santa Fe and Cordoba account for 85% of the total registered vehicles.[196] The Government is undertaking a $12 billion investment programme between 2015-2019 and is implementing a $35 billion road strategy by 2027 that will collectively add 2,800 km of new highways, 2,500 of new 'safe roads', 13,000 km of rehabilitated road and 2,500 km of new paving, amongst other areas of activity.[197] In 2016, 13 million vehicles were registered in the Country.[198]

TRAFFIC CRASHES ARE THE LEADING CAUSE OF ACCIDENTAL DEATH FOR YOUNG PEOPLE AGED

15-24

IN ARGENTINA

Between 2009-2015, total motor vehicles increased by 52%, including the addition of 3.5 million motorcycles, which more than doubles the number registered.[199] This could be a contributing factor to the large number of youth road fatalities for ages 15-17, with traffic crashes being the leading cause of accidental death for young people aged 15-24.[200] In longer term studies covering seven trauma centres in Argentina, 20% of children suffering traumatic brain injury were discharged with some degree of disability: half of this group was defined as being severely or moderately disabled, with motor vehicle collisions being one of the primary causes of traumatic brain injury (TBI).[201]

Argentina presents road safety challenges across all areas - vehicles, motorcycles, pedestrians, and cyclists, - with a mortality rate of 12.4 deaths per 100,000 inhabitants. The GDP for Argentina has grown by around 25% since 2009, while fatalities have remained relatively static, despite a 45% growth in motor vehicle registrations over the same period.[202] The 17-24-year old age group represents 17% of the population of Argentina and shows the highest mortality per 100,000 inhabitants at age 18.[203] The age group of up to 17 accounts for 14.5% of fatalities and serious injuries: the highest rate amongst the countries reviewed. Argentina also has the highest DALYs and estimated medical costs.

While non-urban areas accounted for 7% of road crashes in Argentina, they resulted in 42% of fatalities, with urban and suburban areas accounting for the remaining fatalities and over 90% of crashes.[204] The incidence of younger people under 17 killed in road traffic accidents (RTA) in Argentina has remained relatively static at round 14% since the 1990s.[205] The Government is implementing a road safety plan based on the *United Nations Plan for the Decade of Action for Road Safety*, which seeks to reduce fatalities and injuries including education and campaigns targeting vulnerable users such as children. The Safe Road to School programme for example, aims at developing a safe road network to access schools commencing with 15 facilities encompassing over 6,000 students.[206] To increase awareness among students on road safety, around 550 conferences have been held with an attendance of over 100,000 young people in high schools.[207]

[193] CEIC Data, Motor Vehicle Registered Argentina, CEIC website (ceicdata.com), https://www.ceicdata.com/en/indicator/argentina/motor-vehicle-registered.
[194] "Argentina - Motor vehicles," Trading Economics website, https://tradingeconomics.com/argentina/motor-vehicles-per-1-000-people-wb-data.html
[195] "Argentina Developing Road Infrastructure and Road Maintenance," World Highways website (worldhighways.com), http://www.worldhighways.com/categories/maintenance-utility/news/argentina-developing-road-infrastructure-and-road-maintenance/.
[196] Ibid.
[197] Ministerio de Transporte (Brazil), "National Transportation Plan: Status and Impact on Argentina's Development," http://www.ejapo.mrecic.gov.ar/userfiles/v7/23.National%20Transport%20Plan%20-%20v7.compressed.pdf.
[198] World Health Organization, Number of Registered Vehicles, Global Health Observatory Data, http://www.who.int/gho/road_safety/registered_vehicles/number/en/.
[199] OECD, "International Transport Forum," op. cit.
[200] White, J. (2007), "Young road users are at particular risk: What needs to be done to save them?" 2nd UN Global Road Safety Week Stakeholders' Forum, Geneva, https://www.unece.org/fileadmin/DAM/trans/globalroadsafetyweek/docs/SF_JohnWhite.pdf.
[201] Dewan, M.C., et al. (2016), "Epidemiology of Global Pediatric Traumatic Brain Injury: Qualitative Review," World Neurosurgery, https://www.ncbi.nlm.nih.gov/pubmed/27018009.
[202] Ibid.
[203] "Argentina Demographics Profile 2018," Index Mundi website (indexmundi.com), https://www.indexmundi.com/argentina/demographics_profile.html.
[204] World Health Organisation, (2013), Op cit.
[205] Valente, M. (2007), "Argentina: Regional Leader in Traffic Deaths," IPS News Agency website (ipsnews.net), http://www.ipsnews.net/2007/07/argentina-regional-leader-in-traffic-deaths.
[206] Raffo, V., et al. (2014), "Case study: The Argentina Road Safety Project: Lessons learned for the decade of action for road safety, 2011–2020," Global Health Promotion, V(20)4, pp. 20-36 https://doi.org/10.1177/1757975913502690.
[207] Ibid.

Total forecast fatalities for children aged up to 17 from road traffic accidents in Argentina in 2016 were 810, representing 14.59% of total fatalities of 5,550. Table 26 depicts these summary traffic accident results.

Table 26: Summary traffic accidents Argentina – total and for Children Aged up to 17

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	-	454,000	66,000	388,500	5,550	810	625	185
			15%	85%		14.59%	77%	23%

The total socioeconomic cost from injuries and fatalities in the up to 17-year age group in Argentina is forecast to be $4.0 billion as depicted in Table 27. This table also includes earlier highlighted per capita costs for each contributing category.

Table 27: Socioeconomic cost of road traffic accidents: Argentina, 0-17 years of age

Argentina	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 731,221,736	$ 5,368,138	$ 7,814,436	$ 540,955,772	$ 2,794,462,686	$ 4,079,822,768
Per capita	$ 16.52	$ 0.12	$ 0.18	$ 12.22	$ 63.12	$ 92.16
Population	44,271,040					

The largest component of the total cost is the Human Cost, followed by Medical Costs and Production Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has sourced data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 28.

Table 28: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Argentina	3,270	1,945	390	376	5,981

PUERTO RICO

Puerto Rico has a Gross Domestic Product (GDP) of $103 billion in 2016, and a population of 3.5 million.[208] Around 2.23 million vehicles are registered. With 26,800 km of road,[209] the Country's fatality incidence in 2015 was 12.4 per 100,000 inhabitants [210] Speeding-related fatalities comprised the majority cause for deaths, followed by pedestrian fatalities, unrestrained fatalities, alcohol-induced fatalities, motorcycle fatalities, and teen driver fatalities.[211] Puerto Rico has a high rate of child restraint use at over 94% of the population, with studies showing that the use of restraints can reduce fatal infant injuries by 71% overall and 54% in the case of toddlers.[212]

ROAD FATALITIES WERE HALVED IN PUERTO RICO BETWEEN 1997 AND 2004

The Puerto Rican Government has been undertaking Community Traffic Safety Programmes (CTSP) to address vulnerable and high-traffic fatality groups. These national educational campaigns address youth alcohol, pedestrians and child restraints, amongst other areas. Fatalities by age group indicate that children and young people up to 17 years of age were represented by 5% of fatalities for pedestrians and 8% for cyclists.[213] Motorcycle fatalities decreased by 40% between 2008 and 2012, accounting for 14% of all road traffic fatalities at the end of this period, in contrast to 25% at the outset.[214] Between 1997 and 2004 road fatalities were halved through policy changes, vehicle safety enhancements, educational campaigns, and the Puerto Rico Strategic Highway Safety Plan.[215] Vulnerable road users still comprise over one third of all fatal crashes in the country, with policy initiatives seeking to improve this and reduce road traffic fatalities and injuries.[216]

Young drivers between 15 and 20 years of age represent 6-8% of all fatalities.[217] This is higher than the fatality rate evident in half of the sample. The Puerto Rican Government has been engaged in road fatality and injury reduction programmes to reduce road traffic fatalities, particularly in this age group,

[208] The World Bank, GDP per Capita Puerto Rico, World Bank website (data.worldbank.org), https://data.worldbank.org/indicator/NY.GDP.PCAP.CD?locations=PR.
[209] The World Bank, Current health expenditure (% of GDP), World Bank website (data.worldbank.org), https://data.worldbank.org/indicator/SH.XPD.CHEX.GD.ZS.
[210] Lopez-Charneco, M., et al. (2011), "Motor Vehicle Accident Fatalities Trends, Puerto Rico 2000-2007," *Journal of Forensic Sciences*, V(56)5, https://www.ncbi.nlm.nih.gov/pubmed/21827468
[211] Puerto Rico Traffic Safety Commission, (2014), "Puerto Rico Highway Safety Plan FY 2014," https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/pr_fy14hsp.pdf
[212] Ibid.
[213] Ibid.
[214] Ibid.
[215] Ibid
[216] Colucci, B., et al. (2014), "The Strategic Highway Safety Plan in Puerto Rico: Accomplishments During the First Two Years of Its Implementation," http://www.diva-portal.org/smash/record.jsf?pid=diva2%3A920590&dswid=5442
[217] Lopez-Charneco, M., et al. (2011). "Motor Vehicle Accident Fatalities Trends, Puerto Rico 2000-2007," Journal of Forensic Sciences, V(56)5, pp. 1222-1226, https://www.ncbi.nlm.nih.gov/pubmed/21827468
[218] Puerto Rico Traffic Safety Commission, (2014), "Puerto Rico Annual Report FY2014", https://www.nhtsa.gov/sites/nhtsa.dot.gov/files/pr-fy2014ar.pdf

targeting Impaired Driving, Alcohol Consumption, Occupant, Non-occupant Safety, Distracted Driving, Motorcycle Safety and Hazard Mitigation.[218]

Total forecast fatalities for children aged up to 17 from road traffic accidents in Puerto Rico in 2016 were 27, representing 7.80% of total fatalities of 344. Table 29 depicts these summary traffic accident results.

Table 29: Summary traffic accidents Puerto Rico – total and for Children Aged up to 17

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	**216,000**	65,202	4,239	60,963	344	27	22	5
			7%	93%		7.80%	81%	19%

The total socioeconomic cost from injuries and fatalities in the up-to-17-year age group in Puerto Rico is forecast to be $519 million as depicted in Table 30. This table also includes earlier highlighted per capita costs for each contributing category.

Table 30: Socioeconomic cost of road traffic accidents: Puerto Rico, 0-17 years of age

Puerto Rico	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 13,592,123	$ 914,450	$ 613,749	$ 28,634,511	$ 476,030,527	$ 519,785,360
Per capita	$ 4.07	$ 0.27	$ 0.18	$ 8.58	$ 142.64	$ 155.76
Population	3,337,180					

The largest component of the total cost is the Human Cost, followed by Production Costs and Medical Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has sourced data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost for these are depicted in Table 31.

Table 31: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
Puerto Rico	114	69	14	13	210

INDIA

India has a Gross Domestic Product (GDP) of $2.24 trillion in 2016, and a population of 1.3 billion.[219] Around 230 million vehicles are registered and using the 2.2 million km of road,[220] with road length growing at a compound annual growth rate (CAGR) of 3.7% between 2005 and 2015.[221] Although they account for only 2% of the total road network, India's National Highways account for over 33% of road fatalities, with the State Highways accounting for an additional 27.9% in 2016.[222] Studies from New Delhi show that vulnerable road users (pedestrians, cyclists and two-wheeler riders) accounted for 84% of the total fatalities, whereas car occupants were involved in only 3%.[223]

150,000

ROAD TRAFFIC FATALITIES RECORDED IN INDIA IN 2016

India's fatality rate was 11.9 per 100,000 inhabitants in 2016, which is the second highest from the eight countries assessed, with 150,000 fatalities recorded in 2016. Of these fatalities, 10,135 two-wheeled riders were not wearing helmets, and 5,638 vehicle drivers or passengers were not wearing seat belts.[224] Two-wheeled riders represent the largest proportion of fatalities (34.8%) followed by all other vehicle fatalities (29.1%), pedestrian fatalities, and a number of other smaller categories.[225] This reflects the trend in developing countries for road use to be dominated by two-wheel vehicles.[226]

The estimated high socioeconomic costs estimated in this research for India reflect the high number of fatalities and injuries across all ages, including up-to-17-year olds riding motorcycles, who are at greater risk for head injury in road traffic accidents. In India, road traffic injuries are also the second most frequent cause of death in the younger age group of 5-14-year-olds.[227] It is believed that sustained GDP growth between 2000-2016 spurred a rise in motor vehicles that could have contributed to an increase in road fatalities: these rose by 5% per annum between 1980 and 2000, and by 8% until 2006.[228] Although poorly documented, serious injuries are estimated to be between 300,000 and 400,000, but these are likely to be underestimated by as much as 50%.[229]

Children and young people under 18 represent 7% of all road traffic fatalities, with over 10,000 fatalities occurring in 2016 in this age group.[230] The Government is implementing a national Road Safety Policy that is multi-pronged and encompasses promoting awareness; encouraging the safer use of roads; creating safer drivers and vehicles, and other safety enforcing laws. This has been assisted with the passing of The Motor Vehicles (Amendment) Bill, 2017, which introduces stricter penalties for traffic rule violations to support enforcement and compliance.[231]

Total forecast fatalities for children aged up to 17 from road traffic accidents in India in 2016 were 10,622, representing 7.04% of total fatalities of 150,785. Table 32 depicts these summary traffic accident results.

[219] The World Bank, India Country Profile, World Bank website (data.worldbank.org), https://data.worldbank.org/country/india
[220] Ministry of Statistics and Programme Implementation, (2017), "Annual Report 2016-17", http://mospi.nic.in/sites/default/files/publication_reports/mospi_Annual_Report_2016-17.pdf
[221] Government of India, Ministry of Road Transport and Highways (2016), "Road Accidents in India–2016," http://www.indiaenvironmentportal.org.in/files/file/Road%20accidents%20in%20India%202016.pdf
[222] Ibid.
[223] Tiwari G., et al. (2000), "Evaluation of Capacity Augmentation Projects of National Highways and State Highways," Ministry of Surface Transport Report, GOI, New Delhi.
[224] Ibid.
[225] Transportation Research and Injury Prevention Programme (TRIPP) (2016), "Road Safety in India: Status Report 2016," http://tripp.iitd.ernet.in/assets/publication/2016_India_Safety_status1.pdf
[226] Mallikarjuna, G.P., op. cit.
[227] Ibid.
[228] Jagnoor, J., et al. (2015), "The Impact of Road Traffic Injury in North India: A Mixed-methods Study Protocol," BMJ Open, https://www.ncbi.nlm.nih.gov/pubmed/26289452
[229] Ibid.
[230] Ibid.
[231] Indian Parliament (2017), "The Motor Vehicles (Amendment) Bill, 2017," http://164.100.47.4/BillsTexts/LSBillTexts/PassedLoksabha/214C_2016_LS_Eng.pdf

Table 32: Summary traffic accidents India – total and for Children Aged up to 17

Year	Accidents	Injured	Serious injuries	Mild/Minor injuries	Fatalities	Child fatalities	Male child fatalities	Female child fatalities
2016	**480,652**	494,624	179,421	315,204	150,785	10,622	8,347	2,275
			36%	64%		7.04%	79%	21%

The total socioeconomic cost from injuries and fatalities in the up to 17 year-age group in India is forecast to be $5.8 billion as depicted in Table 33. This table also includes earlier highlighted per capita costs for each contributing category.

Table 33: Socioeconomic cost India: 0-17 years of age

India	Medical cost	Property cost	Administrative cost	Production cost	Human cost	TOTAL
Total cost	$ 248,428,455	$ 9,751,576	$ 14,195,438	$ 525,182,613	$ 5,076,325,305	$ 5,873,883,387
Per capita	$ 0.19	$ 0.01	$ 0.01	$ 0.39	$ 3.79	$ 4.39
Population	1,339,180,130					

The largest component of the total cost is the Human Cost, followed by Production Costs and Medical Costs.

Current research and literature have a lacuna in the estimation of the psychological impact of road traffic accident on children 0-17. This research has sourced data from multiple sources in the target countries to estimate lost days due to:

- Psychiatric disorders
- Depression
- Post-traumatic stress
- Anxiety

The consolidated days lost are depicted in Table 34.

Table 34: Days lost from psychological 'injuries' inflicted from road traffic accidents for 0-17 age group

Country	Psychiatric disorder	Depression	Post traumatic stress	Anxiety	Total
India	28,537	16,518	3,554	3,406	52,014

SUMMARY

Reducing road traffic accidents, injuries and fatalities in children requires a multi-faceted approach: *"There are a broad range of factors that can contribute towards better outcomes for victims of road traffic collisions. The disparity between low and high income countries may suggest that factors such as the quality of road infrastructure, vehicle standards, emergency medical care and educational intervention all have a significant impact."*[232] This research estimates that the socioeconomic cost as a result of road traffic accidents involving children is $21.8 billion for the countries assessed - Argentina, Brazil, Chile, Spain, France, India, Italy and Puerto Rico -, but the full impact is wider, deeper and not fully quantifiable.

Many governments are actively engaged in programmes to address road safety. The imperative is for these to persist and expand, as without further initiatives by policy and decision makers to address traffic accidents in the eight countries studied, fatalities and injuries are likely to remain at their present levels or increase. A growth in GDP and motorisation in many LMICs will continue to place pressure on traffic management to provide a safe environment for vulnerable groups, particularly for children under the age of 17.

The opportunities to reduce the incidence and impact of road accidents on 0-17-year-olds are numerous. The socioeconomic costs including medical, production and human cost on countries, shows us that greater investment in infrastructure and educational campaigns is justified, particularly in contrast to the result of not doing so, and the irreversible effects it would inflict on individuals, especially children and their communities.

[232] Des McKibbin (2016), "Examining Best Practice in Road Safety Management," Northern Ireland Assembly, Research and Information Service Research Paper, http://www.niassembly.gov.uk/globalassets/documents/raise/publications/2016-2021/2016/infrastructure/6416.pdf.

ABERTIS

Abertis is one leading international toll road management group in terms of kilometres managed, with over 8,500 kilometres of high-capacity and quality roads, and operations in 15 countries across Europe, America and Asia.

In addition to being the number one national operator in countries such as Spain, Chile, and Brazil, Abertis also has an important presence in France, Italy and Puerto Rico.

The company has a stake in the indirect management of over 200 kilometres. Thanks to the Group's internationalisation strategy over recent years, over 70% of Abertis' revenues comes from outside Spain, with significant contributions from France, Brazil and Chile.

Road safety is a top priority for Abertis. The company continually invests in technology and smart engineering to guarantee the safety, comfort, speed and ease of its customers' travel when they choose the Group's toll roads.

The organization's ambition is to reach zero fatalities in all toll roads with 100% safe high-quality roads. Cross-cutting teams from all disciplines and areas are working together in the Group's global Road Safety programme to ensure the knowledge and application of the best practices in road safety on Abertis' toll roads. Thanks to this strategy, the main units of the Group have continuously improved their accident and fatality rates in recent years.

Committed to research and innovation, Abertis combines advances in high capacity infrastructure with new technologies for innovative solutions that meet future mobility challenges.

ABERTIS FOUNDATION

The Abertis Foundation was established in 1999 as a non-profit organisation, with the objective of responding to the impact that the Abertis Group's economic activity has in the different territories and countries where is present.

The Foundation has always prioritised actions related to road safety, the environment and social action, in line with the Abertis Corporate Social Responsibility Strategic Plan.

The Abertis Foundation carries out activities aimed at improving road safety, with the objective of reducing the accident rate. These activities are geared towards road safety education for children, raising awareness in young people and preventing accidents in elderly drivers.

It also promotes social activities for the most vulnerable groups, incorporating said activities into their road safety activities encouraging sustainability and environmental care. This is because its headquarters, Castellet Castle, is the International UNESCO Centre for Mediterranean Biosphere Reserves.

Furthermore, it supplements the Abertis Group activities in the countries where it operates: Spain, France, Puerto Rico, Chile, Argentina and Brazil, and contributes to the development of the International Network of Abertis Chairs.

UNICEF

UNICEF is a global organization promoting the rights and well-being of children, particularly the most vulnerable, by means of dedicated practical action across the world.

A core member of the Child Health Initiative and partner of the Abertis Foundation and the Guttman Institute, UNICEF is committed to ensuring a safe and healthy journey to school for all children. Its Child Road Traffic Injury Prevention Program aims to protect children on the roads through action aimed at:

- Influencing road safety policies
- Improving infrastructure
- Advancing service responses to traffic accidents
- Raising awareness amongst road users

UNICEF carries out Road Safety programs in several developing countries, including Jamaica and the Philippines as part of the newly formed Rights of Way alliance.

GUTTMANN INSTITUTE

The Guttman Institute is a private not-for-profit foundation and specialist hospital that provides expert medical treatment and rehabilitation services for individuals with spinal injuries, brain damage and other neurological disabilities. It provides comprehensive services and personalized assistance to help patients' recovery and reincorporation. Operating at the highest possible human, scientific and technical level, The Guttman Institute has become a worldwide leader in neuro-rehabilitation.

The United Nations Sustainable Development Goals (SDGs) are 17 interconnected targets that all UN Member States have agreed to try to achieve by 2030, centered on ending poverty, protecting the planet and ensuring that all people enjoy peace and prosperity. Building on the Millennium Development Goals, the SDGs address new areas of action including climate change, economic inequality, innovation and sustainable consumption. They provide a framework for action for UN member states, and the organizations and entities operating within them, committed to achieving a more sustainable world for the future.

The Rights of Way initiative contributes directly to helping reach Sustainable Development Goals 3 and 11, ensuring good health and well-being for individuals and making cities more inclusive, safe and resilient. Specifically, its actions help reach the targets 3.6 and 11.2.

Target 3.6 pledges to halve the number of global deaths and injuries from road traffic accidents by 2020.

Target 11.2 aims to provide access to safe, affordable, accessible and sustainable transport systems for all, improving road safety by expanding public transport, with special attention to the needs of those in vulnerable situations, women, children, persons with disabilities and older persons, by 2030.

In support of the SDGs, and to promote the rapid uptake of proven road safety initiatives worldwide, Abertis embraces the United Nations Global Road Safety Targets. These include ensuring that all new roads are built to at least a 3-star standard for all road users (Goal 3), and that more than 75% of travel is on the equivalent of 3-star or better roads for all road users by 2030 (Goal 4). Abertis has already accomplished Target 4 in accordance with the International Road Assessment Programme (iRAP) methodology.

The Rights of Way initiative was born as a result of the alliance formed between the Abertis Foundation, UNICEF and the Guttman Institute and was presented during the General Assembly of the United Nations in New York on September 25th 2018. Establishing a $3 million fund dedicated entirely to improving child road safety and the prevention of injury, the partnership is committed to raising public awareness, supporting research and improving public policy over the course of the next three years.

Rights of Way is focused on preserving children's right to a safe journey to school, particularly in developing countries where children are at greater risk of injury or death because of incidents on the road. Amongst other actions, the alliance is currently helping to improve immediate and ongoing medical assistance for child victims of road traffic accidents.

foundation abertis

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