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The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013

Juanita A Haagsma,[1,60] Nicholas Graetz,[1] Ian Bolliger,[1] Mohsen Naghavi,[1] Hideki Higashi,[1] Erin C Mullany,[1] Semaw Ferede Abera,[2,3] Jerry Puthenpurakal Abraham,[4,5] Koranteng Adofo,[6] Ubai Alsharif,[7] Emmanuel A Ameh,[8] Walid Ammar,[9] Carl Abelardo T Antonio,[10] Lope H Barrero,[11] Tolesa Bekele,[12] Dipan Bose,[13] Alexandra Brazinova,[14] Ferrán Catalá-López,[15] Lalit Dandona,[1,16] Rakhi Dandona,[16] Paul I Dargan,[17] Diego De Leo,[18] Louisa Degenhardt,[19] Sarah Derrett,[20,21] Samath D Dharmaratne,[22] Tim R Driscoll,[23] Leilei Duan,[24] Sergey Petrovich Ermakov,[25,26] Farshad Farzadfar,[27] Valery L Feigin,[28] Richard C Franklin,[29] Belinda Gabbe,[30] Richard A Gosselin,[31] Nima Hafezi-Nejad,[32] Randah Ribhi Hamadeh,[33] Martha Hijar,[34] Guoqing Hu,[35] Sudha P Jayaraman,[36] Guohong Jiang,[37] Yousef Saleh Khader,[38] Ejaz Ahmad Khan,[39,40] Sanjay Krishnaswami,[41] Chanda Kulkarni,[42] Fiona E Lecky,[43] Ricky Leung,[44] Raimundas Lunevicius,[45,46] Ronan Anthony Lyons,[47] Marek Majdan,[48] Amanda J Mason-Jones,[49] Richard Matzopoulos,[50,51] Peter A Meaney,[52,53] Wubegzier Mekonnen,[54] Ted R Miller,[55,56] Charles N Mock,[57] Rosana E Norman,[58] Ricardo Orozco,[59] Suzanne Polinder,[60] Farshad Pourmalek,[61] Vafa Rahimi-Movaghar,[62] Amany Refaat,[63] David Rojas-Rueda,[64] Nobhojit Roy,[65,66] David C Schwebel,[67] Amira Shaheen,[68] Saeid Shahraz,[69] Vegard Skirbekk,[70] Kjetil Søreide,[71] Sergey Soshnikov,[72] Dan J Stein,[73,74] Bryan L Sykes,[75] Karen M Tabb,[76] Awoke Misganaw Temesgen,[77] Eric Yeboah Tenkorang,[78] Alice M Theadom,[79] Bach Xuan Tran,[80,81] Tommi J Vasankari,[82] Monica S Vavilala,[57] Vasiliy Victorovich Vlassov,[83] Solomon Meseret Woldeyohannes,[84] Paul Yip,[85] Naohiro Yonemoto,[86] Mustafa Z Younis,[87] Chuanhua Yu,[88,89] Christopher J L Murray,[1] Theo Vos,[1] Shivanthi Balalla,[28] Michael R Phillips[90]

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For numbered affiliations see end of article.

Correspondence to
Dr Juanita A Haagsma, Institute for Health Metrics and Evaluation, University of Washington, Seattle, WA, USA; jhaagsma@uw.edu

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ABSTRACT

Background The Global Burden of Diseases (GBD), Injuries, and Risk Factors study used the disability-adjusted life year (DALY) to quantify the burden of diseases, injuries, and risk factors. This paper provides an overview of injury estimates from the 2013 update of GBD, with detailed information on incidence, mortality, DALYs and rates of change from 1990 to 2013 for 26 causes of injury, globally, by region and by country.

Methods Injury mortality was estimated using the extensive GBD mortality database, corrections for ill-defined cause of death and the cause of death ensemble modelling tool. Morbidity estimation was based on inpatient and outpatient data sets, 26 cause-of-injury and 47 nature-of-injury categories, and seven follow-up studies with patient-reported long-term outcome measures.

Results In 2013, 973 million (uncertainty interval (UI) 942 to 993) people sustained injuries that warranted some type of healthcare and 4.8 million (UI 4.5 to 5.1) people died from injuries. Between 1990 and 2013 the global age-standardised injury DALY rate decreased by 31% (UI 26% to 35%). The rate of decline in DALY rates was significant for 22 cause-of-injury categories, including all the major injuries.

Conclusions Injuries continue to be an important cause of morbidity and mortality in the developed and developing world. The decline in rates for almost all injuries is so prominent that it warrants a general statement that the world is becoming a safer place to live in. However, the patterns vary widely by cause, age, sex, region and time and there are still large improvements that need to be made.

INTRODUCTION

Since the late 1940s the use of epidemiological analyses to assess the gains of prevention of injury has been advocated, reflecting the changing view of injuries as preventable events.[1] These epidemiological analyses entail the use of data to quantify the injury problem and assess causative factors to guide the development of preventive measures and to enable periodic evaluation of the effectiveness of instituted prevention programmes.[1] For many decades, injury epidemiologists have largely relied on mortality data.[2] However, since the launch of the disability-adjusted life year (DALY) in 1993, the burden of disease concept has become more widely adopted by countries and health development agencies.[3] The DALY measures the burden of disease; it aggregates the total health loss at the population level into a single index by summarising premature mortality in years of life lost (YLLs), and non-fatal health outcomes in years lived with disability (YLDs).[4] Thus, the DALY provides a more comprehensive measure of the relative magnitude of different health problems for health planning purposes.[5 6] This information serves as a crucial input to facilitate policy decision-making on prevention and control through allowing comparisons of the health impact of different diseases and injuries and related risk factors over time and between countries.

In the first Global Burden of Disease and Injury (GBD) study, commissioned by the World Bank in the early 1990s, the DALY was used to describe the burden of disease of 98 diseases, 9 injuries and 10 health risk factors for eight world regions.[7] This study, and subsequent updates by WHO, showed that injury was a substantial cause of morbidity and mortality in the developed and developing world.[7–10] A new GBD study, the GBD 2010, commenced in 2007. This study used enhanced methodology and interactive visualisation tools to provide regional and global estimates for 263 diseases, 28 causes of injury, 67 risk factors, 20 age groups, both sexes and 187 countries in 21 world regions from 1990 to 2010.[11] Apart from the expansion of cause list, risk factor list and regional detail, a notable methodological change was the change from incidence-based to prevalence-based YLDs.[12] The key results of the GBD 2010 study were published in 2012, including injury results.[11–14] However, a detailed description of the GBD injury methods and results has not yet been published. To provide policy-makers, researchers and other decision-makers with the most current estimates of population health, the GBD estimates are being updated annually starting with the year 2013 (GBD 2013). At every update the whole time series from 1990 onwards is estimated again in order to maintain internal consistency and comparability after the addition of new data and revision of some parts of the methods.

The aim of this study is to provide an overview of the methods, and results of injury mortality, incidence and DALYs from the GBD 2013 study, with detailed information on the range of causes of injuries globally and by country including trends in their occurrence.

METHODS

Disability-adjusted life years

The DALY is calculated by adding YLLs and YLDs. YLLs are calculated by multiplying deaths by the remaining life expectancy at the age of death from a standard life table chosen as the norm for estimating premature mortality in GBD. YLDs are calculated by multiplying the number of prevalent cases with a certain health outcome by the disability weight assigned to this health outcome. A disability weight reflects the magnitude of the health loss associated with an outcome and it has a value that is anchored between 0, equivalent to full health, and 1, equivalent to death.

GBD injury codes and categories

The International Classification of Diseases (ICD) was used to classify injuries because it is the standard diagnostic tool for epidemiology. In the GBD study injury incidence and death are defined as in ICD-9 codes E000-E999 and ICD-10 chapters V to Y. Chapters S and T in ICD-10 and codes 800–999 in ICD-9 are used for estimation of injury morbidity. There is one exception: deaths and cases of alcohol poisoning and drug overdoses are classified under drug and alcohol use disorders.

For GBD 2013, injury was categorised into 26 mutually exclusive and collectively exhaustive external cause-of-injury categories. For our morbidity analysis, each cause-of-injury category was further divided among 47 mutually exclusive nature-of-injury categories (see online supplementary annex tables 1.1 and 1.2). Some injuries are trivial and unlikely to account for an important number of DALYs (eg, small bruises, scratches); these injuries were excluded from this study by restricting our morbidity analysis to cases warranting some form of healthcare in a system with full access to healthcare. We have included cases with injuries that did not receive care in areas with restricted access to healthcare, but that would have warranted some type of healthcare in a system with full access to healthcare.

Mortality

Online supplementary annex table 2.1 summarises the number of site-years of death from vital registration, verbal autopsy, mortality surveillance, censuses, surveys, hospitals, police records and mortuaries by the 21 GBD world regions. A site-year is defined as a country, state or other subnational geographical unit contributing cause of deaths data in a given year. The overall approach to estimate causes of death has been described elsewhere.[13 15] Briefly, the first step is the mapping of all data sources into the GBD cause list of diseases and injuries. Second, adjustments are made for ill-defined cause of death or garbage codes. Third, ensemble models with varying choice of covariates and mathematical models are run using the GBD cause of death ensemble modelling (CODEm) software to derive estimates by age, sex, country, year and cause. Police and crime reports are data sources uniquely used for the estimation of deaths from road injury, self-harm and interpersonal violence. The police data were collected from published studies, national agencies and institutional surveys such as the United Nations Crime Trends Survey and the WHO Global Status Report on Road Safety Survey. For countries with vital registration data we did not use police records, except if the recorded number of road injury and interpersonal violence deaths from police records exceeds that in the vital registration.

In countries for which we did not have vital registration data hospital and burial/mortuary data were used to assess patterns and proportions of deaths from each injury cause of death by year, age, sex and country (ie, cause fractions). In these cases, the proportion of injury deaths due to specific causes were transformed into proportions of all causes by multiplying by the proportions of all deaths due to injuries estimated in CODEm.

Online supplementary annex section 3 describes the preparation of cause of death data, the redistribution of garbage codes, the modelling process and covariates, and the separate analyses of mortality from armed conflicts and natural disasters in more detail.

Years of life lost

We calculated YLLs by multiplying deaths by the residual expected individual life span at the age of death as derived from the GBD 2013 standard model life table.[13]

Morbidity

Estimating the non-fatal health consequences of injuries is complex as it needs to take into account short-term and long-term disability for a large range of nature-of-injury categories that can arise from each cause of injury. Figure 1 shows the flow diagram of this process. Our strategy was to first apply DisMod-MR 2.0 (a descriptive epidemiological meta-regression

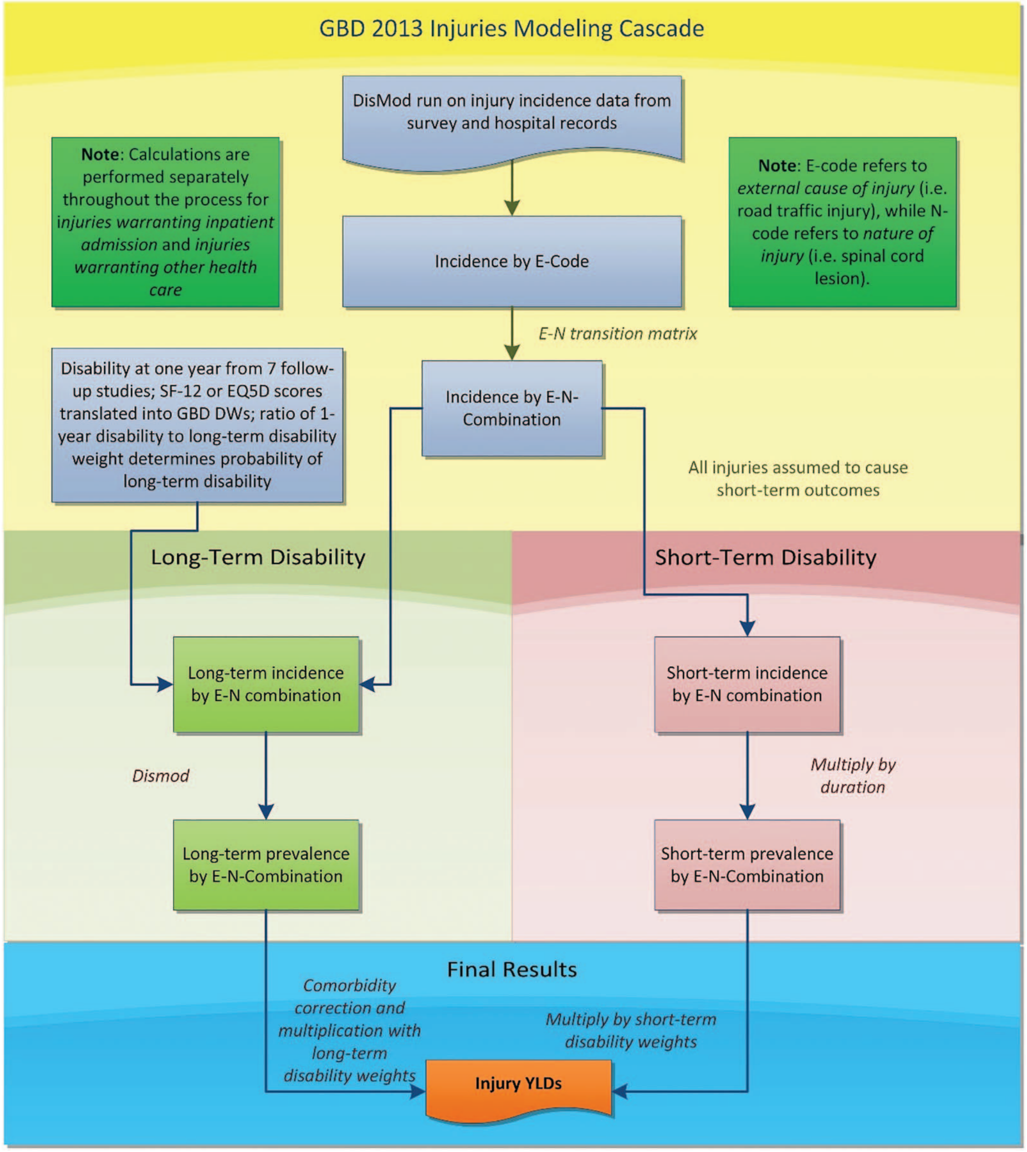

Figure 1 Flowchart of Global Burden of Disease Injury years lived with disability (YLD) estimation.

tool that uses an integrative systems modelling approach to produce simultaneous estimates of incidence, prevalence, remission and mortality) to injury incidence data from emergency department (ED) and hospital records and survey data to produce cause-of-injury incidence by country, year, age and sex. We estimated incidence of injury warranting inpatient admission ('inpatient care') and incidence of injury warranting other types of care ('outpatient care') for all cause-of-injury categories.[16] Injuries warranting inpatient care refer to injury cases of sufficient severity to require inpatient care if there are no restrictions in access to healthcare. Outpatient care refers to injury cases of sufficient severity to require healthcare attention but not hospitalisation. This category includes ED visits. Second, we imposed a hierarchy to select the nature-of-injury category that leads to the largest burden when an individual experiences multiple injuries. Third, using hospital and ED data we created two different matrices to estimate the proportions of incident cases in each of the 26 cause-of-injury categories that resulted in each of 47 nature-of-injury categories. One cause-nature-of-injury matrix was for inpatient injuries, the other for outpatient injuries. Applying these matrices to our cause-of-injury incidence from step 1, we produced incidence of inpatient and outpatient injuries by cause and nature of injury. Fourth, we estimated short-term disability by nature-of-injury category for all incident cases of inpatient and outpatient injuries. We estimated the average duration for each nature of injury category and derived short-term prevalence by multiplication of incidence and duration. Fifth, we estimated the proportion of cases that result in permanent disability for each nature-of-injury category. We then applied DisMod-MR 2.0 to estimate the long-term prevalence for each combination of cause-of-injury and nature-of-injury from incidence and the long-term mortality risk in cases with long-term disability. After correction for comorbidity with other non-fatal diseases, YLDs were calculated as prevalence times a disability weight.

Online supplementary annex section 4 describes the data sources and our strategy to assess the non-fatal burden of disease in more detail.

Uncertainty

Burden of disease estimates have varying degrees of uncertainty arising from input data, the data adjustments and the statistical models. We have propagated uncertainty from all these sources using standard GBD methods of repeating all calculations 1000 times, each time drawing from distributions rather than point estimates for all the relevant parameters in our models.[12] For the injury mortality estimates the estimation of model uncertainty is inherent to the ensemble modelling method.[13]

All rates of deaths and DALYs we present are age-standardised using the revised GBD 2013 standard population.[15]

RESULTS

Incidence, mortality and burden of disease of injuries in 2013

In 2013, we estimated that 973 million (uncertainty interval (UI) 942 to 993) people sustained injuries that warranted some type of healthcare and 4.8 million (UI 4.5 to 5.1) people died from injuries. Major causes of injury death were road injury (29.1%), self-harm (17.6%), falls (11.6%) and interpersonal violence (8.5%). Of the people who sustained injuries that warranted some type of healthcare, 5.8% (56.2 million; UI 55.6 to 57.3) warranted inpatient care, of whom 38.5% (21.7 million; UI 21.3 to 22.0) sustained fractures (see online supplementary annex table 5.1). Of the patients who warranted outpatient care 75.2% sustained minor injuries (689 million; UI 672.0 to 712.8).

Table 1 shows the global incidence and deaths by cause of injury.

Injuries accounted for 10.1% (UI 9.5 to 10.8) of the global burden of disease in 2013. YLLs were responsible for 85.2% (UI 81.2 to 88.7) of injury DALYs. The proportion of DALYs due to disability (YLD) is much higher for collective violence (69.1%; UI 54.3 to 81.8), falls (46.4%; UI 38.3 to 54.1) and forces of nature (43.0%; UI 26.0 to 56.7). The main contributors to injury DALYs are road injuries (29.3%; UI 26.4 to 32.2), self-harm (14.0%; UI 11.8 to 16.2), falls (12.0%; UI 9.8 to 14.1), drowning (8.7%; UI 6.3 to 11.2) and interpersonal violence (8.4%; UI 6.5 to 10.4).

Table 2 shows the global YLLs, YLDs and DALYs by cause of injury.

Table 3 shows the global age-standardised YLL, YLD and DALY rates by cause of injury. DALY rate refers to the number of DALYs per 100 000 population.

The contribution of cause-of-injury category DALY rates to the total injury DALY rates differ by year, age category, sex and region. Figures 2–5 show the DALY rates by cause-of-injury, for men and women, and by GBD world regions in 2013 separately for age categories 0–14 years, 15–49 years, 50–79 years and 80+ years, respectively. In all regions injury rates are much higher in men than in women with the exception of the 80 years and older age group where the sex differential largely disappears. In boys under the age of 15 years, DALY rates per 100 000 vary from a low of 468.4 (UI 427.7 to 509.7) in western Europe to a high of 6471.4 (UI 4197.1 to 8680.9) in central sub-Saharan Africa. In girls under the age of 15 years DALY rates vary from a low of 307.4 (UI 277.9 to 336.8) in western Europe to a high of 4788.1 (UI 3260.4 to 6354.7) in central sub-Saharan Africa. Road injuries are an important driver of DALY injury rates in children across the globe but with a large variation in the rates. The DALY rate for road injuries is 9.7 times higher in boys and 9.1 times higher in girls in central sub-Saharan Africa compared with high-income Asia Pacific. Drowning shows large variations with highest rates in sub-Saharan African and Asian regions. Even in children, the high rates of homicide in Latin America and, particularly, in tropical and central Latin America stand out.

In younger adults aged 15 years to 49 years, DALY rates in men vary from a low of 2651 per 100 000 population (UI 2427 to 2904) in western Europe to a high of 10 780 (UI 10 157 to 11 390) in eastern Europe. In women, rates range from a low of 798 (UI 712 to 907) in Australasia to a high of 3268 (UI 2608 to 3985) in South Asia. This is the peak age category for road injuries in all regions but with an eightfold difference in rates between high-income Asia Pacific and western sub-Saharan Africa. Rates in high-income North America are around 70% higher than in western Europe, Australasia and high-income Asia Pacific with generally higher rates for most injuries, but particularly so for interpersonal violence. High rates in Latin America and sub-Saharan Africa are driven by road injuries and interpersonal violence. Eastern Europe and Central Asia have particularly high rates of drowning and self-harm (figure 3). The high rate of fire injuries in South Asian women stands out.

Patterns of injury DALY rates in the age group 50–79 years follow similar patterns as those in the younger adult age group but the differences between regions and between men and women are less pronounced: DALY rates in high income regions are higher and those in other regions are lower. The lowest DALY rates per 100 000 for men (2873; UI 2668 to 3070) and women (1574.2; UI 1429 to 1720) are seen in Australasia while South Asia has the highest rates in men (7525; UI 6880 to 8172) and in women (4798; UI 4421 to 5173). Falls become a more prominent cause of DALYs in this age group and self-harm becomes a greater cause than violence in most regions. Fire injuries and drowning are sizeable causes in sub-Saharan Africa, eastern Europe and South Asia.

Falls are the dominant cause of injury DALY rates in the elderly. An ageing cohort of people with long-term disabilities from past wars and disasters is quite prominent in Andean Latin America, South-East Asia, North Africa and the Middle East and sub-Saharan African regions. At older ages the share of road injuries in pedestrians increases.

With regards to YLDs, the disability component of the DALY, in 2013, nature-of-injury categories fracture of patella, tibia, fibula or ankle (26.6%; UI 26.0 to 27.1) and multiple significant injuries (11.1%; UI 10.8 to 11.4) contributed most to the global YLDs of injuries. The relative contribution of nature-of-injury YLDs to cause-of-injury YLDs differs for each cause of injury. For some cause-of-injury categories one or two nature-of-injury categories are responsible for the majority of YLDs (eg, fire, heat and hot substances, and burns), whereas for others a variety of nature-of-injury categories contribute to the cause-of-injury categories. The distribution of nature-of-injury YLDs by cause-of-injury category also differs by sex, age category, injuries warranting inpatient versus outpatient care and high/low income countries.

Changes between 1990 and 2013—all injury

Between 1990 and 2013 injury DALY rates have declined by 30.9%, an annualised rate of decline of 1.6% (table 3). For communicable, maternal, neonatal and nutritional disorders and non-communicable disease DALY rates declined by 42.2% (UI −45.0 to −40) and 14.5% (UI −17.3 and −11.6), respectively. Rates of change for injury DALY rates vary widely across regions ranging from a decrease of 54.8% (UI −64.2 to −44.1) in Andean Latin America to an increase of 6.4% in Oceania (UI −24.1 to 48.3) (figure 6). All but four regions showed a significant decline with Oceania, and West, central and southern sub-Saharan Africa the exceptions. Among high-income regions, western Europe and Australasia showed the largest declines. East

Table 1 Global incidence and deaths by cause of injury with 95% UI, 2013

	Incidence outpatient injuries*		Incidence inpatient injuries*			
Cause of injury	(Millions)	Rate per 100 000	(Millions)	Rate per 100 000	Deaths (thousands)	Death rate
Transport injuries	102 (100–105)	1176 (1152–1209)	12.3 (12.1–12.7)	142 (139–146)	1483 (1365–1589)	20.7 (19.1–22.2)
Road injuries	86 (84–88)	990 (968–1017)	11.0 (10.8–11.3)	128 (125–131)	1396 (1286–1493)	20.7 (19.1–22.2)
Other transport injuries	17 (16–18)	186 (178–198)	1.3 (1.3–1.4)	15 (14–16)	87 (72–97)	1.2 (1.0–1.4)
Unintentional injuries (not transport injuries)	758 (741–780)	8377 (8183–8612)	39.9 (39.4–40.2)	435 (431–439)	2007 (1857–2183)	28.0 (25.9–30.5)
Falls	134 (131–137)	1435 (1409–1455)	20.5 (20.1–20.9)	220 (217–223)	556 (449–611)	7.8 (6.3–8.5)
Drowning	0.9 (0.8–1.0)	10 (9–12)	0.8 (0.8–0.8)	9 (9–9)	368 (311–515)	5.1 (4.3–7.2)
Fire, heat and hot substances	31 (9–32)	337 (320–355)	2.9 (2.8–3.1)	32 (31–34)	238 (199–283)	3.3 (2.8–4.0)
Poisonings	2.8 (2.7–2.8)	31 (30–32)	0.5 (0.5–0.5)	6 (5–6)	98 (70–111)	1.4 (1.0–1.5)
Exposure to mechanical forces	383 (365–402)	4185 (3997–4404)	4.1 (4.0–4.1)	45 (44–45)	197 (178–245)	2.8 (2.5–3.4)
Adverse effects of medical treatment	13 (13–13)	140 (137–141)	7.3 (7.3–7.4)	81 (80–82)	142 (108–166)	2.0 (1.5–2.3)
Animal contact	62 (60–64)	709 (687–730)	1.5 (1.4–1.5)	17 (16–17)	80 (62–139)	1.1 (0.9–1.9)
Foreign body	39 (38–40)	467 (460–473)	1.0 (1.0–1.0)	12 (12–12)	166 (115–219)	2.3 (1.6–3.1)
Other unintentional injuries	94 (92–95)	1062 (1046–1080)	1.2 (1.2–1.3)	14 (14–14)	163 (144–180)	2.3 (2.0–2.5)
Intentional injury	30 (29–31)	336 (329–343)	3.0 (3.0–3.1)	34 (33–34)	1247 (1067–1391)	17.4 (14.9–19.4)
Self-harm	1.7 (1.7–1.8)	19 (19–19)	1.5 (1.5–1.5)	17 (17–17)	842 (718–939)	11.8 (10.0–13.1)
Interpersonal violence	28 (28–29)	317 (310–324)	1.5 (1.5–1.5)	17 (17–17)	405 (299–497)	5.7 (4.2–6.9)
War and disaster	26 (15–56)	383 (224–922)	1.0 (0.6–1.9)	17 (10–29)	50 (34–89)	0.7 (0.2–1.2)
Exposure to forces of nature	5.4 (3.5–11.5)	76 (43–149)	0.3 (0.2–0.5)	4 (2–6)	19 (14–32)	0.3 (0.2–0.4)
Collective violence and legal intervention	21 (12–47)	307 (179–672)	0.8 (0.4–1.5)	13 (8–22)	31 (20–57)	0.4 (0.3–0.8)
Total	916 (895–951)	8257 (8025–8645)	56.2 (55.6–57.3)	461 (453–473)	4787 (4508–5073)	66.9 (63.0–70.9)

*Inpatient injuries refer to injuries warranting hospital admission and outpatient injuries refer to injuries warranting some other type of care.
UI, uncertainty interval.

Asia, North Africa and the Middle East, Central Europe and Southeast Asia ranked second to fifth in terms of largest decrease in injury DALY rates.

Table 4 shows the per cent change in incidence, YLL and YLD rates by cause of injury. The patterns of change in injury DALY rates were similar between men and women. Over the period 1990–2013 the rate of YLDs from injuries decreased by −37.0% (UI −30.0 to −45.4) while YLLs due to injuries decreased only by −29.6% (UI −24.1 to −33.6). The rate of incidence of all injuries declined at a slower pace of −19.5% (UI −14.7 to −23.9) over the same period.

The change in incidence rates for all causes of injury has been smaller than the change in YLD or YLL rates. For transport injuries and intentional injuries the change in YLD rates has been greater than the change in YLL rates but the opposite is the case for unintentional non-transport injuries.

Table 2 Global YLLs, YLDs and DALYs, 2013 and per cent change in DALYs 1990–2013 with 95% UI, by cause of injury

Cause of injury	YLLs (in millions)	YLDs (in millions)	DALYs (in millions)	Percent change DALYs, 1990–2013
Transport injuries	68.8 (63.2–73.7)	10.2 (7.5–13.4)	79.0 (72.1–85.1)	**11.3 (1.2 to 18.7)**
Road injuries	64.7 (59.3–69.2)	8.6 (6.3–11.3)	73.3 (66.9–78.7)	**13.6 (2.7 to 21.2)**
Other transport injuries	4.1 (3.4–4.6)	1.6 (1.2–2.1)	5.7 (4.9–6.4)	**−11.5 (−21.0 to −0.4)**
Unintentional injuries (not transport injury)	84.3 (77.7–94.5)	21.6 (16.0–28.7)	105.9 (97.0–117.3)	**−21.7 (−28.1 to −8.6)**
Falls	14.7 (12.2–16.4)	12.8 (9.4–17.0)	27.5 (23.4–31.9)	**21.1 (0.9 to 34.4)**
Drowning	21.2 (17.8–29.5)	0.4 (0.3–0.5)	21.6 (18.2–29.8)	**−45.1 (−53.6 to 3.2)**
Fire, heat and hot substances	11.1 (9.4–13.5)	1.2 (0.9–1.6)	12.3 (10.5–14.7)	**−33.0 (−43.7 to −14.3)**
Poisonings	4.5 (3.1–5.1)	0.07 (0.06–0.08)	4.5 (3.2–5.2)	**−28.8 (−56.2 to −17.8)**
Exposure to mechanical forces	10.3 (9.1–13.4)	3.8 (2.7–5.0)	14.0 (12.4–17.2)	−25.9 (−40.5 to 6.7)
Adverse effects of medical treatment	5.2 (3.9–6.4)	0.2 (0.1–0.3)	5.4 (4.1–6.6)	18.8 (−5.7 to 44.3)
Animal contact	3.9 (3.0–6.5)	0.4 (0.3–0.5)	4.3 (3.4–6.9)	−30.5 (−42.7 to 11.3)
Foreign body	6.7 (4.7–9.1)	0.3 (0.2–0.3)	7.0 (5.0–9.4)	−20.8 (−38.4 to 18.4)
Other unintentional injuries	6.7 (6.1–7.4)	2.6 (1.9–3.4)	9.3 (8.4–10.3)	−5.0 (−14.7 to 16.5)
Intentional injuries	55.5 (47.6–62.2)	1.1 (0.8–1.4)	56.6 (48.7–63.3)	9.6 (−0.2 to 19.9)
Self-harm	34.9 (29.0–39.2)	0.2 (0.2–0.3)	35.2 (29.2–39.5)	9.3 (−3.2 to 23.9)
Interpersonal violence	20.6 (15.2–24.9)	0.8 (0.6–1.1)	21.4 (16.0–25.7)	**9.4 (2.3 to 20.4)**
War and disaster	2.2 (1.5–3.8)	3.9 (1.9–7.8)	6.1 (3.5–11.1)	**−55.8 (−60.2 to −48.6)**
Exposure to forces of nature	0.7 (0.5–1.6)	0.6 (0.3–1.1)	1.3 (0.8–2.5)	**−43.6 (−52.8 to −12.7)**
Collective violence and legal intervention	1.4 (1.0–2.5)	3.4 (1.5–6.8)	4.8 (2.6–8.7)	**−58.3 (−62.3 to −52.9)**
Total	210.8 (198.2–224.0)	36.8 (26.9–48.7)	247.6 (231.3–265.1)	**−8.4 (−13.6 to −1.6)**

A positive change indicates an increase over time; a negative percentage indicates a decrease over time. Figures in bold indicate significant change in DALYs between 1990 and 2013.
DALYs, disability-adjusted life years; UI, uncertainty interval; YLD, years lived with disability; YLL, years of life lost.

Table 3 Global age-standardised YLL, YLD and DALY rates per 100 000 population in 2013 and per cent change DALY rate 1990–2013 with 95% UI, by cause of injury

Cause of injury	YLL rate	YLD rate	DALY rate	Percent change DALY rate 1990–2013
Transport injuries	961 (883–1027)	142 (105–188)	1103 (1008–1189)	**−17.6 (−24.7 to −12.4)**
Road injuries	903 (829–967)	120 (88–158)	1024 (934–1099)	**−15.7 (−23.2 to −10.4)**
Other transport injuries	57 (48–64)	22 (16–30)	80 (69–90)	**−35.7 (−42.2 to −28.5)**
Unintentional injuries (not transport injury)	1178 (1085–1320)	303 (224–401)	1480 (1355–1638)	**−37.7 (−42.2 to −29.1)**
Falls	205 (171–229)	179 (131–238)	384 (327–446)	**−20.8 (−32.6 to −13.5)**
Drowning	297 (249–412)	5 (4–7)	302 (254–416)	**−52.2 (−59.1 to −12.1)**
Fire, heat and hot substances	156 (131–189)	16 (12–22)	172 (147–205)	**−46.8 (−54.9 to −33.2)**
Poisonings	62 (44–71)	1 (0.8–1.5)	63 (45–72)	**−43.8 (−64.7 to −35.3)**
Exposure—mechanical forces	144 (127–188)	53 (38–70)	196 (173–240)	**−39.9 (−50.2 to −17.4)**
Adverse effects of medical treatment	73 (55–89)	3 (2–4)	75 (58–92)	−6.1 (−23.3 to 10.9)
Animal contact	54 (42–91)	5.6 (4–7)	60 (48–97)	**−45.2 (−54.5 to −12.3)**
Foreign body	94 (66–127)	4 (3–5)	98 (69–131)	**−29.8 (−44.8 to −0.5)**
Other unintentional injuries	94 (85–104)	36 (27–48)	130 (117–144)	**−28.9 (−35.5 to −15.2)**
Intentional injuries	776 (665–870)	15 (11–19)	791 (680–884)	**−22.4 (−29.1 to −15.1)**
Self-harm	488 (405–548)	3 (2–4)	491 (408–552)	**−24.3 (−32.7 to −14.5)**
Interpersonal violence	288 (213–348)	12 (9–15)	299 (224–359)	**−19.1 (−24.2 to −11.5)**
War and disaster	31 (21–53)	55 (26–109)	85 (49–155)	**−69.1 (−72.3 to −63.3)**
Exposure—forces of nature	11 (7–22)	8 (4–16)	19 (11–35)	**−58.7 (−65.8 to −36.9)**
Collective violence and legal intervention	20 (13–36)	47 (22–95)	67 (36–122)	**−71.1 (−74.0 to −67.2)**
Total	2945 (2769–3129)	514.6 (376–681)	3459 (3231–3704)	**−30.9 (−34.7 to −26.1)**

A positive change indicates an increase over time; a negative percentage indicates a decrease over time. Figures in bold indicate significant change in DALY rates between 1990 and 2013.
DALY, disability-adjusted life year; YLD, years lived with disability; YLL, years of life lost; UI, uncertainity interval.

Changes between 1990 and 2013 in DALY rates for unintentional injuries

The decline in injury DALY rates was significant for all unintentional injuries, with the exception of the smaller categories of unintentional suffocation, adverse effects of medical treatment, non-venomous animal contact and foreign body in other body part.

Road injury

Figure 7 shows the per cent change in road injury DALY rates. Over the period 1990 to 2013 global road injury DALY rates decreased by 15.7% (UI −23.2 to −10.4). Decreases were mainly apparent in high-income Asia Pacific (−66.9%; UI −69.8 to −63.9), followed by western Europe (−61.1%; UI −63.1 to −58.9), Australasia (−57.0%; UI −60.1 to −53.8) central Europe (−50.6%; UI −55.8 to −47.1) and eastern Europe (−38.3%, UI −42.9 to 33.5).

The decline in rates in Oceania (−16.9%; UI −41.4 to 22.1), East Asia (−14.1%; UI −33.9 to 2.7) and central sub-Saharan Africa (−9.9%; UI −22.5 to 5.5) were not significant. Rates increased in South Asia (6.5%; UI −11.2 to 26.1) and West (13.1%; UI −0.5 to 28.6) and South sub-Saharan Africa (35.2%; UI −14.1 to 60.6) but not significantly. Four-wheeled motor vehicle injuries significantly increased in South Asia (21.7%; UI 1.8 to 44.6) and sub-Saharan Africa (19.8%; UI 6.6 to 35.0).

Falls, drowning, fire and poisoning

Over the period 1990 to 2013 the burden of disease due to falls decreased −20.8% (UI −32.6 to −13.5). The decrease was significant in 13 out of 21 GBD world regions. The change in DALY rates due to falls in the other eight regions was not significant (figure 8).

Drowning showed a pronounced decline globally by −52.2% (UI −59.1 to −12.1). The greatest declines in drowning DALY rates occurred in East Asia (−71.0%; UI −75.2 to −29.4) and southern sub-Saharan Africa (−62.3%; UI −73.2 to −26.4). Oceania was the only region recording an increase in drowning DALY rate, a non-significant change with large uncertainty (14.9%; UI −38.6 to 72.7). The global decline in DALY rates of drowning was apparent in all age categories, but largest for age category 1–4 years (by 64.4%).

Other unintentional causes of injury that showed marked decreases in DALY rates were fire, heat and hot substances (−46.8%; UI −54.9 to −33.2) and poisoning (−43.8%; UI −64.7 to −35.3). Poisonings and fire, heat and hot substances showed a decrease in burden of injury for most regions, with a few exceptions. South Asia is the only region which did not see a decline in poisoning DALY rates (−0.7%; −50.3 to −33.1). DALY rates from fire injuries declined significantly in 16 out 21 world regions, with central and southern sub-Saharan Africa, Oceania, eastern Europe and the Caribbean as the exceptions (figures 9 and 10).

Changes between 1990 and 2013 in DALY rates for intentional injuries

The decline in DALY rates for interpersonal violence was −19.1% (UI −24.2% to −11.5%), with significant decreases in 11 of 21 world regions with non-significant changes in the other regions. However, the increase by around 50% in the rates of interpersonal violence DALYs in South sub-Saharan Africa and Oceania are reason for concern even though the large UI crosses zero (figure 11).

The per cent change of self-harm was −24.3% (UI −32.7 to −14.5). The largest decline occurred in East Asia (−68.3%; UI −73.0 to −46.8), while rates in South-East Asia, the Caribbean, western Europe, and tropical and southern Latin America dropped by about a third. At the other end of the spectrum rates increased by more than a quarter in South Asia, high-

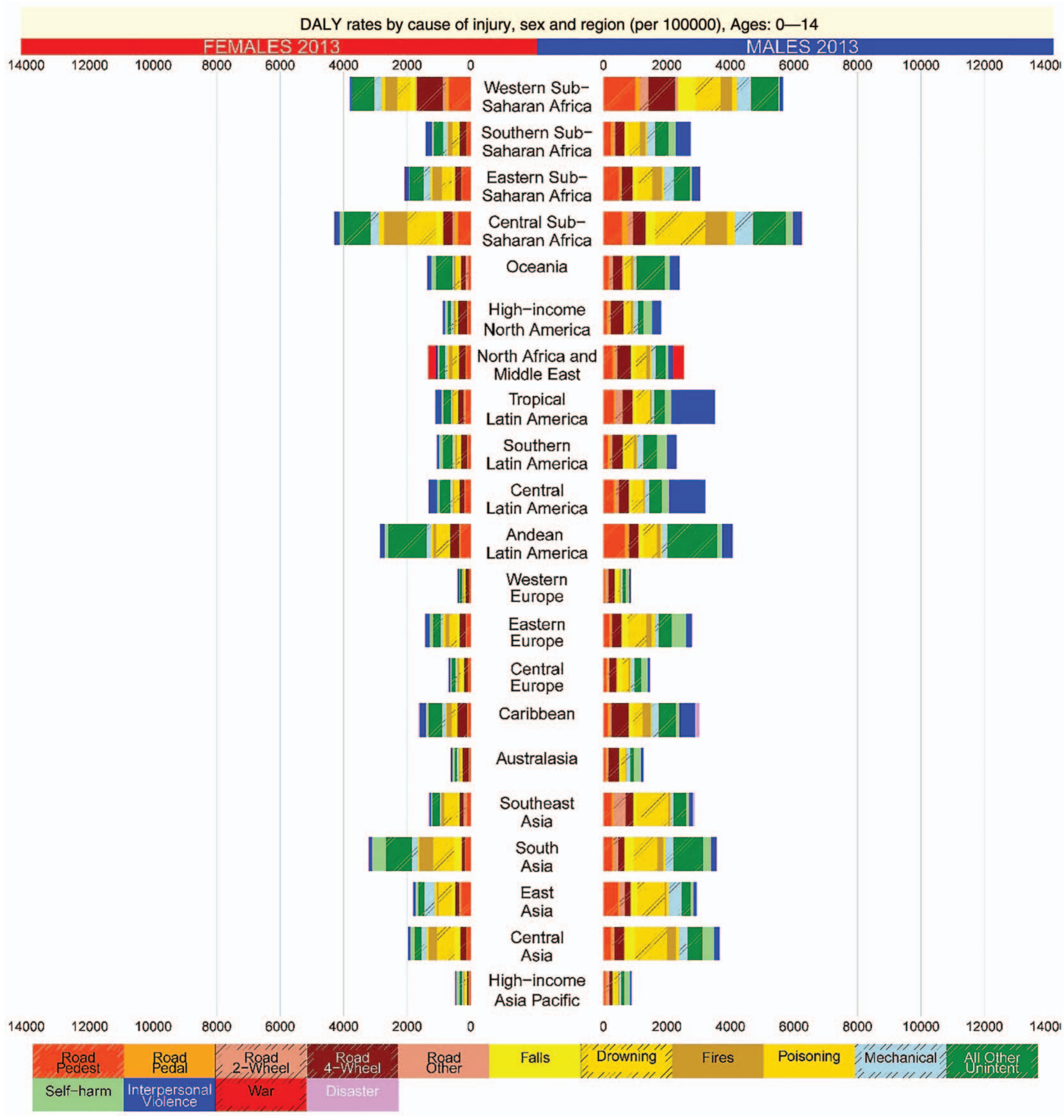

Figure 2 Disability-adjusted life year (DALY) rates by cause of injury, sex and region, ages 0–14 years. For the purposes of these plots, all non-road unintentional injuries have been collapsed to "All Other Unintent" (other transport injury, animal contact categories, foreign body categories, and adverse effects of medical treatment).

income Asia Pacific, North Africa and the Middle East, and southern sub-Saharan Africa (figure 12).

Collective violence and forces of nature

Due to the sporadic nature of war and forces of nature, a rate of change between 1990 and 2013 is a less meaningful statistic. What is of interest is that we estimate a long tail of disability arising from such events for many decades to come. Past disaster and war experience at a large scale in countries like Lebanon, Peru, Cambodia, Vietnam and Rwanda continues for decades in a slowly aging cohort of people with long-term disability, for example, from amputations and poorly healed other injuries.

Online supplementary figures 6.1 to 6.11 in the annex show maps of change in injury DALY rates by sex for selected cause-of-injury categories.

DISCUSSION

GBD 2013 provides a systematic quantification of mortality, incidence and disability over the time period 1990 to 2013, allowing analyses of time trends and comparison between regions. Since 1990 age-standardised rates of DALYs due to injuries have significantly decreased in all major injury categories. The slower decline in incidence rates compared with YLL and YLD rates, GBD's measures of premature mortality and disability, suggests that the observed changes are driven by multiple mechanisms. Reduction in incidence would be the effect of measures preventing the occurrence of injuries (eg, road safety measures, gun control or safer tools). The greater declines in YLL and YLD rates could be brought about by injury prevention measures reducing the severity of the injury sustained (eg, seat belts and helmets) or by improved access to better quality care after an injury (eg, trauma systems).

Road injury

Globally, the burden of disease due to road injury has decreased significantly since 1990, but this decrease is largely in high-income regions, with the reverse trend occurring in low-income and middle-income countries. Other studies have argued that this is because growth in motorisation and traffic density is

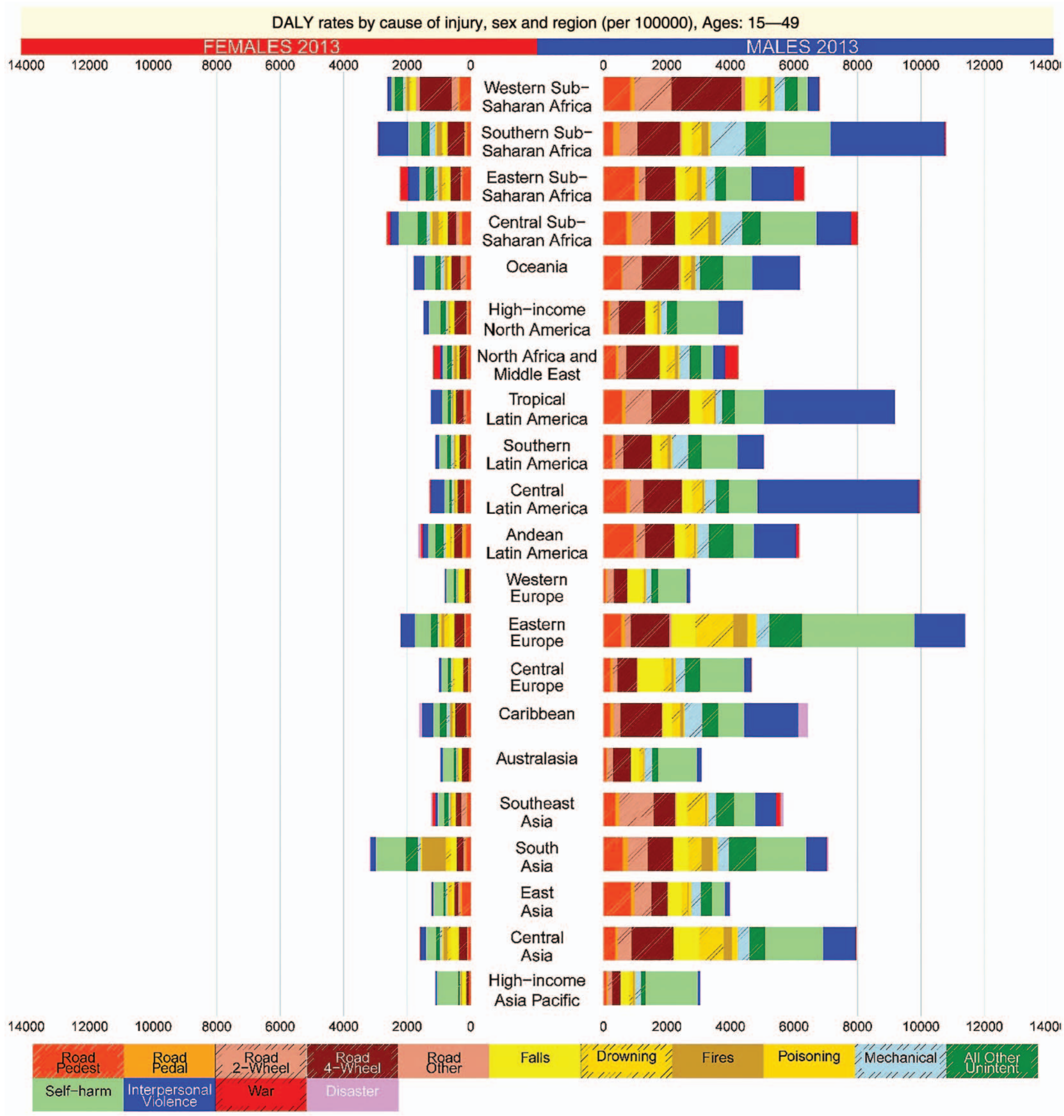

Figure 3 Disability-adjusted life year (DALY) rates by cause of injury, sex and region, ages 15–49 years of injury, sex and region.

outpacing infrastructural development and levels of law enforcement,[17–20] and that this is particularly the case for major fast-growing economies such as Brazil, Russia, India, China and South Africa; countries that have experienced rapid economic development that led to changes in lifestyle and environment and subsequently impacted health and mortality.[21–23] Our study shows that these countries have relatively high road injury mortality and DALY rates, but that DALY rates have significantly decreased in Brazil and Russia over the period 1990–2013 while rates for South Africa, India and China showed insignificant changes. Low-income and middle-income regions that had lesser declines or an increase in traffic injury DALY rates often do not have comprehensive urban speed limit laws, seat belt laws, motorcycle helmet and/or drink-drive laws, or poor enforcement if the laws exist.[17 24] These laws have shown to substantially reduce road injury mortality, underlining the importance of implementing these strategies to reduce road traffic injury.[25]

Intentional injury

Our findings on interpersonal violence tally with findings from the United Nations Office on Drugs and Crime (UNODC) Homicide Statistics and WHO which show that the overall trend in the global homicide rate is decreasing, but that regional trends are diverse:[26 27] in Asia and Europe overall homicide rates are decreasing but other regions have continuing high levels of homicide.[26 28] UNODC and WHO report that this is particularly the case for the Americas and in Eastern and Southern Africa, where homicide levels have remained high, and in some countries levels increased.[29–33] These reported homicide trends correspond to the continuing high levels of DALY rates from interpersonal violence in parts of Latin America and sub-Saharan Africa. Important to note is that regional interpersonal violence death and burden of disease rates may disguise large variations in trends between countries and within countries.[26] Others have observed a decline in violence over much longer periods in history contrary to popular discourse on the rising threat of violence partly attributed to media exposure of prominent events of violence.[34 35]

Self-harm is the second leading cause of death from injury and it is a main contributor to injury DALYs. Over the period 1950–1995 the global self-harm death rates were reported by WHO to have increased, although the authors noted that the figures should be interpreted with caution because the 1950 estimates were based on data from 11 countries.[36 37] More recently, studies found evidence that there was an upturn in suicide rates during the financial crisis of 2007/2008 set against this overall

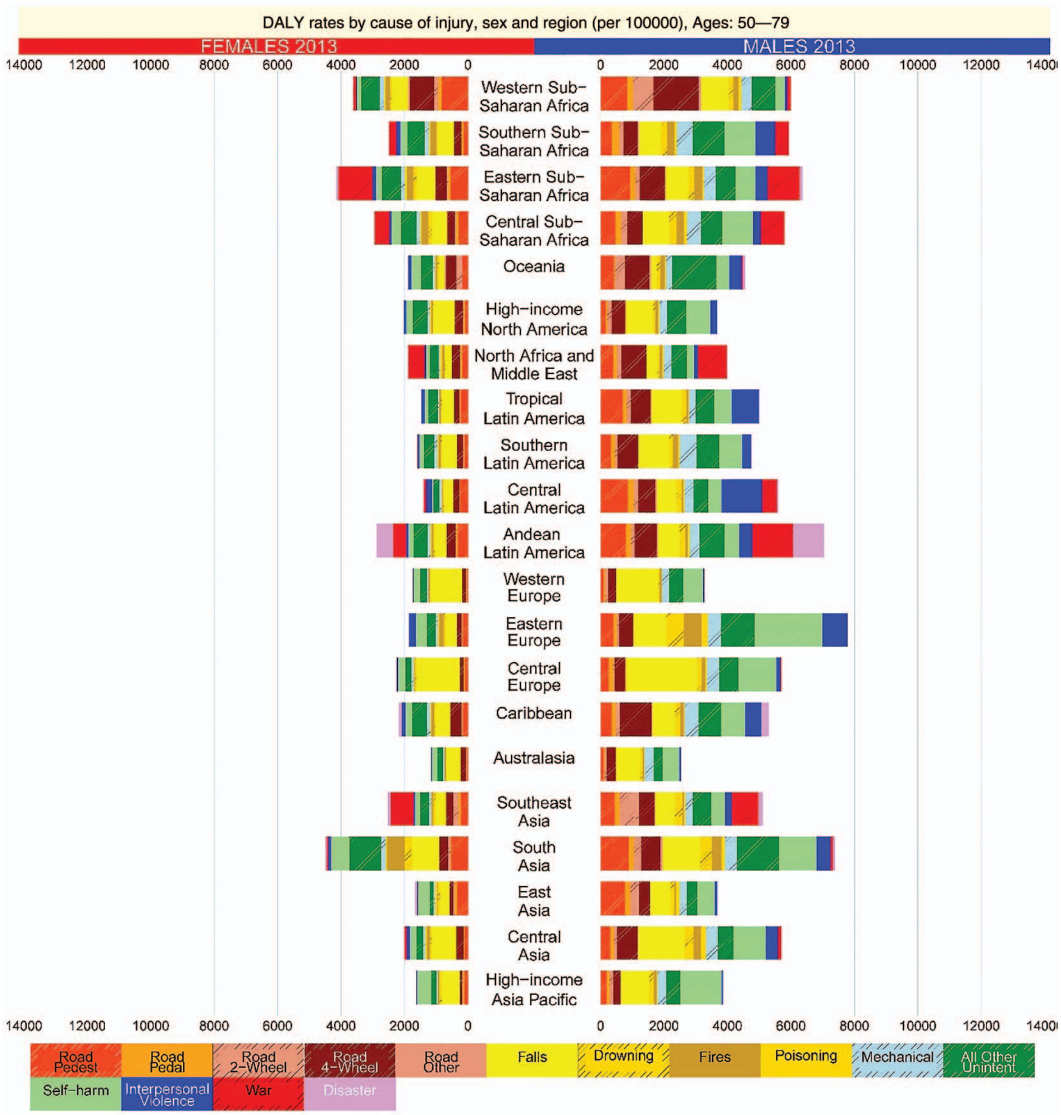

Figure 4 Disability-adjusted life year (DALY) rates by cause of injury, sex and region, ages 50–79 years of injury, sex and region.

decline.[38 39] We found a significant decrease of the self-harm rates between 1990 and 2013 in all European and American regions (except central Latin America) but do not see a change in this decline coinciding with the recent economic downturn. More than half of all self-harm DALYs occur in East and South Asia. The trends in these regions are in opposite directions, decreasing significantly and by a great margin in East Asia but rising, though not significantly, in South Asia between 1990 and 2013. The decline in East Asia was greater in women than in men while in South Asia self-harm increased more rapidly in men than in women. Previous studies have reported similar trends in the most populated countries in these regions, India and China.[40 41] Over the past two decades China and India have experienced rapid economic growth and urbanisation, and therefore the opposing trends would need to be explained by other factors, such as the distribution of increasing wealth, cultural shifts, ease of access to mental health treatment, ease of access to the main means for self-harm, and other factors. Furthermore, India, in contrast to China, is just at the start of industrialisation and urbanisation.

For reasons related to social and religious attitudes, self-harm may be under-reported or misclassified.[36] In the GBD 2013 several steps have been taken to enhance data quality of morbidity and mortality data and adjust for misclassification. Nonetheless, the burden of disease of self-harm may still be under-reported and captured as unintentional injuries.

Collective violence and legal intervention

Globally, battle deaths have declined since 1945 and the number of interstate conflicts has decreased since 1990 while the peak of interstate conflicts with more than 1000 battle deaths per year was in the 1970s with a rapid decline thereafter.[34 42 43] However, the Human Security Report showed that in Africa conflicts and battle deaths have become more numerous in recent years and often are high-intensity conflicts, causing more than 10 000 battle deaths a year.[43] This increase also resulted in an increase in battle deaths in certain African countries. GBD 2013 shows that deaths due to collective violence and legal intervention continued to decline over the 1990–2013 period.[15] These findings correspond to the GBD 2013 changes in burden of disease rates due to collective violence. Deaths do not represent the total impact of injuries and this is particularly relevant to collective violence as two-thirds of DALYs are from long-term disability of past wars, the long tail of long-lasting disabilities

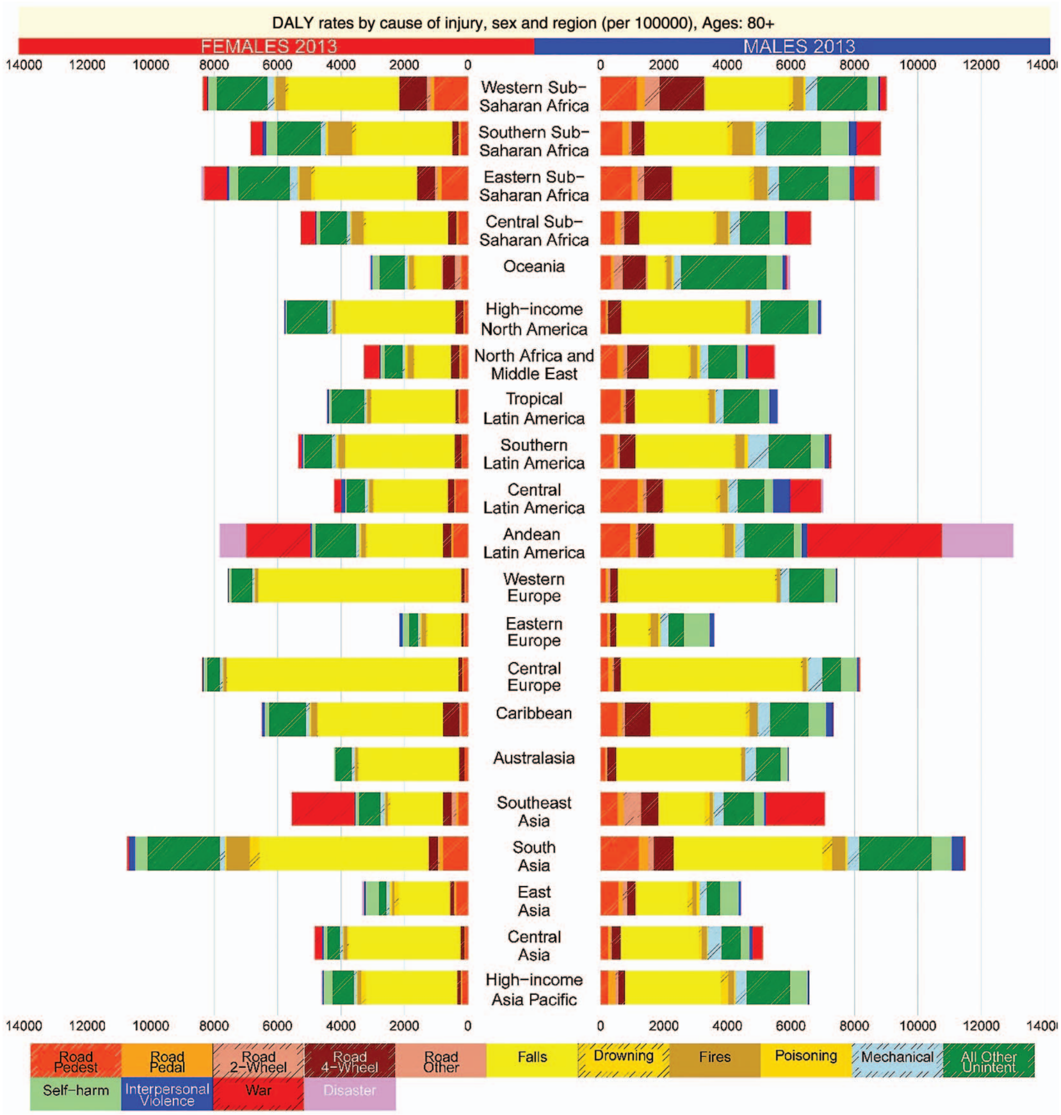

Figure 5 Disability-adjusted life year (DALY) rates by cause of injury, sex and region, ages 80 years and above of injury, sex and region.

such as amputations. The decline in disability (YLDs) from collective violence has kept pace with the decline in mortality (YLLs).

Data limitations

Coverage of vital registration is low or absent in large parts of the world and there are issues of incompleteness and differences in death certification systems, definitions of variables and methods of data collection.[44–47] For these regions, it was necessary to predict estimates using models, relying on covariates and verbal autopsy.[12 13] We added police and mortuary data for road injuries, self-harm, and interpersonal violence to help predict level and age patterns in countries with sparse or absent cause of death data even though we know from countries with near-complete vital registration data that police records tend to underestimate the true level of deaths. GBD uses the largest collection of data on causes of death in the world, allowing us to use statistical models that can borrow strength over time and geography. Although this ensures an estimate for all causes and all countries, estimates for populations and time periods with sparse or absent data are inherently less precise. While we attempt to capture all sources of uncertainty from sampling error, non-sampling error and model specifications in the 95% UIs, we cannot guarantee that we have captured all uncertainty.[48 49]

The lack of nationally representative mortality data in many low-income and middle-income countries emphasises the need for investment in vital registration and standardised cause of death certification. These data are essential to identify and monitor the effectiveness of injury intervention strategies.

For many countries hospital data collection systems with national coverage exist but, due to country-specific privacy regulations, the data are not made available or made available in summary tabulations only. The latter is problematic for injuries as our analyses make a strict distinction between cause and nature of injury and therefore requires dual coding of injuries. Many countries unfortunately record injury hospital admissions or ED encounters as a haphazard mix of cause and nature-of-injury codes. Rather than discarding these data sets we set a low bar for inclusion if at least 45% of cases had a cause-of-injury code. Although these data inform our estimates of cause patterns that are scaled up to the total ‘all injury’ incidence, we cannot be sure that the patterns in these small sample sizes are representative of those at the country level. A clear

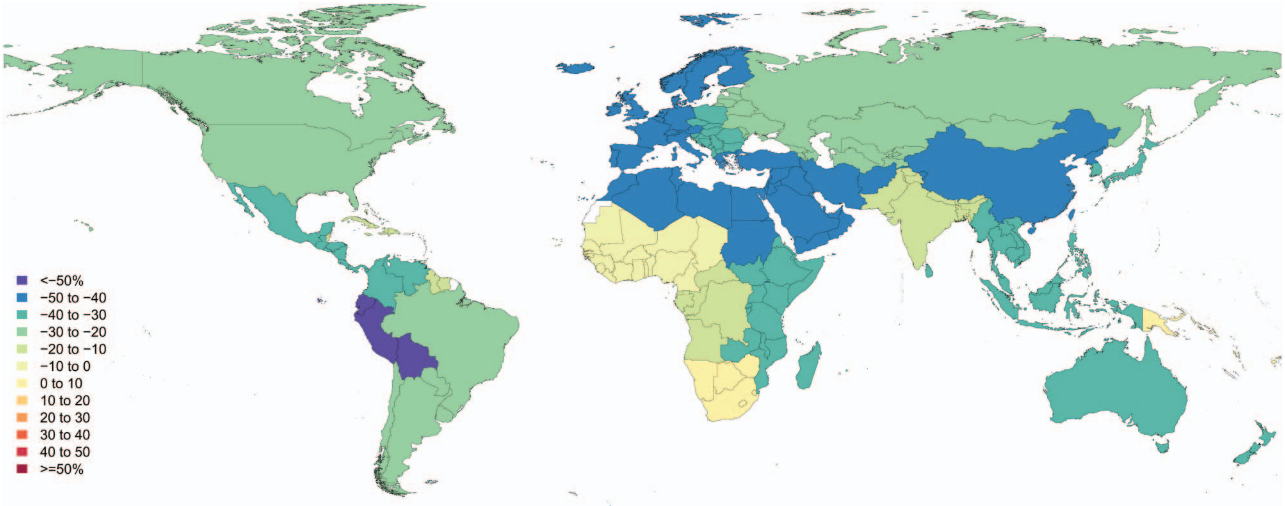

Figure 6 Percent change in age-standardised all-injury disability-adjusted life year (DALY) rates 1990–2013.

recommendation to custodians of hospital data collection systems is to ensure that all cases of injuries are dual coded.

Data protection regulations and legislation are becoming more important, and because of that there may be more countries for which hospital data or other data sources are not made available. However, it should be noted that for GBD de-identified data are sufficient.

Besides hospital data collection systems hospital-based trauma registries have become well established in high-income countries and are emerging in some low-income and middle-income countries. WHO has created standardised data sets to be used across settings to ensure best practice principles and consistent data collection.[50] Application of these guidelines in hospital-based trauma registries and the development of an international trauma databank would make it possible to track burden of disease as well as measure effectiveness of interventions, conduct intervention trials across settings, and support innovation in prevention and treatment of injury.[51 52]

For forces of nature and collective violence we retrieved data from vital registrations as well as data sets that were set up particularly for the collection of data from armed conflicts and/or disaster.[53 54] Problematic, however, is that war and disaster and their after-effects may severely disrupt the infrastructure of vital and health registration systems, complicating collection of data on morbidity and mortality.[55] Postdisaster and war surveys have been carried out to assess related mortality and injury, yet recall bias related to acute postdisaster experiences and postdisaster or postwar migration may hamper the data collection and interpretation of these studies.

Significant methodological differences between GBD 2010 and GBD 2013

To estimate the burden of injury we used a methodology similar to GBD 2010 but with several significant changes, including changes with respect to the injury classification. First, the list of external cause of injury was disaggregated from 15 to 26 categories and the

Table 4 Percent change in incidence, YLL and YLD rates by cause of injury with 95% UI, 1990–2013

Cause of injury	Change in incidence rate	Change in YLD rate	Change in YLL rate
Transport injuries	−10% (−6% to −12%)	−32% (−36% to −27%)	−15% (−23% to 8%)
Road injuries	−7% (−9% to −3%)	−31% (−36% to −26%)	−13% (−22% to −7%)
Other transport injuries	−23% (−27% to −18%)	−35% (−38% to −31%)	−36% (−45 to −25%)
Unintentional injuries, not transport	−13% (−12% to −14%)	−28% (−33% to −23%)	−40% (−45% to −29%)
Falls	−1% (−3% to 2%)	−28% (−35% to −21%)	−13% (−35% to 1%)
Drowning	−27% (−30% to −25%)	−38% (−41% to −234%)	−52% (−59% to −12%)
Fire, heat and hot substances	−31% (−35% to −27%)	−37% (−40% to −34%)	−48% (−56% to −33%)
Poisonings	−27% (−29% to −26%)	−37% (−39% to −34%)	−44% (−65% to −35%)
Exposure—mechanical forces	−16% (−18% to −14%)	−30% (−33% to −27%)	−43% (−55% to −12%)
Adverse effects of medical treatment	−2% (−3% to 0%)	−6% (−7% to −4%)	−6% (−24% to 12%)
Animal contact	−32% (−34% to −29%)	−36% (−39% to −33%)	−46% (−56% to −9%)
Foreign body	0% (−1% to 2%)	−19% (−23% to −15%)	−30% (−45% to 0%)
Other unintentional injuries	−3% (−5% to −1%)	−16% (−18% to −13%)	−33% (−41% to −15%)
Intentional injuries	−13% (−11% to −16%)	−34% (−39% to −29%)	−22% (−29% to −15%)
Self-harm	−28% (−29% to −28%)	−39% (−42% to −35%)	−18% (−33% to −14%)
Interpersonal violence	−11% (−14% to −9%)	−33% (−37% to −27%)	−24% (−24% to −10%)
All Injuries	−20% (−25% to −15%)	−37% (−45% to −30%)	−30% (−34% to −24%)

UI, uncertainty interval; YLD, years lived with disability; YLL, years of life lost.

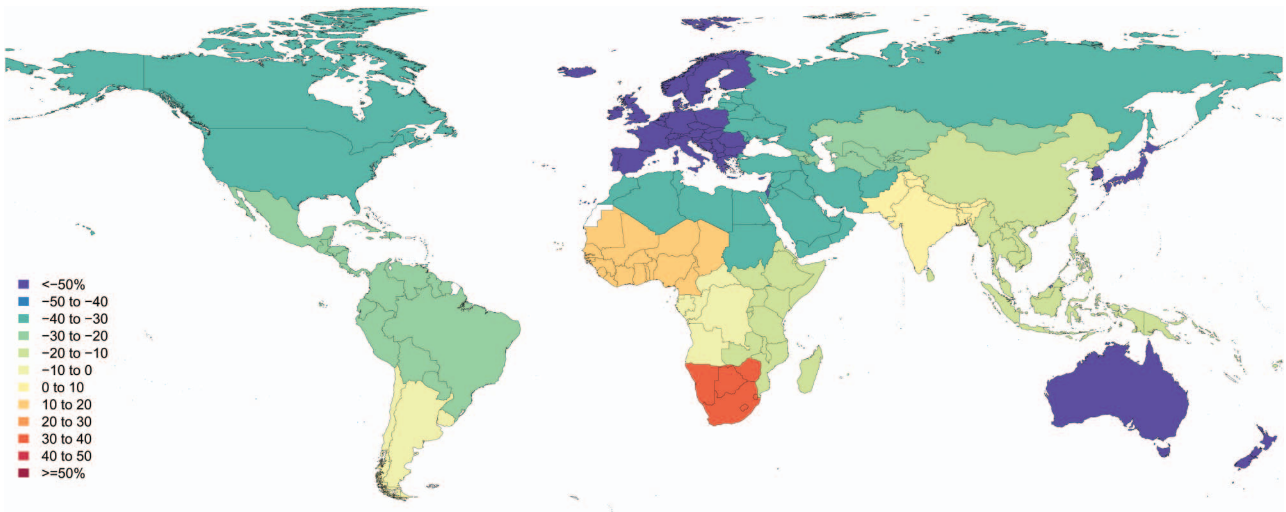

Figure 7 Percent change in age-standardised road injury disability-adjusted life year (DALY) rates 1990–2013.

list of nature of injury was expanded from 23 to 47 categories. Second, we incorporated additional inpatient and outpatient data sets from a variety of countries and new follow-up studies with patient-reported outcome measures from the Netherlands and China and recent years of Medical Expenditure Panel Survey (MEPS). Third, patient-reported outcome measurement data were used to develop a hierarchy to select the most severe injury category for patients with multiple natures of injury. Fourth, we allowed for differing durations of short-term outcomes and probabilities of long-term disability depending on whether an injury was treated or not. Fifth, we report outcomes by cause-of-injury category and nature-of-injury category, whereas previously outcomes were reported by cause of injury only.

Methodological limitations

Nature-of-injury severity hierarchy

To assess issues of correlation between severe natures-of-injury categories and particular mild nature-of-injury categories, we developed a nature-of-injuries severity hierarchy. This hierarchy was used to establish a one-to-one relationship between cause-of-injury category and nature-of-injury category in an individual. This means that in a person with multiple injuries we selected the nature-of-injury category that was likely to be responsible for the largest burden based on a regression analysis of seven follow-up studies. Ignoring the injuries with smaller burden sustained by such individuals may have led to a shift in estimates from milder to more severe injury categories.

Probability of permanent health loss

The estimation of the probability of long-term health loss due to a particular nature of injury is a key step in our analysis that drives the estimation of YLDs from long-term outcomes. The strategy that was used to determine the probabilities of permanent health loss has several limitations. First, in the GBD 2013 study the probability of long-term injury was based on patient-reported outcome data from follow-up studies in just three countries (China, Netherlands and the USA). Second, even though the total number of cases of the pooled data set was high, for rare nature of injury codes there were limited cases. Third, the follow-up studies used different injury classifications that needed to be mapped into the GBD cause and nature-of-injury categories and the follow-up studies used different patient-reported outcome measures, introducing greater uncertainty and potential bias in our estimation of disability.[56 57] Fourth, for certain outpatient nature-of-injury categories high probabilities of permanent health loss were observed. An

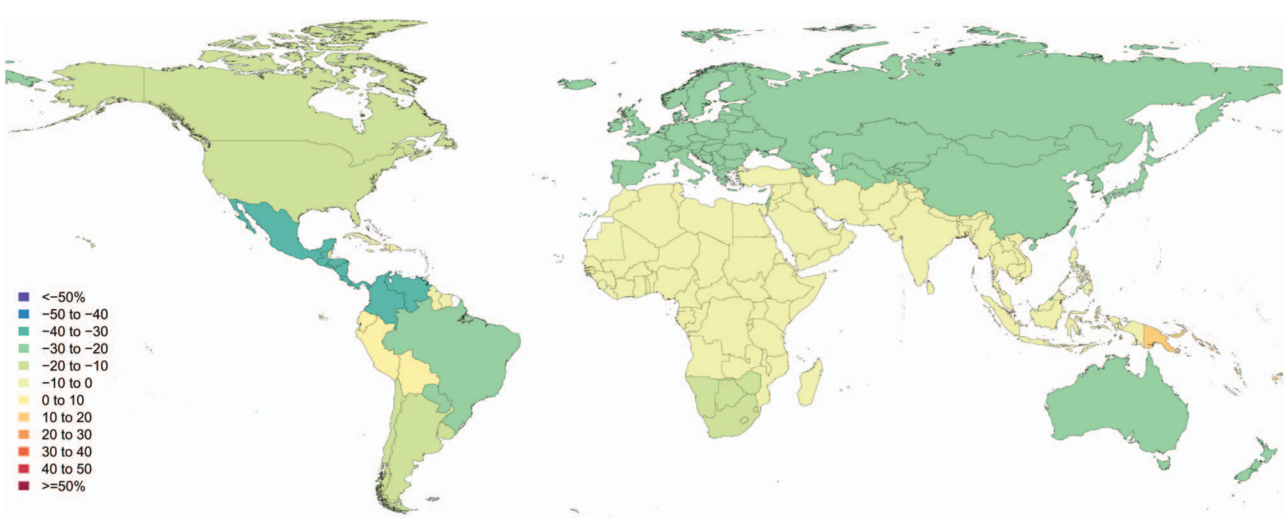

Figure 8 Percent change in age-standardised falls disability-adjusted life year (DALY) rates 1990–2013.

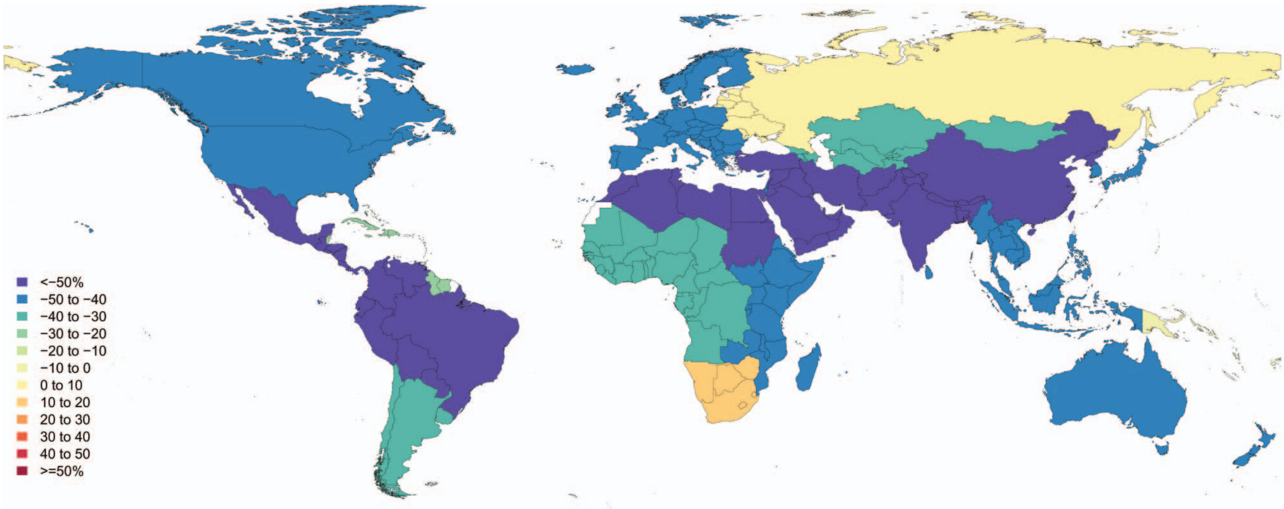

Figure 9 Percent change in age-standardised fire injury disability-adjusted life year (DALY) rates 1990–2013.

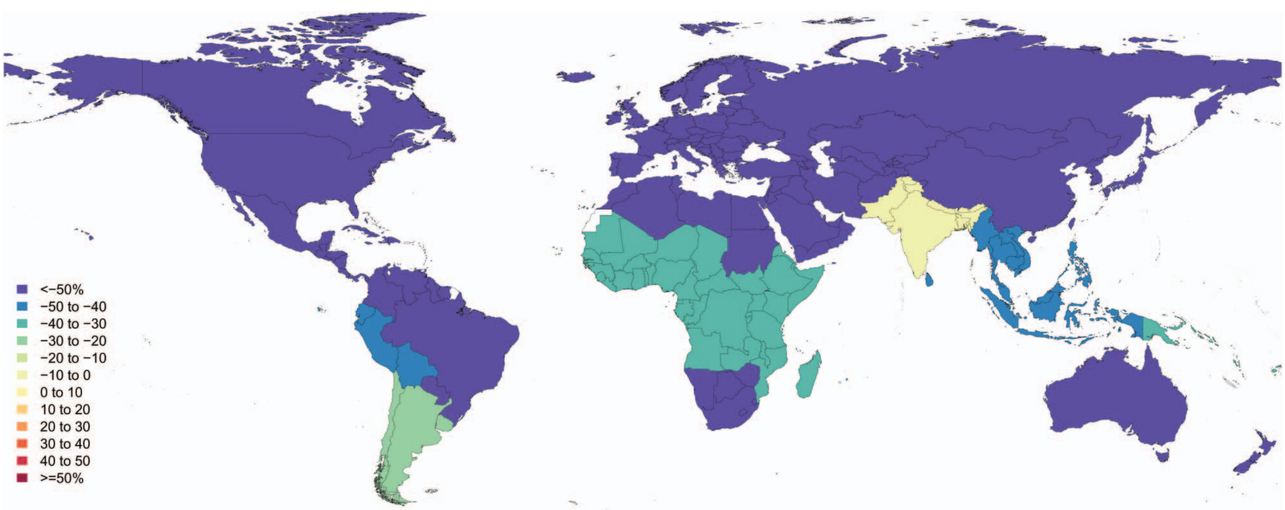

Figure 10 Percent change in age-standardised poisoning injury disability-adjusted life year (DALY) rates 1990–2013.

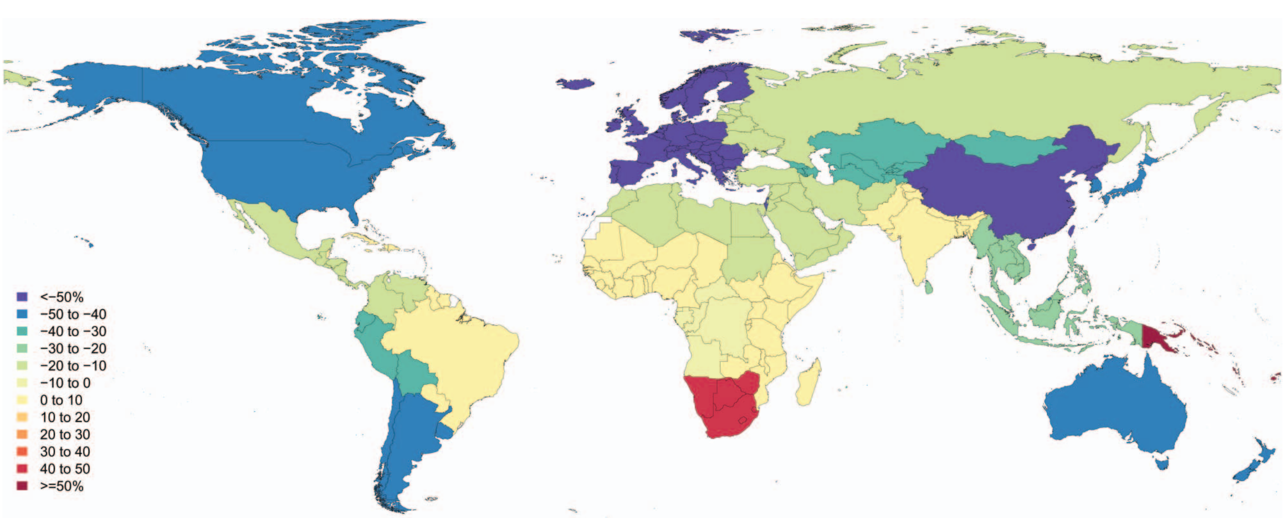

Figure 11 Percent change in age-standardised interpersonal violence disability-adjusted life year (DALY) rates 1990–2013.

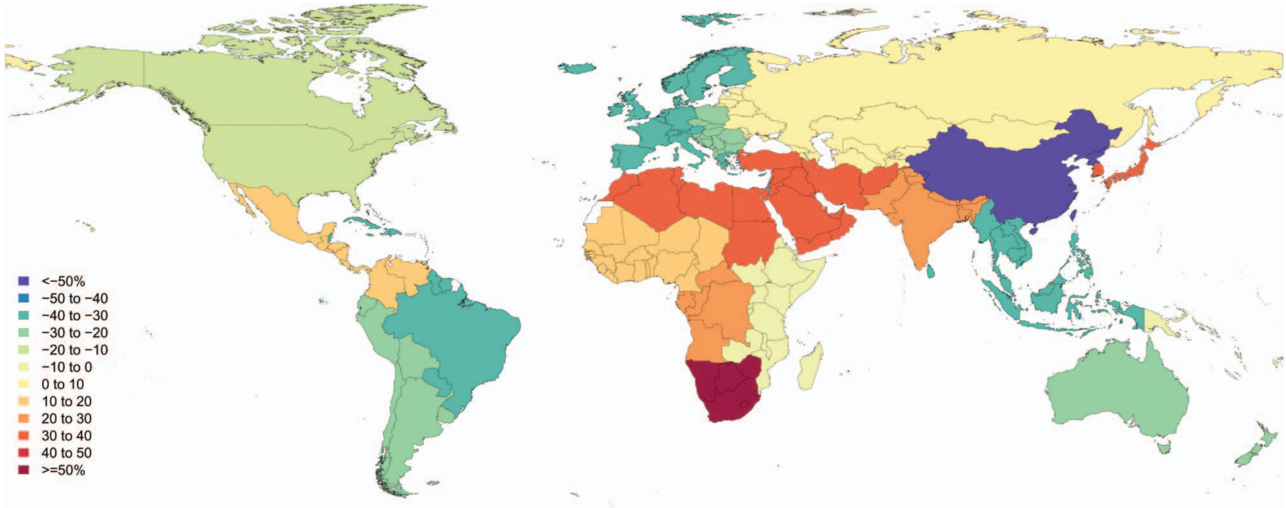

Figure 12 Percent change in age-standardised self-harm disability-adjusted life year (DALY) rates 1990–2013.

explanation for this may be that cases were misclassified as outpatients whereas in fact they were treated in an inpatient setting.

The probability of treated long-term outcomes is estimated via the ratio of the average level of disability 1 year after an injury relative to the long-term disability weight for each nature of injury category. Because this ratio incorporates the disability weights assigned to each nature-of-injury category, the probabilities of long-term outcomes depend strongly on the value of these disability weights. For GBD 2013 disability weights have changed, including all injury disability weights. This means that the probability of long-term outcomes of injuries has changed. Overall YLDs will only be affected in cases where we observed 100% probability of long-term outcomes. In other cases, higher probability of long-term results in a higher prevalence of cases with long-term consequences, but combined with lower disability weights this will result in the same overall YLDs.

Furthermore, we used DisMod-MR to stream out prevalence from incidence and this process assumes a steady state where rates are not changing over time. This steady state assumption may lead to inaccurate estimates of prevalence of long-term disability if there are large trends in incidence rates or mortality. Taking such trends into account would also require adequate data on the trends in the mortality risks in people with long-term disabilities and a new version of DisMod-MR that is under development.

Duration of short-term injury

In GBD 2010, the estimates of short-term duration were based on limited expert opinion.[12] For GBD 2013, we used patient-reported data for the majority of nature-of-injury categories to provide a more empirical basis for these estimates. However, these estimated durations are based on a very limited sample size and the validity and reliability of these estimated durations may be affected by response and recall bias. Second, the patient-reported data were from the Netherlands only, a high-income country with a high access to quality healthcare and these durations may not apply to settings with lower-quality care. The duration of short-term injury in case of untreated injuries was based on the opinion of GBD injury collaborators.

Health system access and the proportion of untreated cases

To determine the proportion of untreated cases for each country-year we used a proxy covariate that defines health system access that is largely based on maternal and child health indicators. It therefore mostly reflects access to primary care services and may not reflect access to trauma services that are required for injuries. There are variables, such as hospital beds per 1000 or physician density that may serve as proxy for the proportion of untreated injury per country-year, but these have been found to vary wildly over time and between countries without face validity as an indicator of access to trauma services.

Conclusions

Globally, since 1990, there is a remarkable declining trend in the rates of DALYs due to injury. The rate of decline was significant for 22 of our 26 cause-of-injury categories, including all the major ones. The decline in rates for almost all injuries is widespread. However, the results vary by cause, age group, sex, geography and over time. These decreases in DALY rates for almost all cause-of-injury categories warrant a general statement that the world is becoming a safer place to live in, although the injury burden remains high in some parts of the world. The slower decline in incidence rates compared with YLL and YLD rates suggests that the observed changes are driven by multiple mechanisms.

The findings from the GBD are a valuable resource for countries to prioritise major contributors of injury deaths, incidence and/or DALYs and monitor progress over time. Changes over time can facilitate in raising hypotheses regarding the underlying causes. However, there may be a complex set of explanations relating to primary, secondary and tertiary prevention efforts and it may be difficult to tease out which measures have yielded the greatest effect. The GBD will continue to be updated annually and provide regular updates of the burden of disease at the national level and, increasingly over time, at the subnational level for large countries.

What is already known on the subject

Since the 1990s Global Burden of Disease and Injury (GBD) studies have quantified the important contribution of injury deaths and disability to the overall burden of disease, by world regions.

What this study adds

- Detailed up-to-date results of injury deaths, incidence and disability for 21 world regions and 188 countries for 1990 to 2013.
- Injuries continue to be an important cause of morbidity and mortality in the developed and developing world.
- Globally, since 1990, there has been a remarkable declining trend in the rates of disability-adjusted life years of all the major causes of injury; however, the patterns vary widely by cause, age, sex, region and time.
- The findings from the GBD are a valuable resource for countries to prioritise injury prevention, monitor progress over time and raise hypotheses regarding causes of changes over time.

Author affiliations
[1]Institute for Health Metrics and Evaluation, Seattle, Washington, USA
[2]Mekelle University, College of Health Sciences, School of Public Health, Mekelle, Tigray, Ethiopia
[3]Kilte Awlaelo-Health and Demographic Surveillance Site, Mekelle, Tigray, Ethiopia
[4]University of Southern California (USC) Family Medicine Residency Program at California Hospital, a Dignity Health member, Los Angeles, California, USA
[5]Harvard School of Public Health/Harvard Institute for Global Health, Boston, Massachusetts, USA
[6]Kwame Nkrumah University of Science and Technology, Kumasi, Ashanti, Ghana
[7]Charité Universitätsmedizin, Berlin, Germany
[8]Ahmadu Bello University, Zaria, Kaduna State, Nigeria
[9]Ministry of Public Health, Beirut, Lebanon
[10]Department of Health Policy and Administration, College of Public Health, University of the Philippines Manila, Manila, Philippines
[11]Department of Industrial Engineering, Pontificia Universidad Javeriana, Bogota, Cundinamarca, Colombia
[12]Madawalabu University, Ethiopia, Bale Goba, Oromia, Ethiopia
[13]World Bank, Washington DC, USA
[14]Faculty of Health Sciences and Social Work, Trnava University, Trnava, Slovakia
[15]Division of Pharmacoepidemiology and Pharmacovigilance, Spanish Medicines and Healthcare Products Agency (AEMPS), Ministry of Health, Madrid, Spain
[16]Public Health Foundation of India, New Delhi, India
[17]Guy's and St. Thomas' NHS Foundation Trust, London, UK
[18]Griffith University, Brisbane, Queensland, Australia
[19]UNSW Australia, Sydney, Australia
[20]Department of Preventive and Social Medicine, Dunedin School of Medicine, University of Otago, Dunedin, New Zealand
[21]School of Public Health, College of Health, Massey University, Palmerston North, New Zealand
[22]University of Peradeniya, Peradeniya, Sri Lanka
[23]Sydney School of Public Health, University of Sydney, Sydney, New South Wales, Australia
[24]National Center for Chronic and Noncommunicable Disease Control and Prevention, China CDC, Beijing, China
[25]The Institute of Social and Economic Studies of Population at the Russian Academy of Sciences, Moscow, Russia
[26]Federal Research Institute for Health Organization and Informatics of Ministry of Health of Russian Federation, Moscow, Russia
[27]Non-Communicable Diseases Research Center, Endocrine and Metabolic Research Institute, Tehran University of Medical Sciences, Tehran, Iran
[28]National Institute for Stroke and Applied Neurosciences, AUT University, Auckland, New Zealand
[29]James Cook University, Townsville, Queensland, Australia
[30]Monash University, Melbourne, Victoria, Australia
[31]University of California in San Francisco, San Francisco, California, USA
[32]Endocrinology and Metabolism Research Center, Tehran University of Medical Sciences, Tehran, Iran
[33]Arabian Gulf University, Manama, Bahrain
[34]Fundacion Entornos AC, Cuernavaca, Morelos, Mexico
[35]Central South University, School of Public Health, Changsha, Hunan, China
[36]Virginia Commonwealth University, Richmond, Virginia, USA
[37]Tianjin Centers for Diseases Control and Prevention, Tianjin, China
[38]Jordan University of Science and Technology, Irbid, Jordan
[39]Health Services Academy, Islamabad, Punjab, Pakistan
[40]Expanded Programme on Immunization, Islamabad, Punjab, Pakistan
[41]Oregon Health and Science University, Portland, Oregon, USA
[42]Rajrajeswari Medical College & Hospital, Bangalore, Karnataka, India
[43]EMRiS, Health Services Research, University of Sheffield, Sheffield, South Yorkshire, UK
[44]SUNY-Albany, Rensselaer, New York, USA
[45]Aintree University Hospital NHS Foundation Trust, Liverpool, UK
[46]School of Medicine, University of Liverpool, Liverpool, UK
[47]Swansea University, Swansea, UK
[48]Faculty of Health Sciences and Social Work, Department of Public Health, Trnava University, Trnava, Slovakia
[49]University of York, York, UK
[50]South African Medical Research Council, Cape Town, South Africa
[51]University of Cape Town School of Public Health and Family Medicine, Cape Town, South Africa
[52]Pereleman School of Medicine, University of Pennsylvania, Philadelphia, Pennsylvania, USA
[53]Children's Hospital of Philadelphia
[54]Addis Ababa University, Addis Ababa, Ethiopia
[55]Pacific Institute for Research & Evaluation, Calverton, Maryland, USA
[56]Curtin University Centre for Population Health, Perth, Western Australia, Australia
[57]University of Washington, Seattle, Washington, USA
[58]Institute of Health and Biomedical Innovation, Queensland University of Technology, Brisbane, Queensland, Australia
[59]National Institute of Psychiatry, Mexico City, Distrito Federal, Mexico
[60]ErasmusMC, Rotterdam, Netherlands
[61]University of British Columbia, School of Population and Public Health, Vancouver, British Columbia, Canada
[62]Sina Trauma and Surgery Research Center, Tehran University of Medical Sciences, Tehran, Iran
[63]Suez Canal University, Ismailia, Egypt
[64]Centre for Research in Environmental Epidemiology (CREAL), Barcelona, Catalonia, Spain
[65]BARC Hospital, HBNI University, Mumbai, Maharashtra, India
[66]Department of Public Health Sciences, Karolinska Institutet, Stockholm, Sweden
[67]University of Alabama at Birmingham, Birmingham, Alabama, USA
[68]An-Najah University, Nablus, Palestine
[69]Tufts Medical Center, Boston, Massachusetts, USA
[70]Norwegian Institute of Public Health, Oslo, Norway
[71]Stavanger University Hospital, Stavanger, Norway
[72]Federal Research Institute for Health Organization and Informatics of Ministry of Health of the Russian Federation was founded in 1999 by the order of Ministry of Health of Russia, Moscow, Russia
[73]University of Cape Town, Cape Town, Western Province, South Africa
[74]MRC Unit on Anxiety & Stress Disorders, Cape Town, Western Cape, South Africa
[75]University of California, Irvine, USA
[76]University of Illinois at Urbana-Champaign, Champaign, Illinois, USA
[77]IHME, Seattle, Washington, USA
[78]Memorial University, St. John's, Newfoundland, Canada
[79]Auckland University of Technology, Auckland, New Zealand
[80]Johns Hopkins University, Baltimore, Maryland, USA
[81]Hanoi Medical University, Hanoi, Vietnam
[82]UKK Institute for Health Promotion Research, Tampere, Finland
[83]Higher School of Economics, Moscow, Russia
[84]Institute of Public Health, University of Gondar, Gondar, Amhara, Ethiopia
[85]The University of Hong Kong, Hong Kong, China
[86]National Center of Neurology and Psychiatry, Kodaira, Tokyo, Japan
[87]Jackson State University, Jackson, Mississippi, USA
[88]Department of Epidemiology and Biostatistics, School of Public Health, Wuhan, Hubei, China
[89]Global Health Institute, Wuhan University, Wuhan, China
[90]Shanghai Mental Health Center, Shanghai Jiao Tong University School of Medicine and Department of Psychiatry, Emory University

Twitter Follow Richard Franklin at @Franklin_R_C and Karen Tabb at @professortd

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Data sharing statement In GBD publications and in our online visualisation tools we allow users to look up the cause of disease or injury, measure at regional, subregional, country or, for some countries, subnational level that is of interest.

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INJURY PREVENTION

Global toll of injuries down by almost a third since 1990

“World is becoming a safer place to live in,” say researchers

The global toll taken by injuries on daily life has fallen by almost a third in the past quarter of a century, reveals research published online in the journal ***Injury Prevention****.*

The findings prompt the researchers to conclude that “the world is becoming a safer place to live in.”

The World Bank commissioned the first Global Burden of Diseases and Injuries, and Risk Factors (GBD) study in the early 1990s. In subsequent updates, injury has emerged as a substantial cause of ill health and death in both the developing and developed world.

As part of a global collaboration, the researchers mined the latest GBD update in 2013 to assess the impact of 26 causes of injury and 47 types of injury, dating back to 1990, for 188 countries in 21 regions of the world.

They used data on the number of injuries, deaths from injuries, and a measure known as disability adjusted life years, or DALYs for short. The DALY is calculated by adding together years of life lost to death, and years of life lived with a disability.

They calculated that in 2013 almost a billion people (973 million) sustained injuries that required medical attention/treatment, accounting for 10% of the global toll of disease.

Major causes included car crashes, which made up 29% of the total, followed by self harm, which includes suicide (17.6%); falls (11.6%); and violence (8.5%).

Among those whose injuries warranted some form of healthcare, just under 6% required admission to hospital. The largest category of injury requiring admission was fracture (38.5%).

In almost all regions of the world, injury rates were higher in men than in women, until the age of 80. Almost 5 million people died of their injuries.

Injuries remain an important cause of ill health and death, the calculations show, but between 1990 and 2013, the global DALY, standardised for age, fell by almost a third (31%).

This fall was significant for 22 of the 26 causes of injury, including all the major ones. But there were some variations, according to age, gender, geography, and time.

DALYs among the under 15s were lowest in Western Europe and highest in central Sub-Saharan Africa.

Among 15 to 49 year olds, the peak age category for road traffic injuries, there was an eightfold difference in rates between high income Asia Pacific and western Sub-Saharan Africa, while rates were 70% higher in North America than in Western Europe, Australasia and Asia Pacific.

“These decreases in DALY rates for almost all cause of injury categories warrant a general statement that the world is becoming a safer place to live in, although the injury burden remains high in some parts of the world,” conclude the researchers.

Notes for editors:
Research: The global burden of injury: incidence, mortality, disability-adjusted life years and time trends from the Global Burden of Disease study 2013 doi 10.1136/injuryprev-2015-041616
Journal: ***Injury Prevention***

Annex to The global burden of injury: incidence, mortality, disability-adjusted life year estimates and time trends from the Global Burden of Disease Study 2013

This annex provides supplemental information on data sources, methods and supplemental tables and figures to support the material in the main paper.

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Section 1. Tables of cause-of-injury and nature-of-injury + ICD-9 & ICD-10 codes

Annex Table 1.1 ICD codes mapped to cause-of-injury

Cause of injury	ICD 9	ICD 10
Pedestrian road injuries	E811.7, E812.7, E813.7, E814.7, E815.7, E816.7, E817.7, E818.7, E819.7, E822.7, E823.7, E824.7, E825.7, E826.0, E827.0, E828.0, E829.0	V01.0, V01.1, V01.2, V01.9, V02.5, V02.6, V02.7, V02.8, V02.9, V03.2, V03.3, V03.4, V03.5, V03.6, V03.7, V03.8, V03.9, V04.0, V04.1, V04.2, V04.3, V04.4, V04.5, V04.6, V06.0, V06.1, V06.2, V06.3, V06.4, V06.5, V06.6, V06.8, V06.9, V07.1, V07.2, V07.3, V07.4, V07.8, V07.9, V09.0, V09.1, V09.2, V09.3, V09.4, V09.5, V09.6, V09.7, V09.8
Cyclist road injuries	E800.3, E801.3, E802.3, E803.3, E804.3, E805.3, E806.3, E807.3, E810.6, E811.6, E812.6, E813.6, E814.6, E815.6, E816.6, E817.6, E818.6, E819.6, E820.6, E821.6, E822.6, E823.6, E824.6, E825.6, E826.1	V10.8, V11.2, V11.3, V11.4, V11.5, V11.8, V11.9, V12.4, V12.5, V13.0, V13.5, V13.6, V13.7, V14.1, V14.2, V14.3, V14.4, V14.5, V14.6, V14.7, V14.8, V14.9, V16.4, V16.5, V16.6, V16.7, V16.8, V16.9, V17.0, V17.5, V17.6, V18.0, V18.5, V18.6, V19.2, V19.4, V19.5, V19.6, V19.8, V19.9
Motorcyclist road injuries	E810.2, E810.3, E811.2, E811.3, E812.2, E812.3, E813.2, E813.3, E814.2, E814.3, E815.2, E815.3, E816.2, E816.3, E817.2, E817.3, E818.2, E818.3, E819.2, E819.3, E820.2, E820.3, E821.2, E821.3, E822.2, E822.3, E823.2, E823.3, E824.2, E824.3, E825.2, E825.3	V20.0, V20.1, V20.2, V20.3, V20.4, V20.5, V20.9, V21.0, V21.1, V21.8, V22.2, V22.3, V22.4, V22.5, V24.3, V24.4, V24.5, V24.9, V27.2, V27.7, V27.9, V28.0, V28.1, V28.2, V28.3, V28.4, V28.5, V28.6, V28.8, V28.9, V29.0, V29.4, V29.5, V29.6, V29.8, V29.9
Motor vehicle road injuries	E810.0, E810.1, E811.0, E811.1, E812.0, E812.1, E813.0, E813.1, E814.0, E814.1, E815.0, E815.1, E816.0, E816.1, E817.0, E817.1, E818.0, E818.1, E819.0, E819.1, E820.0, E820.1, E821.0, E821.1, E822.0, E822.1, E823.0, E823.1, E824.0, E824.1, E825.0, E825.1	V30.0, V30.1, V33.6, V35.0, V35.1, V35.2, V35.3, V35.4, V35.5, V35.6, V35.7, V35.9, V36.2, V36.5, V36.9, V37.1, V37.2, V37.3, V37.6, V37.7, V38.1, V38.2, V38.9, V39.0, V39.1, V39.2, V39.4, V39.5, V39.6, V39.8, V40.9, V41.0, V41.1, V41.5, V41.6, V41.7, V41.8, V41.9, V42.0, V42.1, V42.2, V42.3, V42.4, V42.5, V42.6, V42.7, V42.8, V42.9, V43.1, V43.2, V43.4, V43.5, V43.6, V43.9, V44.1, V44.2, V44.7, V44.8, V48.9, V49.0, V49.3, V49.5, V49.6, V49.8, V51.1, V52.2, V54.5, V58.3, V58.4, V58.5, V59.6, V60.7, V62.1, V62.6, V63.9, V64.1, V64.2, V65.7, V65.8, V65.9, V66.0, V66.1, V66.2, V66.3, V66.4, V66.5, V66.6, V66.7, V66.9, V67.4, V69.1, V69.6, V69.9, V71.0, V73.5, V73.9, V74.6, V74.7, V74.8, V75.3, V75.9, V76.6, V77.1, V77.7, V77.8, V87.2, V87.3
Other road injuries	E810.4, E810.5, E811.4, E811.5, E812.4, E812.5, E813.4, E813.5, E814.4, E814.5, E815.4, E815.5, E816.4, E816.5, E817.4, E817.5, E818.4, E818.5, E819.4, E819.5, E820.4, E820.5, E821.4, E821.5, E822.4, E822.5, E823.4, E823.5, E824.4, E824.5, E825.4, E825.5, E826.3, E826.4, E827.3, E827.4, E828.4, E829.4	V80.1, V80.2, V80.4, V80.6, V80.7, V80.8, V80.9, V82.0, V82.1, V82.2, V82.3, V82.4, V82.5, V82.6, V82.7, V82.8, V82.9
Other transport injuries	E800.0, E800.1, E800.2, E801.0, E801.1, E801.2, E802.0, E802.1, E802.2, E803.0, E803.1, E803.2, E804.0, E804.1, E804.2, E805.0, E805.1, E805.2, E806.0, E806.1, E806.2, E807.0, E807.1, E807.2, E810.7, E820.7, E821.7, E826.2, E827.2, E828.2, E830.0, E830.1, E830.2, E830.3, E830.4, E830.5, E830.6, E830.7, E830.8, E830.9, E831.0, E831.1, E831.2, E831.3, E831.4, E831.5, E831.6, E831.7, E831.8, E831.9, E832.0, E832.1, E832.2, E832.3, E832.4, E832.5, E832.6, E832.7, E832.8, E832.9, E833.0, E833.1, E833.2, E833.3, E833.4, E833.5, E833.6, E833.7, E833.8, E833.9, E834.0, E834.1, E834.2, E834.3, E834.4, E834.5, E834.6, E834.7, E834.8, E834.9, E835.0, E835.1, E835.2, E835.3, E835.4, E835.5, E835.6, E835.7, E835.8, E835.9, E836.0, E836.1, E836.2, E836.3, E836.4, E836.5, E836.6, E836.7, E836.8, E836.9, E837.0, E837.1, E837.2, E837.3, E837.4, E837.5, E837.6, E837.7, E837.8, E837.9, E838.0, E838.1, E838.2, E838.3, E838.4, E838.5, E838.6, E838.7, E838.8, E838.9, E840.0, E840.1, E840.2, E840.3, E840.4, E840.5, E840.6, E840.7, E840.8, E840.9, E841.0, E841.1, E841.2, E841.3, E841.4, E841.5, E841.6, E841.7, E841.8, E841.9, E842.6, E842.7, E842.8, E842.9, E843.0, E843.1, E843.2, E843.3, E843.4, E843.5, E843.6, E843.7, E843.8, E843.9, E844.0, E844.1, E844.2, E844.3, E844.4, E844.5, E844.6, E844.7, E844.8, E844.9, E845.0, E845.8, E845.9, E849.0, E849.1, E849.2, E849.3, E849.4, E849.5, E849.6, E849.7, E849.8, E849.9, E929.1	V00.1, V00.2, V00.3, V00.8, V05.1, V05.2, V05.3, V05.4, V05.9, V81.0, V81.1, V81.2, V81.3, V81.4, V81.5, V81.6, V81.7, V81.8, V81.9, V83.0, V83.1, V83.2, V83.3, V83.4, V83.5, V83.6, V83.7, V83.8, V83.9, V84.0, V84.1, V84.2, V84.3, V84.4, V84.5, V84.6, V84.7, V84.8, V84.9, V85.0, V85.1, V85.2, V85.3, V85.4, V85.5, V85.6, V85.7, V85.9, V86.0, V86.1, V86.2, V86.3, V86.4, V86.5, V86.6, V86.7, V86.9, V88.2, V88.3, V90.0, V90.1, V90.3, V90.8, V91.0, V91.2, V91.3, V91.4, V91.5, V91.6, V91.8, V92.0, V92.1, V92.2, V92.7, V92.8, V93.0, V93.1, V93.2, V93.3, V93.4, V93.5, V93.6, V93.7, V93.8, V93.9, V94.0, V94.1, V94.2, V94.3, V94.7, V94.8, V94.9, V95.0, V95.1, V95.2, V95.3, V95.4, V95.8, V95.9, V96.0, V96.1, V96.2, V96.8, V96.9, V97.0, V97.1, V97.2, V97.3, V97.8, V98.0, V98.1, V98.2, V98.3, V98.8

Cause of injury	ICD 9	ICD 10
Falls	E880.0, E880.1, E880.9, E881.0, E881.1, E882.0, E883.0, E883.1, E883.2, E883.9, E884.0, E884.1, E884.2, E884.3, E884.4, E884.5, E884.6, E884.9, E885.0, E885.1, E885.2, E885.3, E885.4, E885.9, E886.0, E886.9, E888.0, E888.1, E888.8, E888.9, E929.3	W00.2, W00.4, W00.7, W00.9, W01.1, W01.2, W01.3, W01.4, W01.5, W01.6, W01.7, W01.8, W01.9, W02.0, W02.1, W02.2, W02.3, W02.4, W02.5, W02.6, W02.7, W02.8, W02.9, W03.0, W03.1, W03.2, W03.3, W03.4, W03.5, W03.6, W03.7, W03.8, W03.9, W04.0, W04.1, W04.2, W04.3, W04.4, W04.5, W04.6, W04.7, W04.8, W04.9, W05.0, W05.1, W05.2, W05.3, W05.4, W05.5, W05.6, W05.7, W05.8, W05.9, W06.0, W06.1, W06.2, W06.3, W06.4, W06.5, W06.6, W06.7, W06.8, W06.9, W07.0, W07.1, W07.2, W07.3, W07.4, W07.5, W07.6, W07.7, W07.8, W07.9, W08.0, W08.1, W08.2, W08.3, W08.4, W08.5, W08.6, W08.7, W08.8, W09.0, W09.3, W09.4, W09.5, W10.2, W10.3, W10.6, W10.7, W11.0, W11.1, W11.2, W11.3, W11.4, W11.5, W11.6, W11.7, W11.8, W11.9, W12.0, W12.1, W12.2, W12.3, W12.4, W12.5, W12.6, W12.7, W12.8, W12.9, W13.0, W13.1, W13.2, W13.3, W13.4, W13.5, W13.6, W13.7, W13.8, W13.9, W14.0, W14.1, W14.2, W14.3, W14.4, W14.5, W14.6, W14.7, W14.8, W14.9, W15.0, W15.1, W15.2, W15.3, W15.4, W15.5, W15.6, W15.7, W15.8, W15.9, W16.0, W16.1, W16.2, W16.3, W16.4, W16.5, W16.6, W16.7, W16.8, W16.9, W17.0, W17.1, W17.2, W17.3, W17.4, W17.5, W17.6, W17.7, W17.8, W17.9, W18.0, W18.3, W18.4, W18.8, W18.9, W19.3, W19.6
Drowning	E910.0, E910.1, E910.2, E910.3, E910.4, E910.8, E910.9	W65.9, W69.6, W69.8, W70.0, W70.3, W70.4, W70.5, W73.1, W73.2, W73.3, W73.9, W74.1
Fire, heat, and hot substances	E890.0, E890.1, E890.2, E890.3, E890.8, E890.9, E891.0, E891.1, E891.2, E891.3, E891.8, E891.9, E892.0, E893.0, E893.1, E893.2, E893.8, E893.9, E894.0, E895.0, E896.0, E897.0, E898.0, E898.1, E899.0, E924.0, E924.1, E924.2, E924.8, E924.9, E929.4	X00.5, X00.9, X01.8, X02.9, X03.0, X03.1, X03.2, X03.3, X03.6, X03.7, X03.8, X04.0, X04.1, X04.6, X04.7, X04.8, X05.0, X05.1, X05.9, X06.0, X06.2, X06.3, X06.4, X06.5, X06.6, X06.7, X06.8, X06.9, X08.0, X08.1, X08.2, X09.1, X09.2, X09.3, X09.4, X09.5, X09.6, X09.7, X09.8, X10.0, X10.1, X10.2, X10.4, X10.5, X10.8, X10.9, X11.7, X11.8, X12.0, X12.1, X12.8, X13.6, X13.8, X13.9, X14.1, X14.2, X14.4, X14.5, X14.6, X14.7, X14.8, X15.1, X15.2, X15.3, X15.8, X15.9, X16.7, X17.4, X17.7, X19.5, X19.6, X19.9
Poisoning by gases and vapors	E862.0, E862.1, E862.2, E862.3, E862.4, E862.9, E867.0, E868.0, E868.1, E868.2, E868.3, E868.8, E868.9, E869.0, E869.1, E869.2, E869.3, E869.4, E869.8, E869.9	X46.5, X46.6, X47.3, X47.4, X47.5
Poisoning by pesticides	E863.0, E863.1, E863.2, E863.3, E863.4, E863.5, E863.6, E863.7, E863.8, E863.9	-
Poisoning by other means	E850.3, E850.4, E850.5, E850.6, E850.7, E850.8, E854.8, E855.0, E855.1, E855.2, E855.3, E855.4, E855.5, E855.6, E856.0, E857.0, E858.0, E858.1, E858.2, E858.3, E858.4, E858.5, E858.6, E858.7, E858.8, E858.9, E860.2, E860.3, E860.4, E860.8, E860.9, E861.0, E861.1, E861.2, E861.3, E861.4, E861.5, E861.6, E861.9, E864.0, E864.1, E864.2, E864.3, E864.4, E865.0, E865.1, E865.2, E865.3, E865.4, E865.5, E865.8, E865.9, E866.0, E866.1, E866.2, E866.3, E866.4, E866.5, E866.6, E866.7, E866.8, E866.9	X40.0, X40.9, X43.0, X43.1
Unintentional firearm injuries	E922.0, E922.1, E922.2, E922.3, E922.4, E922.5, E922.8, E922.9, E928.7	W32.8, W33.0, W33.1, W33.9, W34.0, W34.1
Unintentional suffocation	E913.0, E913.1	W75.0, W75.7, W75.8, W75.9, W76.8, W76.9
Other exposure to mechanical forces	E916.0, E917.0, E917.1, E917.2, E917.3, E917.4, E917.5, E917.6, E917.7, E917.8, E917.9, E918.0, E919.0, E919.1, E919.2, E919.3, E919.4, E919.5, E919.6, E919.7, E919.8, E919.9, E920.0, E920.1, E920.2, E920.3, E920.4, E920.5, E920.8, E920.9, E921.0, E921.1, E921.8, E921.9, E928.1, E928.2, E928.3, E928.4, E928.5, E928.6	W20.5, W20.6, W20.7, W20.8, W21.0, W21.1, W21.2, W21.3, W21.4, W21.5, W21.8, W21.9, W22.0, W22.1, W22.2, W22.5, W22.6, W22.7, W22.9, W23.0, W23.1, W23.2, W23.3, W23.4, W23.5, W23.6, W23.7, W23.9, W24.0, W24.3, W24.6, W24.7, W25.2, W25.5, W25.6, W25.9, W26.0, W26.1, W26.2, W26.3, W26.4, W26.5, W26.6, W26.7, W26.8, W26.9, W27.0, W27.1, W27.2, W27.3, W27.4, W27.5, W27.6, W27.7, W27.8, W27.9, W28.0, W28.1, W28.3, W28.4, W28.5, W28.6, W28.7, W28.8, W28.9, W29.0, W29.1, W29.2, W29.3, W29.4, W29.5, W29.6, W30.2, W30.3, W30.4, W30.5, W30.6, W30.7, W30.8, W30.9, W31.0, W31.1, W31.8, W37.0, W37.1, W37.4, W37.7, W37.8, W37.9, W38.1, W38.2, W38.3, W38.4, W38.8, W38.9, W40.8, W41.0, W41.1, W41.2, W41.5, W41.6, W41.9, W42.9, W43.6, W43.8, W43.9, W49.0, W49.1, W49.5, W49.7, W50.0, W50.1, W50.2, W50.3, W50.4, W50.5, W50.6, W50.7, W51.0, W51.1, W51.2, W51.3, W51.4, W51.5, W51.6, W51.7, W51.8, W51.9

Cause of injury	ICD 9	ICD 10
Adverse effects of medical treatment	E870.0, E870.1, E870.2, E870.3, E870.4, E870.5, E870.6, E870.7, E870.8, E870.9, E871.0, E871.1, E871.2, E871.3, E871.4, E871.5, E871.6, E871.7, E871.8, E871.9, E872.0, E872.1, E872.2, E872.3, E872.4, E872.5, E872.6, E872.8, E872.9, E873.0, E873.1, E873.2, E873.3, E873.4, E873.5, E873.6, E873.8, E873.9, E874.0, E874.1, E874.2, E874.3, E874.4, E874.5, E874.8, E874.9, E875.0, E875.1, E875.2, E875.8, E875.9, E876.0, E876.1, E876.2, E876.3, E876.4, E876.5, E876.6, E876.7, E876.8, E876.9, E878.0, E878.1, E878.2, E878.3, E878.4, E878.5, E878.6, E878.8, E878.9, E879.0, E879.1, E879.2, E879.3, E879.4, E879.5, E879.6, E879.7, E879.8, E879.9, E930.0, E930.1, E930.2, E930.3, E930.4, E930.5, E930.6, E930.7, E930.8, E930.9, E931.0, E931.1, E931.2, E931.3, E931.4, E931.5, E931.6, E931.7, E931.8, E931.9, E932.0, E932.1, E932.2, E932.3, E932.4, E932.5, E932.6, E932.7, E932.8, E932.9, E933.0, E933.1, E933.2, E933.3, E933.4, E933.5, E933.6, E933.7, E933.8, E933.9, E934.0, E934.1, E934.2, E934.3, E934.4, E934.5, E934.6, E934.7, E934.8, E934.9, E935.0, E935.1, E935.2, E935.3, E935.4, E935.5, E935.6, E935.7, E935.8, E935.9, E936.0, E936.1, E936.2, E936.3, E936.4, E937.0, E937.1, E937.2, E937.3, E937.4, E937.5, E937.6, E937.8, E937.9, E938.0, E938.1, E938.2, E938.3, E938.4, E938.5, E938.6, E938.7, E938.9, E939.0, E939.1, E939.2, E939.3, E939.4, E939.5, E939.6, E939.7, E939.8, E939.9, E940.0, E940.1, E940.8, E940.9, E941.0, E941.1, E941.2, E941.3, E941.9, E942.0, E942.1, E942.2, E942.3, E942.4, E942.5, E942.6, E942.7, E942.8, E942.9, E943.0, E943.1, E943.2, E943.3, E943.4, E943.5, E943.6, E943.8, E943.9, E944.0, E944.1, E944.2, E944.3, E944.4, E944.5, E944.6, E944.7, E945.0, E945.1, E945.2, E945.3, E945.4, E945.5, E945.6, E945.7, E945.8, E946.0, E946.1, E946.2, E946.3, E946.4, E946.5, E946.6, E946.7, E946.8, E946.9, E947.0, E947.1, E947.2, E947.3, E947.4, E947.8, E947.9, E948.0, E948.1, E948.2, E948.3, E948.4, E948.5, E948.6, E948.8, E948.9, E949.0, E949.1, E949.2, E949.3, E949.4, E949.5, E949.6, E949.7, E949.9	D52.1, D59.0, D59.2, D59.6, D69.5, D78.2, D78.8, E03.2, E06.4, E09.0, E09.1, E09.3, E09.4, E09.6, E09.8, E27.3, E36.0, E36.1, E66.1, E89.0, E89.1, E89.3, E89.8, G24.0, G25.1, G25.6, G25.7, G93.7, G97.0, G97.1, G97.2, G97.3, G97.4, G97.5, G97.9, I97.4, J95.8, K43.0, K43.1, K43.2, K43.3, K43.4, K43.7, K43.9, K91.5, K91.6, K94.1, K94.2, K94.3, K95.0, K95.8, M87.1, N99.5, N99.6, N99.8, R50.2, R50.8, Y40.1, Y40.2, Y40.3, Y40.4, Y40.7, Y43.4, Y44.5, Y45.0, Y45.1, Y45.4, Y46.0, Y46.2, Y46.3, Y46.4, Y48.2, Y49.2, Y49.8, Y51.3, Y51.4, Y52.0, Y52.4, Y52.5, Y53.8, Y53.9, Y54.6, Y55.3, Y57.5, Y57.9, Y58.5, Y59.0, Y59.1, Y59.2, Y59.3, Y59.8, Y59.9, Y60.5, Y60.6, Y60.7, Y60.9, Y62.0, Y62.6, Y63.1, Y63.2, Y63.5, Y64.0, Y65.1, Y65.3, Y65.5, Y65.8, Y70.0, Y70.1, Y73.2, Y74.0, Y75.1, Y75.2, Y75.3, Y76.8, Y76.9, Y78.3, Y79.8, Y80.2, Y80.3, Y81.2, Y81.8, Y82.1, Y83.0, Y83.4, Y83.5, Y83.6, Y83.8, Y84.0, Y84.1, Y84.3, Y84.5, Y84.6, Y84.7, Y88.3
Venomous animal contact	E905.0, E905.1, E905.2, E905.3, E905.4, E905.5, E905.6, E905.7, E905.8, E905.9	X20.0, X20.2, X20.4, X20.6, X23.0, X23.1, X23.2, X25.4, X25.7, X28.1, X28.2, X28.4, X28.5, X28.7, X28.8, X28.9, X29.6, X29.8
Non-venomous animal contact	E906.0, E906.1, E906.2, E906.3, E906.4, E906.5, E906.8, E906.9	W52.0, W52.1, W52.2, W52.4, W52.5, W52.6, W52.7, W52.8, W52.9, W53.0, W53.1, W53.2, W53.8, W54.0, W54.1, W54.2, W54.4, W54.5, W54.7, W54.8, W54.9, W55.0, W55.1, W55.2, W55.3, W55.4, W55.5, W55.6, W55.7, W55.8, W55.9, W56.0, W56.1, W56.2, W56.3, W56.4, W56.5, W56.6, W56.8, W56.9, W57.4, W57.5, W57.8, W58.0, W58.1, W59.1, W59.2, W59.4, W59.7, W59.8, W60.1, W60.2, W61.0, W64.0
Pulmonary aspiration and foreign body in airway	E911.0, E912.0, E913.8, E913.9	W78.2, W79.4, W79.5, W79.7, W80.9, W83.2, W83.3, W83.6, W84.1, W84.4, W84.7
Foreign body in eyes	360.5, 360.6, 376.6, 709.4, 729.6, E914.0	H02.8, H05.5, H44.6, H44.7
Foreign body in other body part	E915.0	M60.2, W44.1, W44.2, W44.3, W44.6, W44.9, W45.3
Other unintentional injuries	E903.0, E904.0, E904.1, E904.2, E904.3, E904.9, E913.2, E913.3, E923.0, E923.1, E923.2, E923.8, E923.9, E925.0, E925.1, E925.2, E925.8, E925.9, E927.0, E927.1, E927.2, E927.3, E927.4, E927.8, E927.9, E928.0, E928.8	W39.0, W77.2, W77.4, W81.0, W81.1, W81.2, W86.0, W86.2, W86.3, W86.4, W86.5, W86.8, W87.0, W87.1, W87.2, W87.3, W87.4, W87.7, W87.8, X50.2, X50.3, X50.4, X50.6, X50.7, X52.6, X52.7, X53.0, X58.2
Self-harm by hanging, strangulation, and suffocation	E953.0, E953.1, E953.8, E953.9	-
Self-harm by fire, heat, and hot substances	E958.1	X76.1, X76.5
Self-harm by firearm	E955.0, E955.1, E955.2, E955.3, E955.4, E955.5, E955.6, E955.7, E955.9	X72.9, X73.1, X73.5, X74.0, X74.9
Self-harm by other specified means	E950.0, E950.1, E950.2, E950.3, E950.4, E950.5, E950.6, E950.7, E950.8, E950.9, E951.0, E951.1, E951.8, E952.0, E952.1, E952.8, E952.9, E957.0, E957.1, E957.2, E957.9, E958.0, E958.2, E958.3, E958.4, E958.5, E958.6, E958.7, E958.8, E958.9	X60.2, X60.3, X60.5, X62.9, X63.7, X63.8, X63.9, X64.0, X64.4, X64.6, X65.1, X65.4, X65.5, X65.8, X66.0, X66.1, X67.1, X69.1, X69.2, X69.7, X69.8, X69.9, X70.0, X70.1, X70.2, X70.3, X70.6, X71.0, X75.1, X75.4, X75.8, X78.2, X79.9, X80.8, X80.9, X81.2, X82.2, X82.4, X82.6, X83.6, X83.7, X83.9, X84.0, X84.6, X84.9
Assault by firearm	E965.0, E965.1, E965.2, E965.3, E965.4	X94.0, X94.4, X94.6, X95.0, X95.1, X95.3, X95.7

Cause of injury	ICD 9	ICD 10
Assault by sharp object	-	X99.1, X99.3, X99.5
Assault by other means	E960.0, E960.1, E962.0, E962.1, E962.2, E962.9, E965.5, E965.6, E965.7, E965.8, E965.9, E967.0, E967.1, E967.2, E967.3, E967.4, E967.5, E967.6, E967.7, E967.8, E967.9, E968.0, E968.1, E968.2, E968.3, E968.4, E968.5, E968.6, E968.7, E968.8, E968.9	X85.6, X85.7, X86.0, X87.0, X87.4, X87.8, X88.2, X89.6, X90.0, X90.4, X90.9, X91.1, X91.2, X91.7, X91.8, X92.0, X92.9, X96.0, X96.1, X96.2, X96.3, X96.4, X96.6, X96.8, X96.9, X97.6, X97.7, X98.5, X98.7, X98.8, Y00.5, Y00.7, Y00.8, Y00.9, Y01.4, Y01.6, Y01.9, Y02.0, Y02.9, Y03.2, Y03.5, Y03.8, Y04.0, Y04.6, Y05.7, Y05.8, Y05.9, Y06.8, Y07.1, Y07.4, Y07.5, Y08.0, Y08.1, Y08.5, Y08.6, Y08.8, Y87.1, Y87.2
Exposure to forces of nature, disaster	E907.0, E908.0, E908.1, E908.2, E908.3, E908.4, E908.8, E908.9, E909.0, E909.1, E909.2, E909.3, E909.4, E909.8, E909.9	X33.0, X35.9, X36.8, X37.4, X37.9, X38.6
Exposure to environmental forces, non-disaster	E900.0, E900.1, E900.9, E901.0, E901.1, E901.8, E901.9, E902.0, E902.1, E902.2, E902.8, E902.9, E926.0, E926.1, E926.2, E926.3, E926.4, E926.5, E926.8, E926.9, E929.5	W88.7, W88.9, W89.0, W89.1, W89.2, W89.3, W89.4, W89.8, W89.9, W90.6, W91.7, W92.2, W92.4, W93.0, W93.1, W93.2, W94.1, W94.2, W94.3, W94.4, W94.6, W94.7, W94.9, W97.9, W99.0, W99.1, W99.2, W99.4, X31.6
Collective violence and legal intervention	E979.0, E979.1, E979.2, E979.3, E979.4, E979.5, E979.6, E979.7, E979.8, E979.9, E990.0, E990.1, E990.2, E990.3, E990.9, E991.0, E991.1, E991.2, E991.3, E991.4, E991.5, E991.6, E991.7, E991.8, E991.9, E992.0, E992.1, E992.2, E992.3, E992.8, E992.9, E993.0, E993.1, E993.2, E993.3, E993.4, E993.5, E993.6, E993.7, E993.8, E993.9, E994.0, E994.1, E994.2, E994.3, E994.8, E994.9, E995.0, E995.1, E995.2, E995.3, E995.4, E995.8, E995.9, E996.0, E996.1, E996.2, E996.3, E996.8, E996.9, E997.0, E997.1, E997.2, E997.3, E997.8, E997.9, E998.0, E998.1, E998.8, E998.9, E999.0, , E999.1	Y35.0, Y35.1, Y35.2, Y35.3, Y35.4, Y35.5, Y35.8, Y36.0, Y36.1, Y36.2, Y36.3, Y36.4, Y36.5, Y36.7, Y36.8, Y36.9, Y37.0, Y37.1, Y37.2, Y37.3, Y37.4, Y37.5, Y38.7, Y38.8

Annex Table 1.2 ICD codes mapped to nature-of-injury

Nature of injury	ICD 9	ICD 10
Amputation of lower limbs, bilateral	896.2, 896.3, 897.6, 897.7	-
Amputation of upper limbs, bilateral	887.6, 887.7, 888.1, 888.2, 888.9	S68.4
Amputation of fingers (excluding thumb)	886.0, 886.1	S68.1, S68.6
Amputation of lower limb, unilateral	896.0, 896.1, 897.0, 897.1, 897.2, 897.3, 897.4, 897.5	S78.0, S78.1, S78.9, S88.9, S98.0, S98.3, S98.9
Amputation of upper limb, unilateral	887.0, 887.1, 887.2, 887.3, 887.4, 887.5	S48.9, S58.1
Amputation of thumb	885.0, 885.1	S68.0
Amputation of toe/toes	895.0, 895.1	S98.1
Burns, <20% total burned surface area without lower airway burns	941.0, 941.1, 941.2, 941.3, 941.4, 941.5, 942.0, 942.1, 942.2, 942.3, 943.0, 943.1, 943.2, 943.3, 943.4, 943.5, 944.0, 944.1, 944.2, 944.3, 944.4, 944.5, 945.0, 945.1, 945.2, 945.3, 945.4, 945.5, 947.3, 947.4, 947.8, 947.9, 948.0, 948.1, 949.0, 949.1, 949.2, 949.3, 949.4, 949.5	T20.0, T20.1, T20.2, T20.4, T20.6, T20.7, T21.0, T21.1, T21.2, T21.4, T21.7, T23.1, T24.5, T25.0, T25.1, T25.2, T25.3, T25.4, T25.5, T25.6, T25.7, T28.3, T28.4
Burns, >=20% total burned surface area or >= 10% total burned surface area if head/neck or hands/wrist involved without lower airway burns	906.5, 906.6, 906.7, 906.8, 906.9, 942.4, 942.5, 946.0, 946.1, 946.2, 946.3, 946.4, 946.5, 948.2, 948.3, 948.4, 948.5, 948.6, 948.7, 948.8, 948.9	T29.6, T31.4, T31.6, T31.8, T31.9, T32.2, T32.4, T32.9
Lower airway burns	947.0, 947.1, 947.2	T27.3
Dislocation of hip	835.0, 835.1	S73.0
Dislocation of knee	836.0, 836.1, 836.2, 836.3, 836.4, 836.5, 836.6	S83.0
Dislocation of shoulder	831.0, 831.1	S43.0, S43.1, S43.2, S43.3
Muscle and tendon injuries, including sprains and strains lesser dislocations	830.0, 830.1, 832.0, 832.1, 832.2, 833.0, 833.1, 834.0, 834.1, 837.0, 837.1, 838.0, 838.1, 839.0, 839.1, 839.2, 839.3, 839.4, 839.5, 839.6, 839.7, 839.8, 839.9, 840.0, 840.1, 840.2, 840.3, 840.4, 840.5, 840.6, 840.7, 840.8, 840.9, 841.0, 841.1, 841.2, 841.3, 841.8, 841.9, 842.0, 842.1, 843.0, 843.1, 843.8, 843.9, 844.0, 844.1, 844.2, 844.3, 844.8, 844.9, 845.0, 845.1, 846.0, 846.1, 846.2, 846.3, 846.8, 846.9, 847.0, 847.1, 847.2, 847.3, 847.4,	S03.0, S03.1, S03.2, S03.3, S03.8, S03.9, S13.0, S13.1, S13.2, S13.3, S13.4, S13.5, S13.6, S16.1, S16.2, S16.8, S16.9, S23.0, S23.1, S23.2, S23.3, S23.4, S23.5, S33.3, S43.4, S43.9, S46.1, S46.2, S46.8, S46.9, S53.0, S53.1, S53.4, S66.2, S66.3, S73.1, S76.0, S76.1, S76.2, S76.3, S76.8, S76.9, S86.0, S86.1, S86.2, S86.3, S86.8, S93.0, S93.1, S93.3, S93.4, S93.5, S93.6, S96.0, S96.1, S96.2,

Nature of injury	ICD 9	ICD 10
	847.9, 848.0, 848.1, 848.2, 848.3, 848.4, 848.5, 848.8, 848.9, 905.6, 905.7, 905.8	S96.9, S99.9
Fracture of clavicle, scapula, or humerus	810.0, 810.1, 811.0, 811.1, 812.0, 812.1, 812.2, 812.3, 812.4, 812.5	S49.0, S49.1
Fracture of face bones	802.0, 802.1, 802.2, 802.3, 802.4, 802.5, 802.6, 802.7, 802.8, 802.9	S02.3, S02.4, S02.5, S02.6, S02.7
fracture of foot bones except ankle	825.0, 825.1, 825.2, 825.3, 826.0, 826.1, 826.6	S92.3, S92.4, S92.5, S92.7, S92.9
Fracture of hand(wrist and other distal part of hand)	814.0, 814.1, 815.0, 815.1, 816.0, 816.1	S62.8
Fracture of hip	820.0, 820.1, 820.2, 820.3, 820.8, 820.9, 905.3	S72.0, S72.1, S72.2
Fracture of patella, tibia or fibula, or ankle	822.0, 822.1, 823.0, 823.1, 823.2, 823.3, 823.4, 823.8, 823.9, 824.0, 824.1, 824.2, 824.3, 824.4, 824.5, 824.6, 824.7, 824.8, 824.9, 905.4	S82.0, S82.1, S82.2, S82.3, S82.4, S82.5, S82.6, S82.7, S82.8, S82.9, S89.0, S89.1, S89.2, S89.3
Fracture of pelvis	808.0, 808.1, 808.2, 808.3, 808.4, 808.5, 808.8, 808.9	S32.5
Fracture of radius and/or ulna	813.0, 813.1, 813.2, 813.3, 813.4, 813.5, 813.8, 813.9, 905.2	S52.3, S52.4, S52.5, S52.6, S52.7, S59.0, S59.1, S59.2
Fracture of skull	800.0, 800.1, 800.2, 800.3, 800.4, 800.5, 800.6, 800.7, 800.8, 800.9, 801.0, 801.1, 801.2, 801.3, 801.4, 801.5, 801.6, 801.7, 801.8, 801.9, 803.0, 803.1, 803.2, 803.3, 803.4, 803.5, 803.6, 803.7, 803.8, 803.9, 804.0, 804.1, 804.2, 804.3, 804.4, 804.5, 804.6, 804.7, 804.8, 804.9, 905.0	S02.8, S02.9
Fracture of sternum and/or fracture of one or more ribs	807.0, 807.1, 807.2, 807.3, 807.4, 807.5, 807.6	S22.2, S22.3, S22.4, S22.8, S22.9
Fracture of vertebral column	310.2, 805.0, 805.1, 805.2, 805.3, 805.4, 805.5, 805.6, 805.7, 805.8, 805.9, 905.1	S12.0, S12.5, S12.6, S22.0, S22.1
Fracture of femur, other than femoral neck	821.0, 821.1, 821.2, 821.3	S79.1, T93.1
Minor TBI	850.0, 850.1, 850.2, 850.3, 850.4, 850.5, 850.9	G44.3, S06.0
Moderate and severe TBI[1]	851.0, 851.1, 851.2, 851.3, 851.4, 851.5, 851.6, 851.7, 851.8, 851.9,852.0, 852.1, 852.2, 852.3, 852.4, 852.5, 853.0, 853.1, 854.0, 854.1. 907.0	S06.1, S06.2, S06.3, S06.4, S06.5, S06.6, S06.7, S06.8, S06.9, T90.2
Foreign body in respiratory system	933.0, 933.1, 934.0, 934.1, 934.8, 934.9	T17.2, T17.3, T17.4, T17.8, T17.9
Foreign body in GI and urogenital system	935.0, 935.1, 935.2, 938.9, 939.0, 939.1, 939.2, 939.3, 939.9	T18.1
Spinal cord lesion at neck level	806.0, 806.1, 952.0	S14.1, T91.3
Spinal cord lesion below neck level	806.2, 806.3, 806.4, 806.5, 806.6, 806.7, 806.8, 806.9, 952.1, 952.2, 952.3, 952.4, 952.8, 952.9	S24.0, S24.1, S34.1
Drowning and nonfatal submersion	994.1	-
Asphyxiation	994.7	T71.1, T71.2
Crush injury	906.4, 925.1, 925.2, 926.0, 926.1, 926.8, 926.9, 927.0, 927.1, 927.2, 927.3, 927.8, 927.9, 928.0, 928.1, 928.2, 928.3, 928.8, 928.9, 929.9	S07.0, S07.1, S07.8, S17.0, S17.8, S17.9, S38.0, S67.0, S67.1, S67.3, S67.9, S77.1, S77.2, S87.8, S97.1, S97.8
Nerve injury	907.1, 907.3, 907.4, 907.5, 907.8, 907.9, 950.0, 950.1, 950.2, 950.3, 950.9, 951.0, 951.1, 951.2, 951.3, 951.4, 951.5, 951.6, 951.7, 951.8, 951.9, 953.0, 953.1, 953.2, 953.3, 953.4, 953.5, 953.8, 953.9, 954.0, 954.1, 954.8, 954.9, 955.0, 955.1, 955.2, 955.3, 955.4, 955.5, 955.6, 955.7, 955.8, 955.9, 956.0, 956.1, 956.2, 956.3, 956.4, 956.5, 956.8, 956.9, 957.0, 957.1, 957.8, 957.9	S04.0, S04.1, S04.2, S04.3, S04.4, S04.5, S04.6, S04.7, S04.8, S04.9, S14.2, S14.3, S14.4, S14.5, S14.6, S14.8, S34.8, S34.9, S44.5, S54.0, S54.1, S54.2, S54.3, S64.4, S64.8, S64.9, S74.0, S74.1, S74.2, S74.9, S94.0, S94.1, T13.3, T90.3
Injury to eyes	366.2, 870.0, 870.1, 870.2, 870.3, 870.4, 870.8, 870.9, 871.0, 871.1, 871.2, 871.3, 871.4, 871.5, 871.6, 871.7, 871.9, 918.0, 918.1, 918.2, 918.9, 921.0, 921.1, 921.2, 921.3, 921.9, 930.0, 930.1, 930.2, 930.8, 930.9, 940.0, 940.1, 940.2, 940.3, 940.4, 940.5, 940.9	S01.1, S05.0, S05.1, S05.2, S05.3, S05.4, S05.5, S05.6, S05.7, S05.8, S05.9, T15.0, T15.1, T15.8, T26.4, T26.5, T26.6, T26.8, T90.4
Open wound(s)	872.0, 872.1, 872.6, 872.7, 872.8, 872.9, 873.0, 873.1, 873.2, 873.3, 873.4, 873.5, 873.6, 873.7, 873.8, 873.9, 874.2, 874.3, 874.4, 874.5, 874.8, 874.9, 875.0, 875.1, 876.0, 876.1, 877.0, 877.1, 878.0, 878.1, 878.2, 878.3, 878.4, 878.5, 878.6, 878.7, 878.8, 878.9, 879.0, 879.1, 879.2, 879.3, 879.4, 879.5, 879.6, 879.7, 879.8, 879.9, 880.0, 880.1, 880.2, 881.0, 881.1, 881.2, 882.0, 882.1, 882.2, 883.0, 883.1, 883.2, 884.0, 884.1, 884.2, 890.0, 890.1, 890.2, 891.0, 891.1, 891.2, 892.0, 892.1, 892.2, 893.0, 893.1, 893.2, 894.0, 894.1, 894.2, 900.0, 900.1, 900.8, 900.9, 903.0, 903.1, 903.2, 903.3, 903.4, 903.5, 903.8, 903.9, 904.0, 904.1, 904.2, 904.3, 904.4, 904.5,	S01.0, S01.2, S01.3, S01.4, S01.5, S01.7, S01.8, S01.9, S08.0, S08.1, S08.8, S09.0, S09.1, S09.2, S09.3, S10.7, S11.1, S11.8, S11.9, S15.0, S15.1, S15.2, S15.3, S15.7, S15.8, S15.9, S21.0, S21.1, S21.2, S21.3, S21.4, S21.7, S21.8, S21.9, S31.8, S41.0, S41.1, S45.1, S45.3, S51.0, S51.8, S55.0, S55.1, S55.8, S55.9, S65.0, S65.3, S65.4, S65.5, S65.7, S65.8, S65.9, S71.0, S71.1, S71.7, S75.0, S75.1, S75.2, S75.8, S75.9, S81.0, S81.7, S81.8, S81.9, S85.1, S85.2, S85.3, S85.4, S85.5, S85.8, S85.9, S95.0, S95.2, S95.8, T90.1, T93.0

Nature of injury	ICD 9	ICD 10
	904.6, 904.7, 904.8, 904.9, 906.0, 906.1, 906.2	
Poisoning requiring urgent care	960.0, 960.1, 960.2, 960.3, 960.4, 960.5, 960.6, 960.7, 960.8, 960.9, 961.0, 961.1, 961.2, 961.3, 961.4, 961.5, 961.6, 961.7, 961.8, 961.9, 962.0, 962.1, 962.2, 962.3, 962.4, 962.5, 962.6, 962.7, 962.8, 962.9, 963.0, 963.1, 963.2, 963.3, 963.4, 963.5, 963.8, 963.9, 964.0, 964.1, 964.2, 964.3, 964.4, 964.5, 964.6, 964.7, 964.8, 964.9, 965.0, 965.1, 965.4, 965.5, 965.6, 965.7, 965.8, 965.9, 966.0, 966.1, 966.2, 966.3, 966.4, 967.0, 967.1, 967.2, 967.3, 967.4, 967.5, 967.6, 967.8, 967.9, 968.0, 968.1, 968.2, 968.3, 968.4, 968.5, 968.6, 968.7, 968.9, 969.0, 969.1, 969.2, 969.3, 969.4, 969.5, 969.6, 969.7, 969.8, 969.9, 970.0, 970.1, 970.8, 970.9, 971.0, 971.1, 971.2, 971.3, 971.9, 972.0, 972.1, 972.2, 972.3, 972.4, 972.5, 972.6, 972.7, 972.8, 972.9, 973.0, 973.1, 973.2, 973.3, 973.4, 973.5, 973.6, 973.8, 973.9, 974.0, 974.1, 974.2, 974.3, 974.4, 974.5, 974.6, 974.7, 975.0, 975.1, 975.2, 975.3, 975.4, 975.5, 975.6, 975.7, 975.8, 976.0, 976.1, 976.2, 976.3, 976.4, 976.5, 976.6, 976.7, 976.8, 976.9, 977.0, 977.1, 977.2, 977.3, 977.4, 977.8, 977.9, 978.0, 978.1, 978.2, 978.3, 978.4, 978.5, 978.6, 978.8, 978.9, 979.0, 979.1, 979.2, 979.3, 979.4, 979.5, 979.6, 979.7, 979.9, 980.0, 980.1, 980.2, 980.3, 980.8, 980.9, 981.2, 981.3, 981.5, 981.6, 981.7, 981.9, 982.0, 982.1, 982.2, 982.3, 982.4, 982.8, 983.0, 983.1, 983.2, 983.5, 983.7, 983.9, 984.0, 984.1, 984.3, 984.8, 984.9, 985.0, 985.1, 985.2, 985.3, 985.4, 985.5, 985.6, 985.8, 985.9, 987.0, 987.1, 987.2, 987.3, 987.4, 987.5, 987.6, 987.7, 987.8, 987.9, 988.0, 988.1, 988.2, 988.6, 988.8, 988.9, 989.0, 989.1, 989.2, 989.3, 989.4, 989.5, 989.6, 989.7, 989.8, 989.9	T36.9, T38.8, T38.9, T39.0, T39.3, T39.8, T39.9, T40.3, T40.4, T40.5, T40.6, T40.9, T41.2, T41.4, T42.7, T43.0, T43.2, T43.4, T43.5, T43.6, T43.9, T44.6, T44.9, T45.5, T45.6, T45.7, T45.8, T45.9, T46.0, T46.1, T46.2, T46.3, T46.4, T46.5, T46.6, T46.7, T46.8, T46.9, T47.0, T47.1, T47.2, T47.3, T47.4, T47.5, T47.6, T47.7, T47.8, T47.9, T48.0, T48.1, T48.2, T48.3, T48.4, T48.5, T48.6, T48.7, T48.9, T49.0, T49.1, T49.2, T49.3, T49.4, T49.5, T49.6, T49.7, T49.8, T49.9, T50.0, T50.3, T50.4, T50.8, T50.9, T51.0, T51.1, T51.2, T52.4, T53.5, T54.9, T56.4, T56.8, T57.9, T58.1, T58.2, T58.8, T58.9, T59.0, T59.1, T59.2, T59.3, T59.4, T59.5, T59.6, T59.9, T60.9, T61.1, T61.7, T62.9, T63.8, T65.2, T65.8, T65.9
Severe chest Injury	860.0, 860.1, 860.2, 860.3, 860.4, 860.5, 861.0, 861.1, 861.2, 861.3, 862.0, 862.1, 862.2, 862.3, 862.8, 862.9, 874.0, 874.1, 901.0, 901.1, 901.2, 901.3, 901.4, 901.8, 901.9, 908.0	S11.0, S11.2, S25.0, S25.1, S25.2, S25.3, S25.4, S25.5, S25.7, S25.8, S25.9, S26.0, S26.1, S27.3, S27.4, S27.8, S28.2, T91.4
Internal hemorrhage in abdomen and pelvis	863.0, 863.1, 863.2, 863.3, 863.4, 863.5, 863.8, 863.9, 864.0, 864.1, 865.0, 865.1, 866.0, 866.1, 867.0, 867.1, 867.2, 867.3, 867.4, 867.5, 867.6, 867.7, 867.8, 867.9, 868.0, 868.1, 868.3, 869.0, 869.1, 902.0, 902.1, 902.2, 902.3, 902.4, 902.5, 902.8, 902.9, 908.1, 908.2, 908.3	S35.1, S35.2, S35.3, S35.4, S35.5, S35.9, S36.0, S36.1, S36.2, S36.3, S36.4, S36.5, S36.6, S36.8, S37.0, S37.2, S37.3, S37.4, S37.5, S37.8, S37.9, T79.6
Contusion in any part of the body	906.3, 922.0, 922.1, 922.2, 922.3, 922.4, 922.8, 922.9, 923.0, 923.1, 923.2, 923.3, 923.8, 923.9, 924.0, 924.1, 924.2, 924.3, 924.4, 924.5, 924.8, 924.9	S20.0, S30.2, S40.2, S50.0, S60.2, S60.8, S70.0, S80.0, S80.1, S80.2, S80.7, S90.0, S90.2
Effect of different environmental factors	991.0, 991.1, 991.2, 991.3, 991.4, 991.5, 991.6, 991.8, 991.9, 992.0, 992.1, 992.2, 992.3, 992.4, 992.5, 992.6, 992.7, 992.8, 992.9, 993.0, 993.1, 993.2, 993.3, 993.4, 993.8, 993.9, 994.0, 994.2, 994.3, 994.4, 994.5, 994.6, 994.8, 994.9	T33.5, T33.8, T34.4, T34.5, T34.6, T34.7, T67.3, T69.0, T69.8, T70.8, T75.2
Complications following therapeutic procedures	995.4, 996.0, 996.1, 996.2, 996.3, 996.4, 996.5, 996.6, 996.7, 996.8, 996.9, 998.0, 998.1, 998.2, 998.3, 998.4, 998.5, 998.6, 998.7, 998.8, 998.9, 999.0, 999.1, 999.2, 999.3, 999.6, 999.7, 999.8, 999.9	T80.3, T80.6, T80.8, T80.9, T81.1, T81.3, T81.5, T81.6, T81.7, T81.8, T82.0, T82.1, T82.2, T82.3, T82.4, T82.5, T82.8, T83.0, T83.1, T83.2, T83.4, T83.7, T83.8, T84.4, T84.8, T85.0, T85.1, T85.2, T85.3, T85.4, T85.5, T85.6, T85.8, T86.1, T86.3, T86.8, T86.9, T87.4, T88.1, T88.2, T88.6, T88.7, T88.8, T88.9
Superficial injury of any part of the body	910.0, 910.1, 910.2, 910.3, 910.4, 910.5, 910.6, 910.7, 910.8, 910.9, 911.0, 911.1, 911.2, 911.3, 911.4, 911.5, 911.6, 911.7, 911.8, 911.9, 912.0, 912.1, 912.2, 912.3, 912.4, 912.5, 912.6, 912.7, 912.8, 912.9, 913.0, 913.1, 913.2, 913.3, 913.4, 913.5, 913.6, 913.7, 913.8, 913.9, 914.0, 914.1, 914.2, 914.3, 914.4, 914.5, 914.6, 914.7, 914.8, 914.9, 915.0, 915.1, 915.2, 915.3, 915.4, 915.5, 915.6, 915.7, 915.8, 915.9, 916.0, 916.1, 916.2, 916.3, 916.4, 916.5, 916.6, 916.7, 916.8, 916.9, 917.0, 917.1, 917.2, 917.3, 917.4, 917.5, 917.6, 917.7, 917.8, 917.9, 919.0, 919.1, 919.2, 919.3, 919.4, 919.5, 919.6, 919.7, 919.8, 919.9	S00.0, S00.1, S00.2, S00.3, S00.4, S00.5, S00.8, S00.9, S10.0, S10.1, S10.8, S10.9, S20.1, S20.3, S20.9, S30.8, S40.2, S40.7, S40.8, S40.9, S50.3, S50.7, S50.8, S70.2, S70.3, S80.8, S80.9, S90.4, S90.5, S90.8, S90.9, T00.8, T00.9, T90.0
Multiple fractures, dislocations, crashes, wounds , sprains, and strains	817.0, 817.1, 818.0, 818.1, 819.0, 819.1, 827.0, 827.1, 828.0, 828.1, 929.0	T02.7, T04.7, T06.3

[1] Moderate and severe traumatic brain injury are indistinguishable in ICD

Section 2. Mortality data types by cause of injury

Annex Table 2.1 Number of site-years of cause of deaths data by source type, GBD 2013

Source Type	Vital Registration	Police Records	Mortality Surveillance	Verbal Autopsy	Survey/Census; Hospital; Burial/Mortuary	Total
Global	4528	1433	1021	578	85	7645
Central Latin America	1282	230	0	0	2	1514
East Asia	203	16	1018	27	0	1264
Western Europe	1013	5	0	0	0	1018
Caribbean	418	268	0	27	1	714
North Africa and Middle East	178	179	1	38	13	409
Central Asia	198	108	0	27	0	333
Southeast Asia	140	112	1	49	13	315
Central Europe	296	10	0	0	1	307
South Asia	26	85	0	157	19	287
Eastern Europe	205	6	0	0	1	212
Southern Sub-Saharan Africa	101	72	0	31	8	212
Eastern Sub-Saharan Africa	12	63	1	84	19	179
Southern Latin America	87	53	0	0	0	140
Western Sub-Saharan Africa	7	57	0	51	5	120
High-income Asia Pacific	100	13	0	0	0	113
High-income North America	61	51	0	0	0	112
Tropical Latin America	60	22	0	28	1	111
Andean Latin America	63	36	0	0	0	99
Oceania	16	39	0	30	1	86
Australasia	62	0	0	0	0	62
Central Sub-Saharan Africa	0	8	0	29	1	38

Section 3. Methods - mortality

Preparation of data

The preparation of cause of death data includes age splitting, age-sex splitting, smoothing, and outlier detection. These steps are described in detail by Naghavi et al and Lozano et al.[1 2] The process of redistributing injury ill-defined death or garbage codes is described here. The concept of "garbage codes" and redistribution of these codes was proposed in the GBD 1990.[3] Garbage codes are causes of death that should not be identified as specific underlying causes of death, but have been entered as the underlying cause of death on death certificates. A classic example of these types of codes in injuries chapters are "Exposure to unspecified factor" (X59 in ICD-10 and E887 in ICD-9) and all undetermined intent codes (Y10-Y34 in ICD-10 and E980-E988 in ICD-9). Other examples of garbage codes in injuries are the coding of an injury death to intermediate codes like septicemia or peritonitis or as an ill-defined and unknown cause of mortality (R99). Approximately 2% of total deaths in countries with vital registration data is assigned to these three injury garbage code categories.

Redistribution of garbage codes

We used three methods for distribution, each model was used for a different aspect of the redistribution of garbage codes:

- Proportional redistribution of garbage codes on all injury codes, e.g. ill-defined and unknown cause of mortality (R99).
- Regression methods to find target injuries (i.e. causes of injury deaths to which garbage codes should be redistributed) and the fraction for redistribution of garbage codes, the method used for almost all of garbage codes in injury.
- Obtaining target conditions and redistribution proportions from a literature review and searching individual records in the dataset with multiple causes of death. This method has been used for a small set of garbage codes like septicemia (A40-A41) or peritonitis (K65), some of which are redistributed to injuries as the underlying cause of death.

All of the redistribution methods were done by age, sex, country, year, and ICD type.

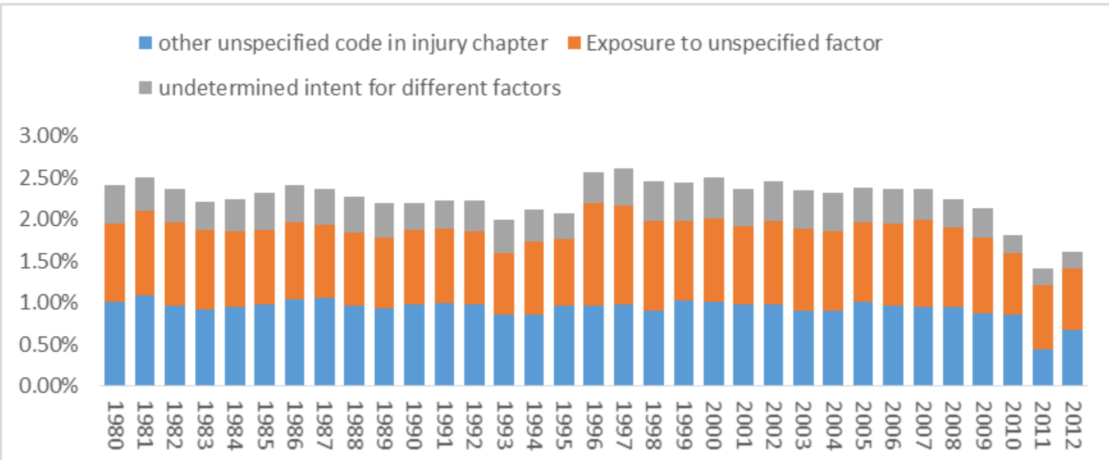
For each redistribution package (i.e. a unit of similar garbage codes and the target conditions and proportions on which the garbage code gets redistributed), we defined the "universe" of data as all deaths coded to either the package's garbage codes or the package's redistribution targets for each country, year, age, and sex. We then ran the following regression:

$$TG_{crt} = \alpha + \beta Gar_{crt} + \gamma_r + \theta_r Gar_{crt} + \varepsilon_{ct}$$

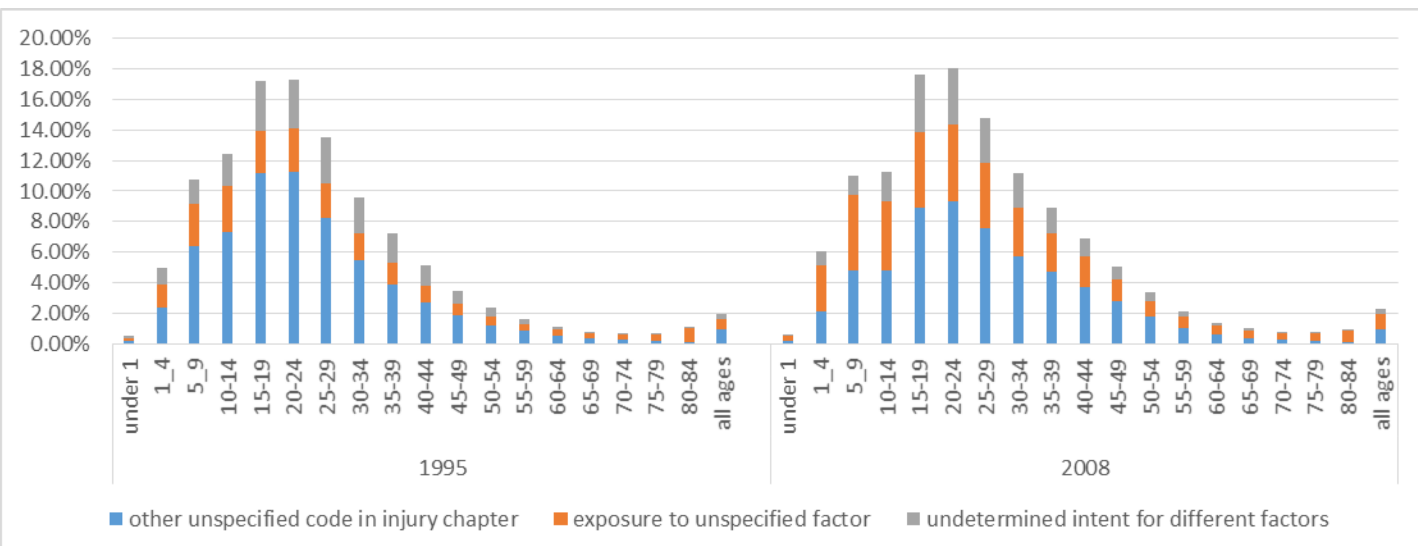
where TG_{crt} is the percentage of deaths within the given garbage code's "universe" which were coded to a given target group, by country (c), region (r) and year (t); Gar_{crt} is the percentage of deaths within the given garbage code's "universe" that were coded to that garbage code (by country-year, with countries grouped by region); the parameter α is a fixed constant; β is a slope coefficient describing the association between Gar and TG; γ_r is a region-specific random intercept; θ_r is a region-specific random slope; and ε_{ct} is normally-distributed error[2].

In injury mortality estimation the garbage codes in injury chapters usually get redistributed to injury deaths. Annex Figure 3.1 shows the pattern of garbage codes by year in the GBD cause of death data sources that use detailed ICD coding. This pattern varied by age. In the age groups 15-30 years and above more than 15% of total deaths were assigned to these garbage codes. Annex Figure 3.2 shows the age pattern for two years: 1995 (countries with ICD9 detail) and 2008 (countries with ICD10 detail). Regional and country patterns for the fraction of death assigned to these codes are different ranging from more than 15% in Southern Sub-Saharan Africa to around 1% in Central Europe.

Annex Figure 3.1. Pattern of garbage codes in injury chapters in countries with ICD9 and ICD10 detail codes by year, all ages and both sexes combined

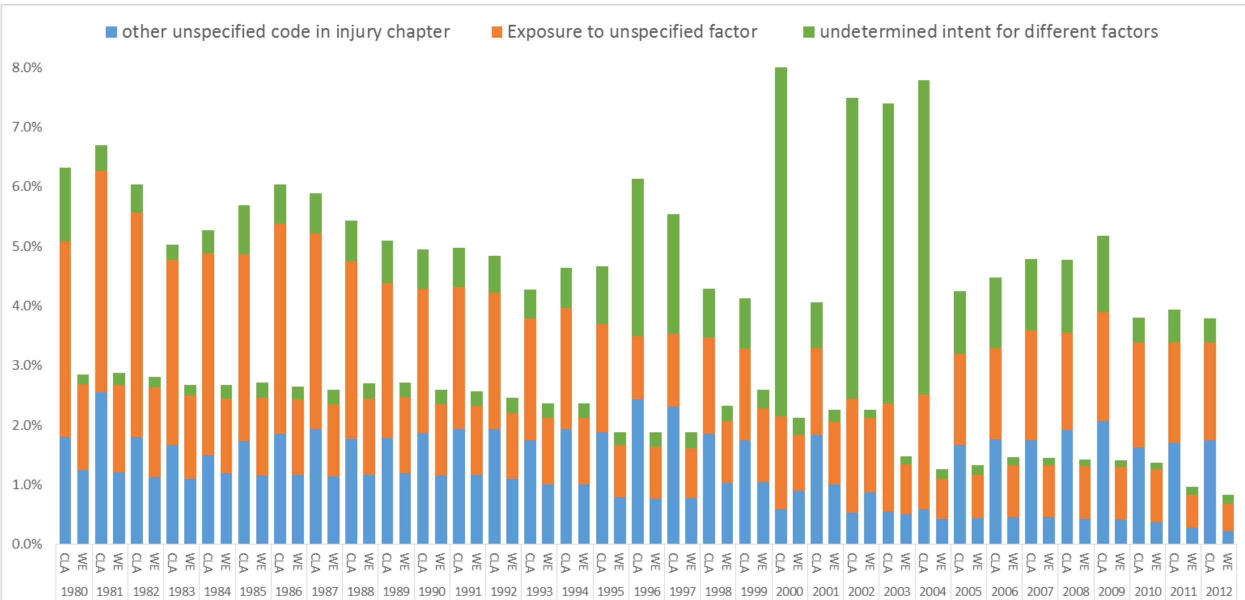


Annex Figure 3.2 Pattern of garbage codes in injury chapters in countries with ICD9 and ICD10 detail codes by age, both sexes, 1995 and 2008



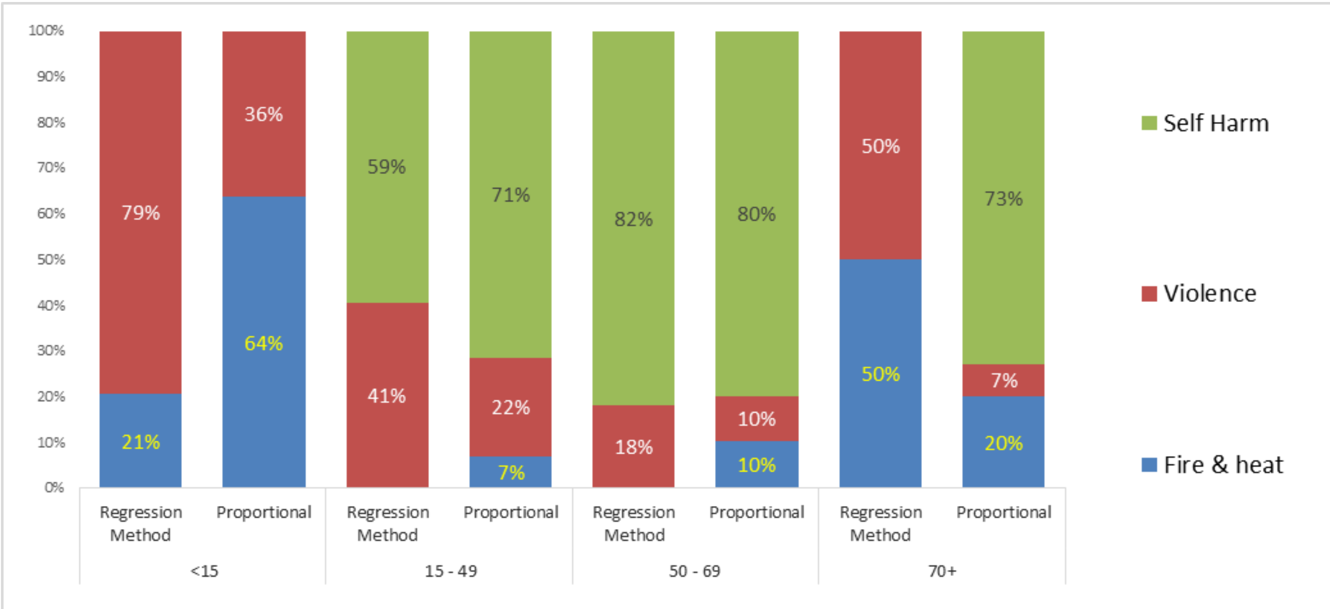
Annex Figure 3.3 shows the pattern of garbage codes in two regions: Western Europe and Central Latin America. The figure shows that Central Latin America has an especially high fraction of undetermined intent injuries in years 2000, 2002, 2003, and 2004.

Annex Figure 3.3 Pattern of garbage codes in injury chapters in countries with ICD9 and ICD10 detail: comparison of two regions (CLE = Central Latin America and WE = Western Europe) all ages and both sexes by year

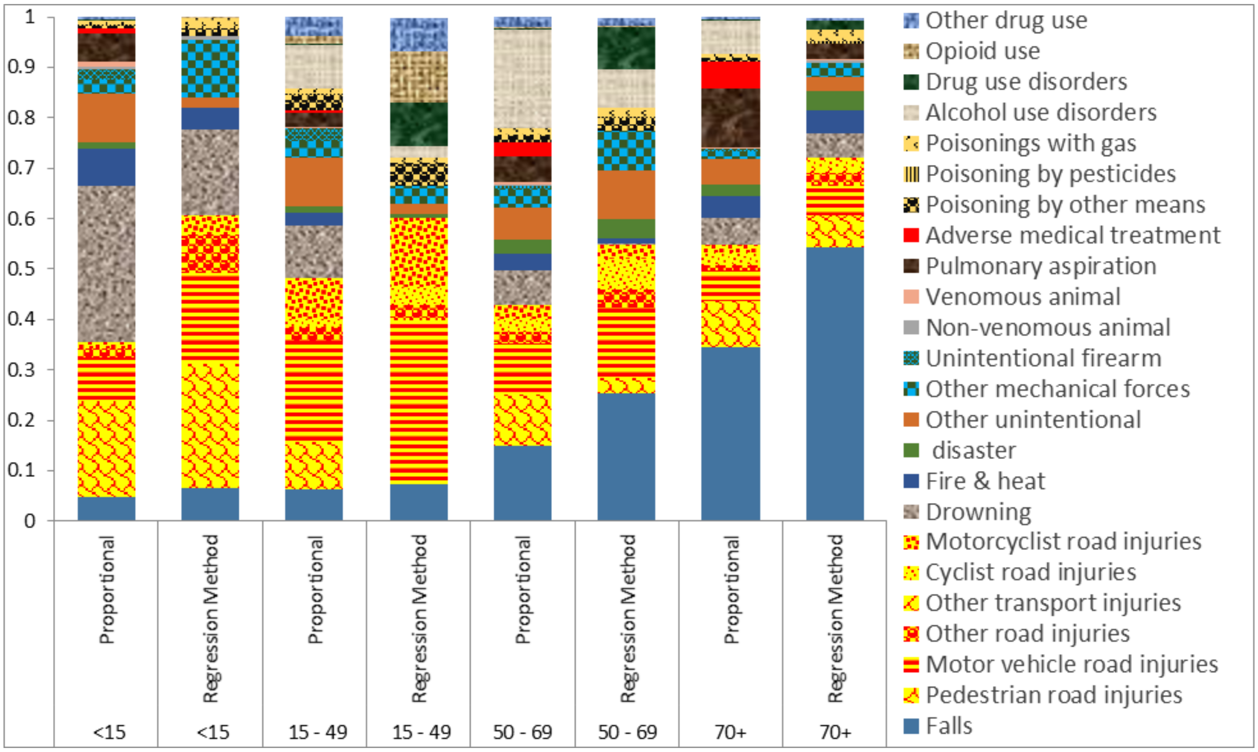


Annex Figures 3.4 and 3.5 show the process of garbage code redistribution by regression for ICD-10 codes Y26 and X59 in males, by age group, at the global level. Y26 (exposure to smoke, fire and flames, undetermined intent and equivalent code in ICD9) and X59 (exposure to unspecified factor) are the biggest "intermediate causes" for injuries in the GBD Causes of Death framework. They are assigned to injuries but further redistributed to more specific injury causes using a regression method based on patterns of similar ICD codes. In GBD2010, these intermediate causes were proportioned to a set of target codes using the existing distribution of deaths assigned to those target codes. Figure 3.4 illustrates how these two methods differ in the male redistribution of Y26, i.e. a larger proportion of Y26 is being distributed to violence across all ages with the GBD2013 regression method. Figure 3.5 illustrates the same mapping for X59, which has many more target codes. The regression method leads to many more X59 deaths being distributed to road injuries in ages 15-49 and falls across all ages. There are other intermediate codes that also needed to be redistributed (i.e.V87, V88, V89, V99 in the transport chapter).

Annex Figure 3.4 Comparison of proportional redistribution with redistribution based on regression methods for Y26 (exposure to smoke, fire and flames, undetermined intent and equivalent code in ICD9) in males at global level



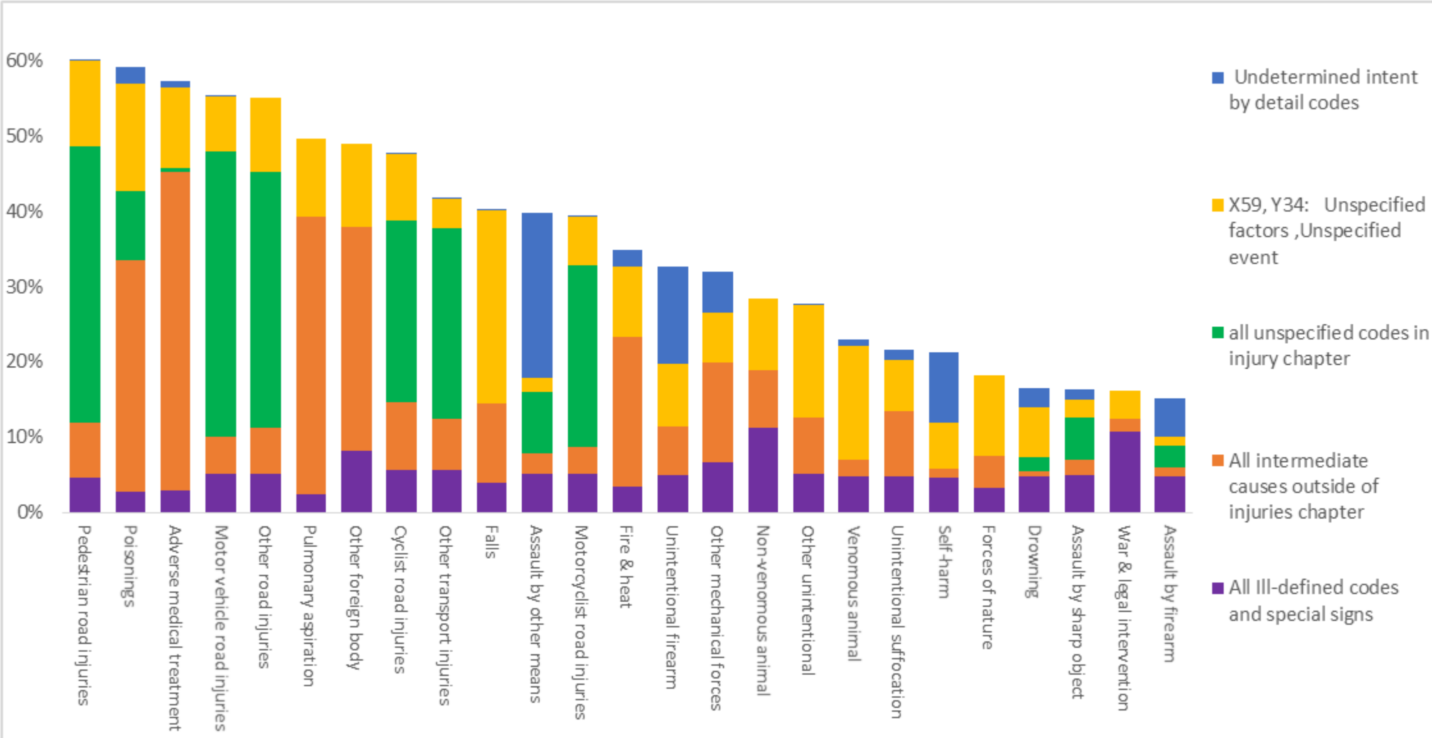
Annex Figure 3.5 Comparison of proportional redistribution with redistribution based on regression methods for X59 (and equivalent code with X59 in ICD9) in males at global level



Annex Figure 3.6 shows the increase of specific causes of injury after redistribution of all garbage codes.

Annex Figure 3.6 Percent increase in each cause of death by source of garbage codes – 2008, all countries with detailed ICD10

codes



Modelling process and covariates

We used CODEm for all causes-of-injury categories except war and disaster.[1 2 4] CODEm explores a large variety of possible models to estimate trends in causes of death using a covariate selection algorithm that yields many possible covariate combinations that are run through several modelling classes (mixed effects or space-time Gaussian process regressions of mortality rates or cause fractions). Uncertainty in cause of death estimates has been captured using standard simulation methods by taking 1000 draws.

Covariates and the direction of effect of each covariate

For each injury cause we chose a different set of covariates in our CODEm analyses. Annex Table 3.1 lists the covariates by injury cause and shows the assumed direction of effect of each covariate. Level 1 covariates have a strong proximal relationship with the cause of death category. For level 2 covariates there is strong evidence of a relationship but no direct biological link. For level 3 covariates there is weak evidence of a relationship or it is a covariate distal in the causal chain. CODEm statistically determines which combination of covariates best predicts the available data using out-of-sample predictive validity testing.

Annex Table 3.1 CODEm covariates, level, and expected direction by cause

Transport injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	Rainfall Quintile 5 (proportion)	3	Positive
Road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels (per capita)	1	Positive
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	Vehicles - 4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population 15 to 30 (proportion)	2	Positive
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
Pedestrian road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	Rainfall Quintile 5 (proportion)	3	Positive
Cyclist road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
Motorcyclist road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None

	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	Rainfall Quintile 5 (proportion)	3	Positive
Motor vehicle road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	Rainfall Quintile 5 (proportion)	3	Positive
Other road injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	LDI (I$ per capita)	2	None
	Rainfall Quintile 5 (proportion)	3	Positive
Other transport injuries	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Vehicles - 2 wheels fraction (proportion)	1	Positive
	Vehicles - 2+4 wheels (per capita)	1	Positive
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
	Rainfall Quintile 5 (proportion)	3	Positive
Falls	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	ln-Milk (kcal per capita)	2	Negative
	Elevation Over 1500m (proportion)	3	Positive
	LDI (I$ per capita)	3	None
Drowning	Alcohol (liters per capita)	1	Positive
	Coastal Population within 10km (proportion)	1	Positive
	Landlocked Nation (binary)	1	Negative
	Rainfall Quintile 1 (proportion)	1	Negative
	Rainfall Quintile 5 (proportion)	1	Positive
	Elevation Under 100m (proportion)	2	Positive
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
Fire, heat, and hot substances	Health System Access 2 (unitless)	1	Negative
	Alcohol (liters per capita)	2	Positive
	Indoor Air Pollution (Biomass Cooking)	2	Positive

	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Tobacco (cigarettes per capita)	2	Positive
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
Poisonings	Health System Access 2 (unitless)	1	Negative
	Opium Cultivation (binary)	1	Positive
	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Population Density (under 150 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
Unintentional firearm injuries	Alcohol (liters per capita)	2	Positive
	Health System Access (unitless)	2	Negative
	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Population Density (under 150 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
Unintentional suffocation	Alcohol (liters per capita)	2	Positive
	Health System Access 2 (unitless)	2	Negative
	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Population Density (under 150 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
Other exposure to mechanical forces	Alcohol (liters per capita)	2	Positive
	Health System Access (unitless)	2	Negative
	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Population Density (under 150 ppl/sqkm, proportion)	2	None
	Education (years per capita)	3	Negative
	LDI (I$ per capita)	3	None
	LDI (I$ per capita)	3	None
Adverse effects of medical treatment	Health System Access 2 (unitless)	2	None
	LDI (I$ per capita)	3	None
Animal contact	Alcohol (liters per capita)	1	Positive
	Vehicles - 2 wheels (per capita)	1	Positive
	Vehicles - 4 wheels (per capita)	1	None
	Health System Access 2 (unitless)	2	Negative
	Population 15 to 30 (proportion)	2	Positive
	Education (years per capita)	3	Negative
	Elevation Over 1500m (proportion)	3	None
	Elevation Under 100m (proportion)	3	None
	LDI (I$ per capita)	3	None
	Population Density (over 1000 ppl/sqkm, proportion)	3	None
	Population Density (under 150 ppl/sqkm, proportion)	3	None

Venomous animal contact	Alcohol (liters per capita)	1	Positive
	Vehicles - 2 wheels (per capita)	1	Positive
	Vehicles - 4 wheels (per capita)	1	None
	Health System Access 2 (unitless)	2	Negative
	Education (years per capita)	3	Negative
	Elevation Over 1500m (proportion)	3	None
	Elevation Under 100m (proportion)	3	None
	LDI (I$ per capita)	3	None
	Population Density (over 1000 ppl/sqkm, proportion)	3	None
	Population Density (under 150 ppl/sqkm, proportion)	3	None
Non-venomous animal contact	Alcohol (liters per capita)	1	Positive
	Vehicles - 2 wheels (per capita)	1	Positive
	Vehicles - 4 wheels (per capita)	1	None
	Health System Access 2 (unitless)	2	Negative
	Education (years per capita)	3	Negative
	Elevation Over 1500m (proportion)	3	None
	Elevation Under 100m (proportion)	3	None
	LDI (I$ per capita)	3	None
	Population Density (over 1000 ppl/sqkm, proportion)	3	None
	Population Density (under 150 ppl/sqkm, proportion)	3	None
Pulmonary aspiration and foreign body in airway	Alcohol (liters per capita)	1	Positive
	Health System Access (capped)	1	Negative
	Mean BMI	1	Positive
	LDI (I$ per capita)	3	None
Foreign body in other body part	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	2	Negative
	Education (years per capita)	3	Negative
	Elevation Over 1500m (proportion)	3	None
	Elevation Under 100m (proportion)	3	None
	LDI (I$ per capita)	3	None
	Population Density (over 1000 ppl/sqkm, proportion)	3	None
	Population Density (under 150 ppl/sqkm, proportion)	3	None
Other unintentional injuries	Alcohol (liters per capita)	1	Positive
	Vehicles - 2 wheels (per capita)	1	Positive
	Vehicles - 4 wheels (per capita)	1	None
	Health System Access 2 (unitless)	2	Negative
	Education (years per capita)	3	Negative
	Elevation Over 1500m (proportion)	3	None
	Elevation Under 100m (proportion)	3	None
	LDI (I$ per capita)	3	None
	Population Density (over 1000 ppl/sqkm, proportion)	3	None

	Population Density (under 150 ppl/sqkm, proportion)	3	None
Self-harm	Alcohol (liters per capita)	1	Positive
	Opium Cultivation (binary)	2	Positive
	Population Density (150-300 ppl/sqkm, proportion)	2	None
	Population Density (300-500 ppl/sqkm, proportion)	2	None
	Population Density (500-1000 ppl/sqkm, proportion)	2	None
	Population Density (over 1000 ppl/sqkm, proportion)	2	None
	Population Density (under 150 ppl/sqkm, proportion)	2	None
	Religion (binary, >50% Muslim)	2	Negative
	Education (years per capita)	3	None
	LDI (I$ per capita)	3	None
Interpersonal violence	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Opium Cultivation (binary)	2	Positive
	Population Density (over 1000 ppl/sqkm, proportion)	2	Positive
	Education (years per capita)	3	None
	LDI (I$ per capita)	3	None
Assault by firearm	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Opium Cultivation (binary)	2	Positive
	Population Density (over 1000 ppl/sqkm, proportion)	2	Positive
	Education (years per capita)	3	None
	LDI (I$ per capita)	3	None
Assault by sharp object	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Opium Cultivation (binary)	2	Positive
	Population Density (over 1000 ppl/sqkm, proportion)	2	Positive
	Education (years per capita)	3	None
	LDI (I$ per capita)	3	None
Assault by other means	Alcohol (liters per capita)	1	Positive
	Health System Access 2 (unitless)	1	Negative
	Opium Cultivation (binary)	2	Positive
	Population Density (over 1000 ppl/sqkm, proportion)	2	Positive
	Education (years per capita)	3	None
	LDI (I$ per capita)	3	None
	Population 15 to 30 (proportion); male model only	1	Positive

Mortality from armed conflicts and natural disaster

For armed conflicts we retrieved data from the Uppsala Conflict Data Program,[5] the International Institute for Strategic Studies,[6] and from countries' vital registration systems. Disaster data were obtained from the International Disaster Database from the Center for Research on the Epidemiology of Disasters (University of Louvain, Belgium).[7] When these databases were not fully up-to-date or did not contain known events, we supplemented with case-by-case sources. Case-by-case sources are individual sources that describe individual events. Armed conflicts and natural disaster mortality rates by age and sex were added to the mortality rates estimated from child and adult mortality data and model life tables.[2]

CODCorrect

Deaths from each cause-of-injury category were modelled separately in CODEm. To ensure that deaths from all individual causes sum to the all-cause mortality estimate, we used an algorithm called CoDCorrect to rescale deaths for each cause such that they sum to the number of deaths from all causes generated from the demographic analysis.[2]

Section 4. Methods - morbidity

Data sources

Annex Table 4.1 lists morbidity data sources from hospital and emergency department records and surveys. Unfortunately, quite a few countries report their data using a mix of cause-of-injury and nature-of-injury codes rather than coding both for each case. In order to retain as much of the data as possible, we included all data sets that had at least 45% of cases coded to the cause of injury. The threshold of 45% was chosen as there were a lot of data sets with half of the records coded to cause-of-injury and half of the records coded to nature-of-injury categories. We increased the cause-specific injury cases from these datasets proportionately to sum to the total number of injury cases.

Annex Table 4.2 shows the GBD 2013 non-fatal data representativeness index by cause, calculated as fraction of countries with data for each cause and time period

Conflict and war morbidity data were obtained from the Uppsala Conflict Data Program,[5] the International Institute for Strategic Studies,[6] and vital registration systems. Disaster morbidity data were derived from the International Disaster Database from the Center for Research on the Epidemiology of Disasters.[7]

Annex Table 4.1 Years of morbidity data by type of data source.

Albania	Survey	2
Bangladesh	Survey	1
Belgium	Inpatient	7
Bosnia and Herzegovina	Survey	1
Brazil	Inpatient	4
Brazil	Survey	1
Bulgaria	Survey	1
Burkina Faso	Survey	1
Cambodia	Survey	1
Canada	Inpatient	16
Canada	Outpatient	8
Chad	Survey	1
China	Inpatient	2
China	Outpatient	7
China	Survey	3
Colombia	Survey	1
Comoros	Survey	1
Congo	Survey	1
Cote d'Ivoire	Survey	1
Croatia	Inpatient	7
Croatia	Survey	1

Cyprus	Survey	1
Czech Republic	Inpatient	11
Czech Republic	Survey	2
Dominican Republic	Survey	1
Ecuador	Survey	1
Estonia	Survey	1
Ethiopia	Survey	2
Finland	Inpatient	9
Georgia	Survey	1
Ghana	Survey	3
Greece	Survey	1
Guatemala	Survey	1
Haiti	Survey	1
Hungary	Survey	2
India	Other	4
India	Survey	3
Iran	Other	9
Iran	Survey	3
Kazakhstan	Survey	1
Kenya	Survey	1
Laos	Survey	1
Latvia	Survey	2
Malawi	Survey	1
Malaysia	Survey	1
Mali	Survey	1
Malta	Inpatient	2
Mauritania	Survey	1
Mauritius	Survey	1
Mexico	Inpatient	9
Morocco	Survey	1
Mozambique	Survey	1
Myanmar	Survey	1
Namibia	Survey	1
Nepal	Survey	1
Netherlands	Inpatient	15
Netherlands	Outpatient	15
New Zealand	Survey	1
Nicaragua	Survey	1
Nigeria	Survey	1
Norway	Other	1
Pakistan	Survey	7
Paraguay	Survey	1
Philippines	Survey	1

Portugal	Inpatient	3
Qatar	Survey	1
Romania	Survey	1
Russia	Survey	2
Senegal	Survey	1
Slovakia	Survey	1
Slovenia	Inpatient	5
Slovenia	Survey	1
South Africa	Survey	3
Spain	Survey	1
Sri Lanka	Survey	1
Sudan	Survey	1
Swaziland	Survey	1
Sweden	Inpatient	1
Switzerland	Inpatient	3
Syria	Survey	1
Taiwan	Other	3
Thailand	Survey	1
Tunisia	Survey	1
Ukraine	Survey	1
United Arab Emirates	Survey	1
United Kingdom	Inpatient	2
United States	Inpatient	29
United States	Outpatient	20
United States	Survey	4
Uruguay	Survey	1
Vietnam	Other	5
Vietnam	Survey	6
Zambia	Survey	1
Zimbabwe	Survey	1

Annex Table 4.2 GBD 2013 non-fatal data representativeness index by cause, calculated as fraction of countries with data for each cause and time period

Injuries	0.95	0.95	0.95	0.96
Transport injuries	0.03	0.34	0.17	0.43
Road injuries	0.03	0.34	0.16	0.42
Pedestrian road injuries	0.01	0.04	0.08	0.08
Cyclist road injuries	0.01	0.05	0.07	0.08
Motorcyclist road injuries	0.01	0.04	0.07	0.07
Motor vehicle road injuries	0.01	0.05	0.07	0.08
Other road injuries	0.01	0.04	0.07	0.07

Other transport injuries	0.01	0.04	0.09	0.09
Unintentional injuries (not transport)	0.03	0.12	0.14	0.20
Falls	0.02	0.11	0.13	0.18
Drowning	0.01	0.07	0.10	0.12
Fire, heat, and hot substances	0.03	0.09	0.12	0.16
Poisonings	0.02	0.09	0.11	0.15
Exposure to mechanical forces	0.02	0.09	0.10	0.14
Unintentional firearm injuries	0.01	0.05	0.09	0.09
Unintentional suffocation	0.01	0.05	0.09	0.09
Other exposure to mechanical forces	0.01	0.05	0.09	0.09
Adverse effects of medical treatment	0.01	0.05	0.09	0.09
Animal contact	0.02	0.05	0.12	0.15
Venomous animal contact	0.01	0.05	0.09	0.09
Non-venomous animal contact	0.01	0.05	0.09	0.09
Foreign body	0.01	0.05	0.09	0.09
Pulmonary aspiration and foreign body in airway	0.01	0.05	0.09	0.09
Foreign body in eyes	0.01	0.03	0.05	0.05
Foreign body in other body part	0.01	0.05	0.09	0.09
Other unintentional injuries	0.03	0.11	0.12	0.18
Self-harm and interpersonal violence	0.02	0.09	0.13	0.16
Self-harm	0.01	0.07	0.12	0.13
Interpersonal violence	0.02	0.09	0.12	0.16
Assault by firearm	0.01	0.05	0.09	0.09
Assault by sharp object	0.01	0.05	0.09	0.09
Assault by other means	0.01	0.02	0.04	0.04
Forces of nature, war, and legal intervention	1.00	0.98	0.99	1.00
Exposure to forces of nature	1.00	0.98	0.99	1.00
Collective violence and legal intervention	1.00	0.99	0.99	1.00

Cause-of-injury incidence

The majority of our incidence data existed at the external cause-of-injury level. We modelled incidence for 24 cause-of-injury categories using DisMod-MR 2.0, a descriptive epidemiological meta-regression tool that uses an integrative systems modelling approach to produce simultaneous estimates of incidence, prevalence, remission, and mortality. Multiple datasets from hospitals (16 countries), emergency/outpatient departments (four countries), and surveys (71 countries) fed into these incidence models. We separately estimated two categories of injury severity: inpatient and outpatient injuries using a covariate in each DisMod-MR model as a multiplier from inpatient to outpatient incidence.

We were unable to use DisMod-MR 2.0 to model exposure to forces of nature (i.e. natural disaster) and collective violence and legal intervention (i.e. war), also called the shock cause-of-injury categories, due to the sporadic nature of incidence rates. To estimate incidence from the shock cause-of-injury categories, we first identified cause-of-injury categories that likely exhibit similar case fatality ratios (road injuries, fire, heat and hot substances, interpersonal violence, and other unintentional injury). Second, we multiplied the mortality rate for shock cause-of-injury categories by the average country-year-age-sex-specific incidence-to-mortality ratio of the cause-of-injury categories with similar case fatality ratios.

Follow-up studies on patient-reported outcomes

Follow-up data were obtained from a pooled dataset of seven follow-up studies from China, the Netherlands, and the US, which followed up patients for at least one year after the injury and the Medical Expenditure Panel Survey (MEPS) (See Table 4.3).[8-15] MEPS is a large-scale overlapping continuous panel survey of the United States non-institutionalized population that collects information on use and cost of health care.[16] Twice over the two-year period individuals are asked to fill in a short general quality of life measure, SF-12. Thus, MEPS offered the benefit of including SF-12 responses pre-injury and post-injury in some of the individuals. We pooled all available MEPS data over a 12-year span.

The seven follow-up studies used different patient-reported outcome measures to assess health status, namely the SF-36, Version 1 SF-12, and the EQ5D.[17-19] To enable comparison across the seven datasets, it was necessary to analyze the data in a standardized patient reported outcome measure. Therefore, we mapped all patient-reported outcome measures to Version 2 SF-12 (SF-12v2).[18 20]

All Version 1 SF-12/36 scores were adjusted by a previously estimated amount to get all scores comparable to Version 2.[21] Several years of MEPS contain individual question responses for EQ5D and SF12. We regressed the log of the SF12 summary scores on individual EQ5D question responses in MEPS and predicted SF-12 summary scores from the EQ5D responses in the Dutch follow-up studies.

Survey participants from a variety of IHME conducted surveys were instructed to fill out SF-12 for a selection of 60 health states from GBD presented with their lay description. We first discarded outliers with a SF-12 composite score of two standard deviations greater than the mean. Then we estimated the mean SF-12 score for each health state by doing a random effects regression of SF-12 on the GBD disability weight for each health state with just a constant term and a random effect on disability weight. Lastly, we ran a Loess curve through these means to get the final function between SF-12 score and corresponding GBD disability weight value.

Annex Table 4.3 Details of injury follow up surveys used in GBD 2013

Guangdong follow up survey, China[#]	2006-2007	Follow up survey among stratified sample of ISS patients (oversampling less common, severe injuries)	Patients (15+ years) who were hospitalized that had been injured by road traffic injury, fall, blunt or penetrating trauma	Based on three national injury surveillance hospitals in Zhuhai, Guangdong Province in China	998 (response 87%)	12 months
LIS follow up survey, Netherlands[1]	2001-2002	Follow up survey among stratified sample of ISS patients (oversampling less common, severe injuries)	Patients (15+ years) who visited the Emergency Department of a hospital and were discharged to the home environment and patients who were admitted to hospital	Based on 17 public hospitals in the Netherlands	8564 (response 37%)	2.5, 5, 9 and 24 months
LIS follow up survey, Netherlands[2]	2007-2008	Follow up survey among stratified sample of ISS patients (oversampling less common, severe injuries)	Patients (15+ years) who visited the Emergency Department of a hospital and were discharged to the home environment and patients who were admitted to hospital	Based on 15 public hospitals in the Netherlands	8057 (response 36%)	2.5, 5, 12 and 24 months
Major trauma outcome study, Netherlands[3]	2004-2006	A prospective cohort study was conducted among all severely injured adult trauma patients presented at a Level I trauma center	Severely injury trauma patients (16+ years) with an Injury severity score >15	One public hospital (level 1)	332 (response 68%)	12 and 24 months
NSCOT – National study on Costs and Outcomes of Trauma, USA[4]	2001-2002	A prospective cohort study was conducted among a sample of adult trauma patients treated at Level I trauma centers and non-trauma center hospitals	Patients treated for a moderate to severe injury (as defined by at least one injury of an Abbreviated Injury Scale (AIS) score of 3 or greater	Based on 69 hospitals in 12 states in the US	5191 (response 61%)	3 and 12 months

SCTBIFR – South Carolina Traumatic Brain injury Follow-up Registry, USA[5]	1999-2002	A prospective cohort study was conducted among injured in-patients with a traumatic brain injury-related injury	Patients (15+ years) who were admitted to hospitals and met the CDC case definition of TBI—trauma to the head associated with altered consciousness, amnesia, neurological abnormalities, skull fracture, intracranial lesion, or death	Discharged from all nonfederal in-state acute care hospitals	7613 (response 28%)	12, 24 and 36 months
Burns outcome study, Netherlands[6]	2003-2006	A multicenter prospective cohort was conducted among adult (severe) burn patients	Injury patients who sustained severe burns	Three public hospitals with specialized burn units.	311 (response 78%)	3 weeks, 3, 6, 9 and 18 months

*number of patients that met the inclusion criteria; response rate = percentage of patients who responded to the follow-up survey (in case of multiple follow-up times the response rate of the first follow-up moment is reported).

[#] data from CDC China, jointly analysed by study authors from IHME and China CDC

Nature-of-injury category hierarchy

Multiple injuries can occur in one individual. In the GBD 2010 we relied on regression methods run at the level of each nature-of-injury category rather than individuals in the seven follow-up studies. This led to relatively large amounts of long-term disability being assigned to some seemingly minor injury categories, presumably because the method did not adequately parse the disability measurement to the more severe of concurrent injuries in the same individual. Therefore, in GBD 2013 we decided to impose a hierarchy to select the nature-of-injury category that leads to the largest long term burden (i.e. a combination of likelihood of long-term disability and the corresponding disability weight) when an individual experiences multiple injuries. To construct the hierarchy we used data from the pooled dataset of follow-up studies in which we translated each individual health status measure into a disability weight. A regression was run of logit-transformed disability weights on nature-of-injury category and individual characteristics to calculate the mean long-term disability for each nature-of-injury category. The ranking of nature-of-injury categories by their mean long-term disability formed the basis for our severity hierarchy. Hierarchies were developed separately for inpatient and outpatient injuries (see Annex Tables 4.4 and 4.5).

Annex Table 4.4 Nature-of-injury severity hierarchy for injuries warranting outpatient care

1	N21	Fracture of pelvis
2	N20	Fracture of patella, tibia, fibula, or ankle
3	N19	Fracture of neck of femur
4	N23	Fracture of skull
5	N6	Amputation of thumb
6	N25	Fracture of vertebral column
7	N48	Multiple significant injuries
8	N43	Internal hemorrhage in abdomen or pelvis
9	N26	Fracture of femur, other than femoral neck
10	N11	Dislocation of hip
11	N7	Amputation of toe
12	N18	Fracture of hand bone
13	N3	Amputation of finger (excluding thumb)
14	N8	Burns with <20% total burned surface area
15	N12	Dislocation of knee
16	N44	Contusion
17	N27	Minor traumatic brain injury
18	N31	Foreign body in respiratory system
19	N42	Severe chest Injury
20	N35	Non-fatal submersion
21	N36	Asphyxiation
22	N41	Poisoning
23	N45	Environmental factors (e.g. temperature, pressure, electricity)
24	N32	Foreign body in gastrointestinal or urogenital system
25	N24	Fracture of sternum or rib(s)
26	N38	Injured nerves
27	N16	Fracture of face bone
28	N13	Dislocation of shoulder
29	N39	Injury to eyes (including foreign body eye)
30	N15	Fracture of clavicle, scapula, or humerus
31	N22	Fracture of radius or ulna

32	N17	Fracture of foot bone
33	N30	Foreign body in ear
34	N14	Other injuries of muscle & tendon and other dislocations
35	N47	Superficial injury
36	N40	Open wound
37	N46	Complications of medical treatment

Annex Table 4.5 Nature-of-injury severity hierarchy of injuries warranting inpatient care (bold indicates natures-of-injury that always warrant inpatient care)

1	**N34**	**Spinal cord lesion below neck level**
2	**N1**	**Amputation of both lower limbs**
3	**N2**	**Amputation of both upper limbs**
4	**N33**	**Spinal cord lesion at neck level**
5	N19	Fracture of neck of femur
6	N26	Fracture of femur, other than femoral neck
7	**N5**	**Amputation of one upper limb**
8	**N4**	**Amputation of one lower limb**
9	N48	Multiple significant injuries
10	N45	Environmental factors (e.g. temperature, pressure, electricity)
11	N20	Fracture of patella, tibia, fibula, or ankle
12	**N28**	**Moderate to severe traumatic brain injury**
13	N17	Fracture of foot bone
14	N43	Internal hemorrhage in abdomen or pelvis
15	**N37**	**Crush injury**
16	N27	Minor traumatic brain injury
17	N21	Fracture of pelvis
18	N38	Injured nerves
19	N42	Severe chest Injury
20	N11	Dislocation of hip
21	**N9**	**Burns with >=20% total burned surface area or >=10% if burns include face and/or hands**
22	**N10**	**Lower airway burns**
23	N23	Fracture of skull
24	N6	Amputation of thumb
25	N25	Fracture of vertebral column
26	N18	Fracture of hand bone
27	N44	Contusion
28	N40	Open wound
29	N7	Amputation of toe
30	N12	Dislocation of knee
31	N3	Amputation of finger (excluding thumb)
32	N35	Non-fatal submersion
33	N36	Asphyxiation
34	N8	Burns with <20% total burned surface area
35	N14	Other injuries of muscle & tendon and other dislocations
36	N16	Fracture of face bone
37	N31	Foreign body in respiratory system
38	N41	Poisoning
39	N32	Foreign body in gastrointestinal or urogenital system

40	N24	Fracture of sternum or rib(s)
41	N13	Dislocation of shoulder
42	N39	Injury to eyes (including foreign body eye)
43	N15	Fracture of clavicle, scapula, or humerus
44	N22	Fracture of radius or ulna
45	N30	Foreign body in ear
46	N47	Superficial injury
47	N46	Complications of medical treatment

Cause-nature matrices

Because injury disability is linked more to nature-of-injury and less to cause-of-injury, we generated transition matrices to estimate the proportion of each cause-of-injury category that results in a particular nature-of-injury category. These matrices are based on a collection of dual-coded (e.g. both cause-of-injury and nature-of-injury coded) inpatient and emergency department datasets. The data for this step came from outpatient, inpatient, and emergency room discharge data from Argentina, Bulgaria, China, Colombia, Cyprus, the Czech Republic, Denmark, Egypt, Estonia, Hungary, Iceland, Iran, Italy, Latvia, Macedonia, Malta, Mauritius, Mexico, Mozambique, the Netherlands, Norway, Portugal, Slovenia, Spain, Sweden, Uganda, USA, and Zambia. We applied our nature-of-injury severity hierarchy to determine a single nature-of-injury in every individual. To attempt to incorporate as much of the variation in cause-nature relationships across injury severity, health system access, sex, and age, negative binomial models were run for both inpatient and outpatient injuries for each cause-nature combination. The models incorporated the sex and age category of the individual, as well as the country's income level category. In cause-nature combinations with small numbers for which the model would not converge, we progressively eliminated covariates until convergence was reached. Once all cause-nature models were completed, the resulting probabilistic attributions were summed to 1 within each cause-of-injury category. Applying the cause-nature matrices to our cause-of-injury incidence from DisMod-MR, we produced cases of inpatient and outpatient injury by cause- and nature-of-injury.

Probability of permanent health loss

Disability due to injury is assumed to affect all cases in the short term with a proportion having long-term (permanent) outcomes. The probability of long-term outcomes is needed to estimate the incidence and subsequently the prevalence of cases with permanent health loss. In our conceptual model, individuals who suffer a non-fatal injury will, in the long-term, return to either full or partial health. If one year post-injury patients return to a health status with more disability than their pre-injury health status, injury patients are assumed to have permanent disability from their injury. The difference between the pre-injury health states and health status one year after injury is assumed to be their permanent level of injury-related disability. We assessed the probability of developing permanent health loss using the pooled dataset of follow-up studies that was also used in the generation of our nature-of-injury hierarchy.

In order to determine the probability of developing long-term outcomes, we needed to compare the mean long-term disability reported in the follow-up data (averaging across those who recovered from their injury and those who did not) to the disability weight assigned to long-term outcomes of the injury in question. For this comparison, we needed first to convert SF12v2 responses into comparable units of disability. This was accomplished through the use of opportunistic surveys asking respondents to complete the SF12v2 survey after reading the lay description of a health state used in GBD 2013 and assuming to represent someone with that condition. A selection of 60 out of the 220 health states that were used in GBD 2010 were assessed in this opportunistic survey.[22]

To assess the probability of permanent health loss we estimated the effects using a logit-linear mixed effects regression:

$$\text{Logit (disability weight)}_{im} = \alpha + \beta(\text{age}_i) + \beta(\text{injuries}_{im}) + \beta(\text{never injured}_i) + \beta(\text{never injured}_i * \text{age}_i) + \beta(\text{fracture of pelvis}_i * \text{age}_i) + \beta(\text{poisoning}_i * \text{age}_i) + \beta(\text{moderate/severe TBI}_i * \text{age}_i) + RE_c + RE_i,$$

where we included dummies for each of the nature-of-injury categories (injuries_{im}), with the reference category being no injury (from MEPS dataset). We also include a dummy for never injured prior to the current injury, age, interactions between age and never injured status, and interactions with three long-term nature-of-injury categories that were found to significantly vary with age: pelvis fractures, poisonings, and moderate/severe traumatic brain injuries. In notation, subscript m refers to patient survey response (some patients have multiple observations), i refers to individual and c refers to country. Random effects (RE) were included to control for variation between countries and individuals.

A counterfactual can be used to compare the observed results of injury patients to those of individuals that did not sustain an injury. After predicting overall disability at one year follow-up, we estimated a counterfactual of no injury by setting all observations to "no injury," the reference group for $\beta(\text{injuries}_{im})$ in our model. The disability attributable to the nature-of-injury at one year was assumed to be the difference between our counterfactual of no injury and predicted disability with injury. The probability of treated long-term outcomes is estimated via the ratio of this attributable disability relative to the long-term disability weight (from the GBD disability weight surveys) for that nature-of-injury.

$$\text{Probability of long-term disability} = (\text{with injury disability}_{im} - \text{counterfactual disability}_{im})/\text{disability weight}$$

We developed estimates of the probability of permanent health loss by nature-of-injury category, injuries warranting other health care and injuries warranting inpatient admission, and age. Depending on the nature-of-injury category, the probability of developing long-term outcomes from an untreated injury was either assumed to be equivalent to that of the corresponding treated injury or was increased by a scaling factor suggested by a trauma surgeon with experience in a low-income country and reviewed by the 236 GBD 2013 experts on injuries. Using a proxy covariate that defines health system access based on a combination of vaccination rates, proportion of deliveries by a skilled birth attendant, in-facility birth, and antenatal care, we estimated the ratio of treated to untreated injuries for each country-year grouping and assigned a country-year-specific probability of permanent health loss equal to a weighted average of the treated and untreated probabilities for each nature-of-injury category/severity-level grouping.

For two long-term probabilities we had to employ different estimation methods. First, there were only 20 cases of “adverse effects of medical treatment” in our follow-up dataset, and all reported extremely high disability weights. This gave us 100% probability of permanent health-loss from this cause-of-injury, which is problematic given that our initial incidence data for this cause-of-injury category is quite high, thus making YLDs attributed to this cause implausibly large. We decided that we had inadequate data to estimate the probability of permanent health-loss. Second, our long-term probability estimates for spinal cord lesions were implausibly low due to a much higher GBD 2013 disability weight than that used in the GBD 2010. Instead, we used a large USA study of spinal injuries followed for more than one year with data classified by the five-category Impairment Scale (AIS A-E) of the American Spinal Injury Association (ASIA) International Classification of Spinal Cord Injury.[23] We matched the descriptions of AIS A-E with appropriate GBD health states (Annex Table 4.6).

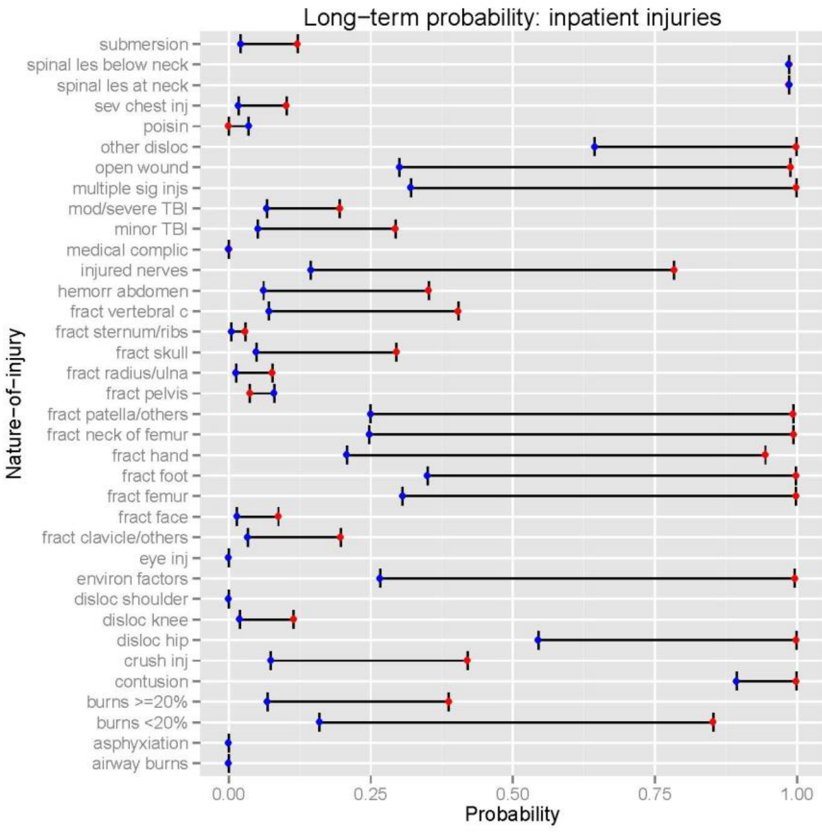
Despite applying the nature-of-injury hierarchy to the follow-up datasets, we still observed implausibly high estimates of long-term disability for several outpatient nature-of-injury categories. We made the decision to ignore any long-term disability from outpatient injuries in the following categories: open wound, poisoning, and contusion while retaining these nature-of-injury categories as valid sources of long-term disability in inpatient injuries.

Annex Table 4.6 ASIA impairment scale for spinal cord injury with matched health states, disability weights, and proportions at the one-year follow-up mark

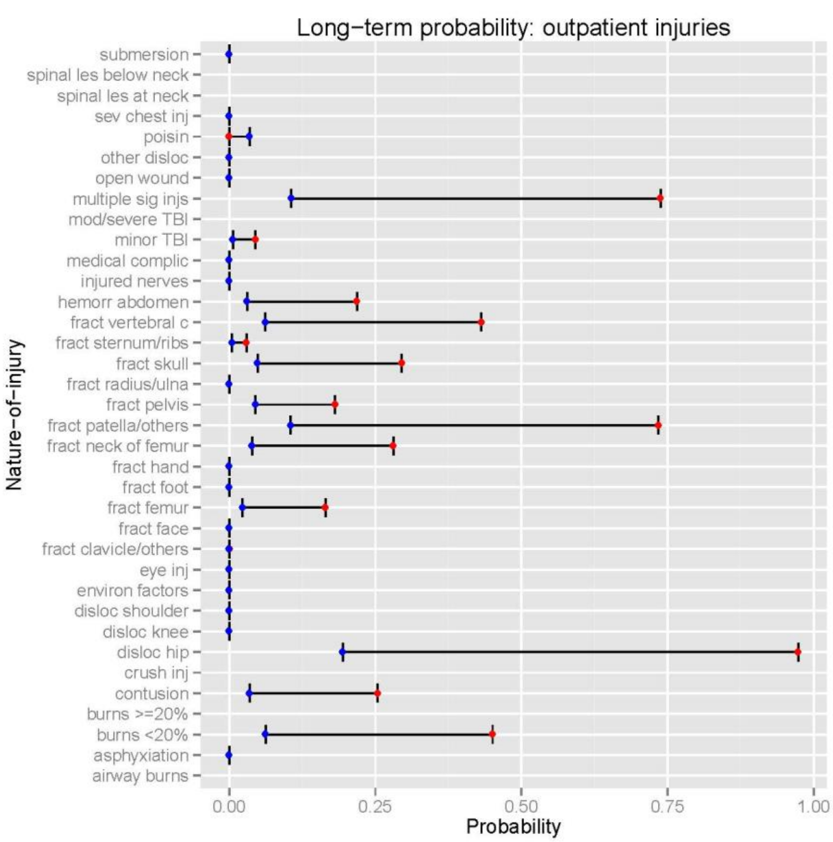
AIS Category	AIS Description of Impairment	Matched GBD Health State	Long-term disability weight		Proportion Attributed
			Treated	Untreated	
A	Complete – No motor or sensory function is preserved in the sacral segments S4-S5.	Spinal cord lesion at neck level (GBD 2013)	0·589	0·732	0·50
		Spinal cord lesion below neck level (GBD 2013)	0·296	0·623	0·50
B	Incomplete – Sensory but not motor function is preserved below the neurologic level and includes the sacral segments S4-S5.	Spinal cord lesion at neck level (GBD 2010)	0·463	0·682	0·07
		Spinal cord lesion below neck level (GBD 2010)	0·057	0·46	0·07
C	Incomplete – Motor function is preserved below the neurologic level, and more than half of key muscles below the neurologic levels have a muscle grade less than 3.	Spinal cord lesion at neck level (GBD 2010)	0·463	0·682	0·14
		Spinal cord lesion below neck level (GBD 2010)	0·057	0·460	0·14
D	Incomplete – Motor function is preserved below the neurologic level, and at least half of key muscles below the neurologic level have a muscle grade of 3 or more.	Motor impairment, moderate	0·061	0·610	0·27
		Motor impairment, moderate	0·061	0·610	0·27
E	Normal – Motor sensory function is normal.	No long-term disability	-	-	0·01
Source: Marino et al. (1999). Neurological recovery after traumatic spinal cord injury: Data from the Model Spinal Cord Injury Systems. Arch Phys Med Rehabil; 80: 1391-6.					

Annex Figures 4.1 and 4.2 show the global probability of each nature-of-injury resulting in permanent health loss. These include only injuries that warrant some form of healthcare. All probabilities increase (or decrease) monotonically with age with the exception of those with a constant zero or 100% probability. Blue dots signify the youngest age group (0 to 1) and red dots signify the oldest age group (80+).

Annex Figure 4.1 Range of probability of long-term disability outcome by age by nature of injury for injuries warranting inpatient care



Annex Figure 4.2 Range of probability of long-term disability outcome by age by nature of injury for injuries warranting outpatient care



Disability weights

For the GBD 2010 study a Disability Weights Measurement study was carried out using household sample surveys in five countries (Bangladesh, Indonesia, Peru, Tanzania, USA) supplemented by an open-access online survey.[24 25] As part of the GBD 2013, an updated set of disability weights has been estimated, including results from four new national surveys in Hungary, Italy, the Netherlands and Sweden, resulting in an expanded set of 235 (from 220 in GBD 2010) disability weights based on the responses from 61,890 people in 167 countries.[24-26] The GBD 2013 disability weights include new health states for conditions that had not yet been covered. Of interest to injuries is the inclusion of a health state for concussion. Furthermore, lay descriptions were rewritten for GBD 2010 health states that were found lacking in consistency or in content. For injuries, incontinence was added to the descriptions of the health states for spinal cord injury and the wording between several amputations descriptions were made more consistent. The GBD 2013 set includes 60 disability weights for injury sequelae (see Annex Table 4.7).[27]

Annex Table 4.7 Disability weights for injury health states in the GBD 2013 study

Amputation of finger(s), excluding thumb	has lost a finger of one hand. At times there is pain and tingling in the stump. [1]	0.005	0.002	0.01
Amputation of thumb (long term)	has lost one thumb, causing some difficulty in using the hand, pain, and tingling in the stump.	0.011	0.005	0.021
Amputation of one upper limb (long term, with treatment)	has lost one hand and part of the arm, leaving pain and tingling in the stump. The person has an artificial arm that makes it possible to lift objects and do daily activities such as cooking, with some extra effort. [1]	0.039	0.024	0.059
Amputation of one upper limb (long term, without treatment) [2]	has lost one hand and part of the arm, leaving pain and tingling in the stump. The person needs help from others to lift objects or do daily activities such as cooking.	0.118	0.079	0.167
Amputation of both upper limbs (long term, with treatment)	has lost part of both arms, leaving pain and tingling in the stumps. The person has two artificial arms that make it possible to do daily activities, with a great deal of extra effort. [1]	0.123	0.081	0.176
Amputation of both upper limbs (long term, without treatment)	has lost part of both arms, leaving pain and tingling in the stumps. The person needs a great deal of help from others to do even basic daily activities such as eating and using the toilet, and the person is very limited in other activities. [1]	0.383	0.251	0.525
Amputation of toe(s)	has lost one toe, leaving occasional pain and tingling in the stump.	0.006	0.002	0.012
Amputation of one lower limb (long term, with treatment)	has lost part of one leg, leaving pain and tingling in the stump. The person has an artificial leg that helps in moving around. [1]	0.039	0.023	0.059
Amputation of one lower limb (long term, without treatment)	has lost part of one leg, leaving pain and tingling in the stump. The person does not have an artificial leg, has frequent sores, and uses crutches.	0.173	0.118	0.240
Amputation of both lower limbs (long term, with treatment)	has lost part of both legs, leaving pain and tingling in the stumps. The person has two artificial legs that make moving around possible, with extra effort. [1]	0.088	0.057	0.124
Amputation of both lower limbs (long term, without treatment)	has lost part of both legs, leaving pain, tingling, and frequent sores in the stumps. The person has great difficulty moving around, has episodes of depression and anxiety, and needs help from others to do many daily activities.	0.443	0.297	0.589
Burns, <20% total burned surface area without lower airway burns (short term, with or without treatment)	has a burn on part of the body. Parts of the burned area are painful, and other parts have lost feeling.	0.141	0.094	0.196
Burns, <20% total burned surface area or <10% total burned surface area if head/neck or hands/wrist involved (long term, with or without treatment)	has scars caused by a burn. The scars are sometimes painful and itchy.	0.016	0.008	0.028

Burns, >20% total burned surface area (short term, with or without treatment)	has a painful burn over a large part of the body. Parts of the burned area have lost feeling, and the person feels anxious and unwell.	0.314	0.211	0.441
Burns, >20% total burned surface area or >10% total burned surface area if head/neck or hands/wrist involved (long term, with treatment)	has scars caused by burns over a large part of the body. The scars are frequently painful and itchy, and the person is often sad.	0.135	0.092	0.190
Burns, >20% total burned surface area or >10% total burned surface area if head/neck or hands/wrist involved (long term, without treatment)	has severe, disfiguring and itchy scars caused by burns over a large part of the body. The person cannot move some joints, feels sad, and has great difficulty with self-care such as dressing and toileting.	0.455	0.302	0.601
Lower airway burns (with or without treatment)	has a burn in the throat and lungs, which causes great difficulty breathing and a lot of anxiety.	0.376	0.24	0.524
Crush injury (short or long term, with or without treatment)	had part of the body crushed, leaving pain, swelling, tingling and limited feeling in the affected area.	0.132	0.089	0.189
Dislocation of hip (long term, with or without treatment)	walks with a limp and feels discomfort when walking.	0.016	0.008	0.028
Dislocation of knee (long term, with or without treatment)	has a knee out of joint, causing pain and difficulty moving the knee, which sometimes gives way. The person needs crutches for walking and help with self-care such as dressing.	0.113	0.075	0.160
Dislocation of shoulder (long term, with or without treatment)	has a shoulder that is out of joint, causing pain and difficulty moving. The person has difficulty with daily activities such as dressing and cooking.	0.062	0.041	0.088
Other injuries of muscle and tendon (includes sprains, strains and dislocations other than shoulder, knee, hip)	has a strained muscle that causes pain and swelling.	0.008	0.003	0.015
Drowning and nonfatal submersion (short or long term, with or without treatment)	has breathlessness, anxiety, cough, and vomiting.	0.247	0.164	0.341
Fracture of clavicle, scapula or humerus (short or long term, with or without treatment)	has a broken shoulder bone, which is painful and swollen. The person cannot use the affected arm and has difficulty with getting dressed.	0.035	0.021	0.053
Fracture of face bone (short or long term, with or without treatment)	has a broken cheek bone or a broken nose or chipped teeth, with swelling and severe pain.	0.067	0.044	0.097
Fracture of foot bones (short term, with or without treatment)	has a broken foot bone, which causes pain, swelling, and difficulty walking.	0.026	0.015	0.043
Fracture of foot bones (long term, without treatment)	had a broken foot in the past that did not heal properly. The person now has pain in the foot and has some difficulty walking.	0.026	0.015	0.042
Fracture of hand (short term, with or without treatment)	has a broken hand, causing pain and swelling.	0.010	0.005	0.019
Fracture of hand (long term, without treatment)	has stiffness in the hand and a weak grip.	0.014	0.007	0.025
Fracture of neck of femur (short term, with or without treatment)	has broken a hip and is in pain. The person cannot stand or walk, and needs help washing, dressing, and going to the toilet.	0.258	0.172	0.356
Fracture of neck of femur (long term, with treatment)	had a broken hip in the past, which was fixed with treatment. The person can only walk short distances, has discomfort when moving around, and has some difficulty in daily activities.	0.058	0.038	0.084
Fracture of neck of femur (long term, without treatment)	had a broken hip bone in the past, which was never treated and did not heal properly. The person cannot get out of bed and needs help washing and going to the toilet.	0.402	0.269	0.541
Fracture, other than femoral neck (short term, with or without treatment)	has a broken thigh bone. The person has severe pain and swelling and cannot walk.	0.111	0.074	0.156
Fracture, other than femoral neck (long term, without treatment)	had a broken thigh bone in the past, which was never treated and did not heal properly. The person now has a limp and discomfort when walking.	0.042	0.027	0.063
Fracture of patella, tibia or fibula or ankle (short term, with or without treatment)	has a broken shin bone, which causes severe pain, swelling, and difficulty walking.	0.050	0.032	0.075
Fracture of patella, tibia or fibula or ankle (long term, with or without treatment)	had a broken shin bone in the past that did not heal properly. The person has pain in the knee and ankle, and has difficulty walking.	0.055	0.036	0.081

Fracture of pelvis (short term)	has a broken pelvis bone, with swelling and bruising. The person has severe pain, and cannot walk or do daily activities.	0.279	0.188	0.384
Fracture of pelvis (long term)	had a broken pelvis in the past and now walks with a limp. There is often pain in the back and groin, and when urinating and sitting for a long time.	0.182	0.123	0.253
Fracture of radius or ulna (short term, with or without treatment)	has a broken forearm, which causes severe pain, swelling, and limited movement.	0.028	0.016	0.046
Fracture of radius or ulna (long term, without treatment)	had a broken forearm in the past that did not heal properly, causing some pain and limited movement in the elbow and wrist. The person has difficulty with daily activities such as dressing.	0.043	0.028	0.064
Fracture of skull (short or long term, with or without treatment)	has a broken skull, but does not have brain damage. The broken area is painful and swollen.	0.071	0.048	0.100
Fracture of sternum and/or fracture of one or two ribs (short term, with or without treatment)	has a broken rib that causes severe pain in the chest, especially when breathing in. The person has difficulty with daily activities such as dressing.	0.103	0.068	0.145
Fracture of vertebral column (short or long term, with or without treatment)	has broken back bones and is in pain, but still has full use of arms and legs.	0.111	0.075	0.156
Fractures, treated (long term)	has slight pain in a bone that was broken in the past.	0.005	0.002	0.010
Injured nerves (short term)	has a nerve injury, which causes difficulty moving and some loss of feeling in the affected area.	0.100	0.067	0.140
Injured nerves (long term)	had a nerve injury in the past, which continues to cause some difficulty moving. The person often injures the affected part because it is numb.	0.113	0.076	0.157
Injury to eyes (short term)	has an injury to one eye, which causes pain and difficulty seeing.	0.054	0.035	0.081
Concussion[2]	has headaches, dizziness, nausea and difficulty concentrating	0.11	0.074	0.158
Severe traumatic brain injury, short term (with or without treatment)	cannot concentrate and has headaches, memory problems, dizziness, and feels angry.	0.214	0.141	0.297
Traumatic brain injury, long-term consequences, minor (with or without treatment)	has episodes of headaches, memory problems, and difficulty concentrating.	0.094	0.063	0.133
Traumatic brain injury, long-term consequences, moderate (with or without treatment)	has frequent headaches, memory problems, difficulty concentrating, and dizziness. The person is often anxious and moody.	0.231	0.156	0.324
Traumatic brain injury, long-term consequences, severe (with or without treatment)	cannot think clearly and has frequent headaches, memory problems, difficulty concentrating and dizziness. The person is often anxious and moody, and depends on others for feeding, toileting, dressing and walking.	0.637	0.462	0.789
Open wound (short term, with or without treatment)	has a cut in the skin, which causes pain and numbness around the cut.	0.006	0.002	0.012
Poisoning (short term with or without treatment)	has drowsiness, stomach pain and vomiting.	0.163	0.109	0.227
Severe chest injury (long term, with or without treatment)	had a severe chest injury in the past that has now healed. The person still gets breathless when walking and feels discomfort in the chest.	0.047	0.030	0.070
Severe chest injury (short term, with or without treatment)	has a serious chest injury, which causes severe pain, shortness of breath and anxiety.	0.369	0.248	0.501
Spinal cord lesion below neck level (treated)	is paralyzed from the waist down, cannot feel or move the legs and has difficulties with urine and bowel control. The person uses a wheelchair to move around. [1]	0.296	0.198	0.414
Spinal cord lesion below neck level (untreated)	is paralyzed from the waist down, cannot feel or move the legs and has difficulties with urine and bowel control. Legs are in fixed, bent positions, and the person gets frequent infections and pressure sores. [1]	0.623	0.434	0.777
Spinal cord lesion at neck level (treated)	is paralyzed from the neck down, with no feeling or control over any part of the body below the neck, and no urine or bowel	0.589	0.415	0.748

	control.[1]			
Spinal cord lesion at neck level (untreated)	is paralyzed from the neck down, with no feeling or control over any part of the body below the neck, and no urine or bowel control. Arms and legs are in fixed, bent positions, and the person gets frequent infections and pressure sores.[1]	0.732	0.544	0.871

[1] Lay descriptions that were revised in European disability weight surveys and adopted in GBD2013

[2] New health states included in European disability weight surveys and adopted in GBD2013

Disability associated with treated and untreated cases

For many nature-of-injury categories, GBD 2013 has a separate disability weight for treated and for untreated cases. Similar to the strategy we employed while estimating the probability of permanent health loss, we used a proxy of health system access to determine the ratio of treated to untreated cases for a given country-year and then assigned a country-year-nature-of-injury category-specific disability weight equal to a weighted average of the treated and untreated disability weight values.

Duration of short-term health loss

The duration of injury is the period of time that there is disability due to the injury. To determine the duration for treated cases of short-term injury we analyzed patient responses of two Dutch Injury Surveillance System follow-up studies of 2001-2003 and 2007-2009.[8 9] These studies collected data at 2.5, 5, 9, and 12 months post-injury asking injury patients if they were still experiencing problems due to their injury.[8 9] If not, the patients were asked how many days they had experienced problems. The injury patients that still reported having problems one year after the injury were assumed to be captured in our analysis of permanent disability. The duration for treated cases of short-term injury was estimated for both inpatient and outpatient injuries, separately. The estimates were supplemented by expert-driven estimates of short-term duration for nature of injury categories that did not appear in the Dutch dataset and untreated injuries. Annex Table 4.8 shows the duration of short term disability by nature-of-injury and the duration multiplier for untreated cases. Short term durations for inpatient and outpatient injuries were empirically derived from the Dutch Injury Surveillance System, unless bolded, in which case they were expert-driven. Untreated duration multiplier means the average factor by which the duration of short-term injury outcomes is increased for a given nature-of-injury category when the injury goes untreated.

Annex Table 4.8 Duration of short term disability by nature-of-injury warranting inpatient or outpatient care and the duration multiplier for untreated cases

Amputation of both lower limbs	N/A			N/A					
Amputation of both upper limbs	N/A			N/A					
Amputation of finger (excluding thumb)	N/A			N/A					
Amputation of one lower limb	N/A			N/A					
Amputation of one upper limb	N/A			N/A					
Amputation of thumb	N/A			N/A					
Amputation of toe	N/A			N/A					
Burns <20% body surface	28	21	35	14	7	21	1.5	1.25	1.75
Burns >=20% body surface or >=10% if include face/hands	60	40	80	60	40	80	2	1.5	2.5
Lower airway burns	28	21	35	28	21	35	1.5	1.25	1.75
Dislocation of hip	40	29	51	31	16	49	2	1.5	2.5
Dislocation of knee	40	24	59	41	32	52	1	1	1
Dislocation of shoulder	62	25	109	54	16	100	1	1	1
Other injuries of muscle & tendon and other dislocations	65	36	94	48	32	63	1	1	1
Fracture of clavicle, scapula, or humerus	64	48	80	52	39	66	1	1	1
Fracture of face bone	46	34	58	37	30	46	1	1	1
Fracture of foot bone	49	31	68	36	27	45	1	1	1
Fracture of hand bone	36	27	44	40	33	48	1	1	1
Fracture of neck of femur	79	57	104	72	45	106	1.5	1.25	1.75
Fracture of patella, tibia, fibula, or ankle	131	77	183	94	63	129	1	1	1
Fracture of pelvis	61	40	85	54	35	76	1	1	1
Fracture of radius or ulna	48	38	59	41	30	51	1.5	1.25	1.75
Fracture of skull	46	34	58	37	30	46	1	1	1
Fracture of sternum or rib(s)	54	38	74	42	30	56	1	1	1
Fracture of vertebral column	85	61	112	75	53	101	1	1	1
Fracture of femur, other than femoral neck	85	55	116	61	39	88	1.5	1.25	1.75
Minor traumatic brain injury	37	31	43	35	26	46	1	1	1
Moderate to severe traumatic brain injury	40	33	48	27	22	32	1	1	1
Foreign body in ear	2	1	3	1	0	2	2	1.5	2.5
Foreign body in respiratory system	4	3	5	2	1	3	2	1.5	2.5
Foreign body in gastrointestinal or urogenital system	4	3	5	2	1	3	2	1.5	2.5
Spinal cord lesion at neck level	28	21	35	28	21	35	1	1	1
Spinal cord lesion below neck level	28	21	35	28	21	35	1	1	1
Non-fatal submersion	4	3	5	2	1	3	1	1	1
Asphyxiation	4	3	5	2	1	3	1	1	1

Crush injury	61	39	98	11	8	13	1	1	1
Injured nerves	62	34	103	36	17	61	1	1	1
Injury to eyes (including foreign body eye)	45	17	77	50	20	83	1	1	1
Open wound	36	30	42	18	10	29	2	1.5	2.5
Poisoning	4	3	5	2	1	3	1	1	1
Severe chest Injury	54	38	74	42	30	56	1	1	1
Internal hemorrhage in abdomen or pelvis	21	14	28	21	14	28	2	1.5	2.5
Contusion	36	30	42	18	10	29	1	1	1
Environmental factors (e.g. temperature, pressure, electricity)	28	21	35	28	21	35	1	1	1
Complications of medical treatment	28	21	35	28	21	35	1	1	1
Superficial injury	42	24	60	18	14	23	1	1	1
Multiple significant injuries	131	77	183	94	63	129	2	1.5	2.5

LL=lower limit; UL=upper limit; N/A=not available

Calculation of prevalence from incidence data – short term injury

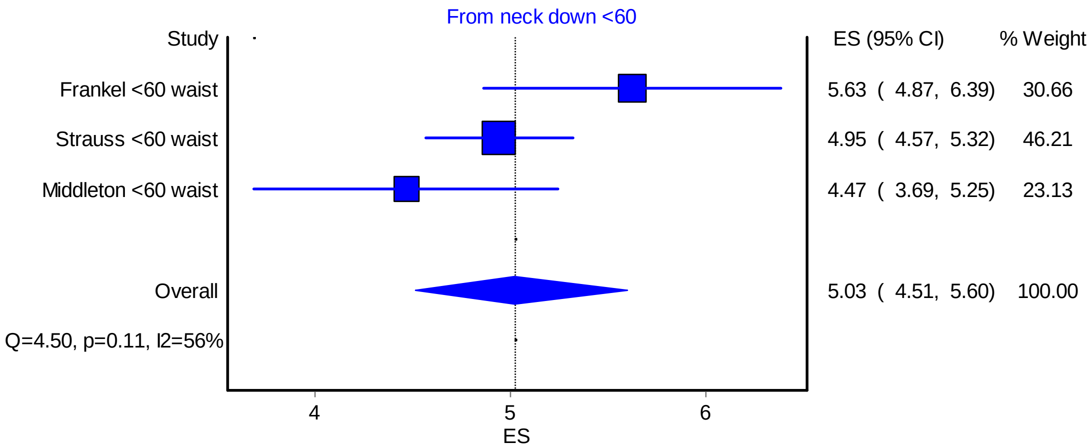
For short-term injury outcomes, the prevalence for each cause-of-injury/nature-of-injury/severity-level grouping was estimated as the product of incidence and duration.

Calculation of prevalence from incidence data – permanent health loss

For permanent health loss, we needed to integrate incidence over time to arrive at prevalence estimates while taking into account differential mortality risk for more serious long-term disabilities. We used a random effects meta-analysis to pool data on standardized mortality ratios derived from literature reviews for spinal cord injury, burns covering more than 20% of the body, moderate to severe traumatic brain injury, hip fracture, and multiple significant injuries. Annex Figures 4.3 – 4.9 show the results of the random effects meta-analysis of data on standardized mortality ratios that were derived from literature reviews for spinal cord injury below neck level in patients aged younger than 60 years (Annex Figure 4.3) and patients aged 60 years and older (Annex Figure 4.4), spinal cord injury at waist level in patients younger than 60 years (Annex Figure 4.5) and 60 years and older (Annex Figure 4.6), moderate to severe traumatic brain injury (Annex Figure 4.7), hip fracture in patients aged younger than 75 years (Annex Figure 4.8) and patients 75 years and older (Annex Figure 4.9).

Spinal cord injury

Annex Figure 4.3 Forest plot of standardized mortality ratios in individual samples of spinal cord injury at neck level in patients younger than 60 years*



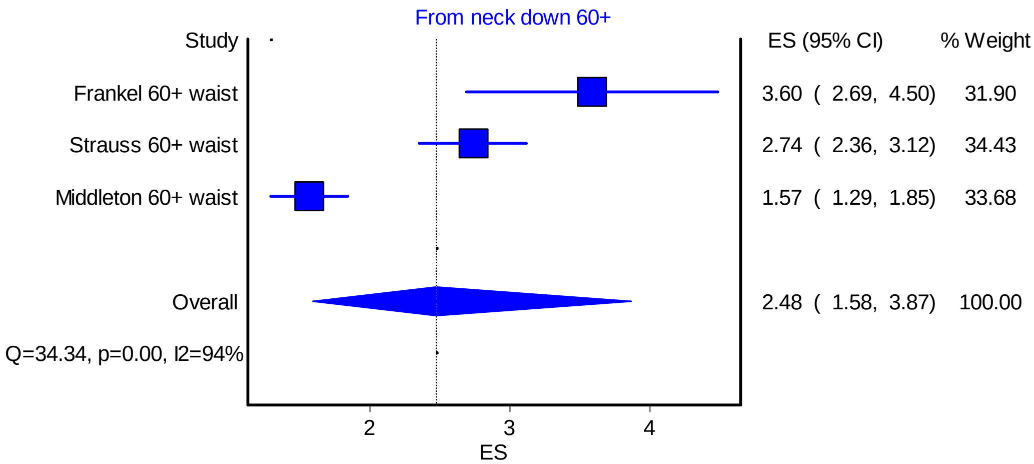
*Studies:

Frankel HL, Coll JR, Charlifue SW, *et al*. Long-term survival in spinal cord injury: a fifty year investigation. *Spinal Cord* 1998; **36**: 266–74.

Middleton JW, Dayton A, Walsh J, Rutkowski SB, Leong G, Duong S. Life expectancy after spinal cord injury: a 50-year study. *Spinal Cord* 2012; **50**: 803–11.

Strauss D, DeVivo M, Shavello R. Long-term Mortality Risk After Spinal Cord Injury. *J Insurance Med* 2000; **32**: 11–6.

Annex Figure 4.4 Forest plot of standardized mortality ratios in individual samples of spinal cord injury at neck level in patients 60 years and olderz*



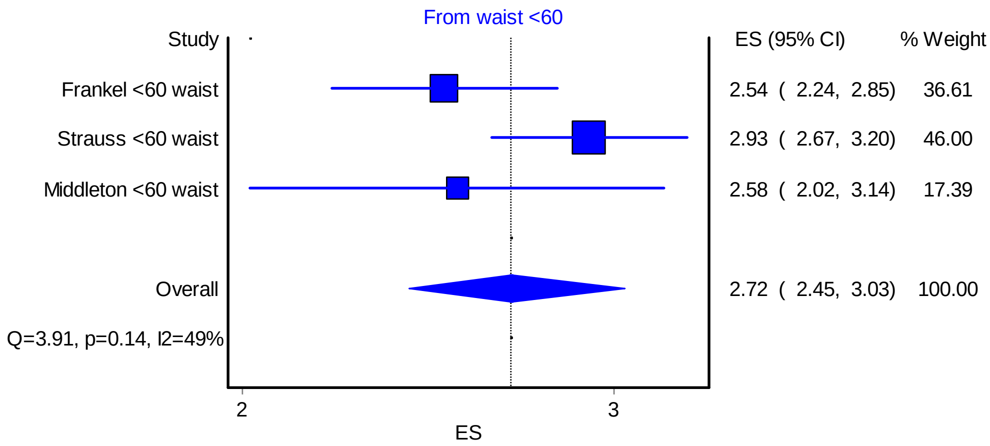
*Studies:

Frankel HL, Coll JR, Charlifue SW, *et al*. Long-term survival in spinal cord injury: a fifty year investigation. *Spinal Cord* 1998; **36**: 266–74.

Middleton JW, Dayton A, Walsh J, Rutkowski SB, Leong G, Duong S. Life expectancy after spinal cord injury: a 50-year study. *Spinal Cord* 2012; **50**: 803–11.

Strauss D, DeVivo M, Shavello R. Long-term Mortality Risk After Spinal Cord Injury. *J Insurance Med* 2000; **32**: 11–6.

Annex Figure 4.5 Forest plot of standardized mortality ratios in individual samples of spinal cord injury at waist level in patients younger than 60 years*



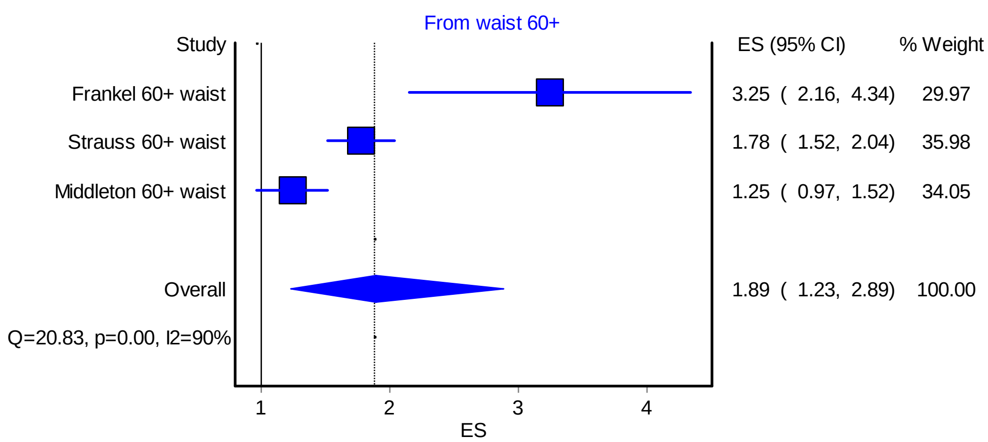
*Studies:

Frankel HL, Coll JR, Charlifue SW, *et al*. Long-term survival in spinal cord injury: a fifty year investigation. *Spinal Cord* 1998; **36**: 266–74.

Middleton JW, Dayton A, Walsh J, Rutkowski SB, Leong G, Duong S. Life expectancy after spinal cord injury: a 50-year study. *Spinal Cord* 2012; **50**: 803–11.

Strauss D, DeVivo M, Shavello R. Long-term Mortality Risk After Spinal Cord Injury. *J Insurance Med* 2000; **32**: 11–6.

Annex Figure 4.6 Forest plot of standardized mortality ratios in individual samples of spinal cord injury at waist level in patients 60 years and older*



*Studies:

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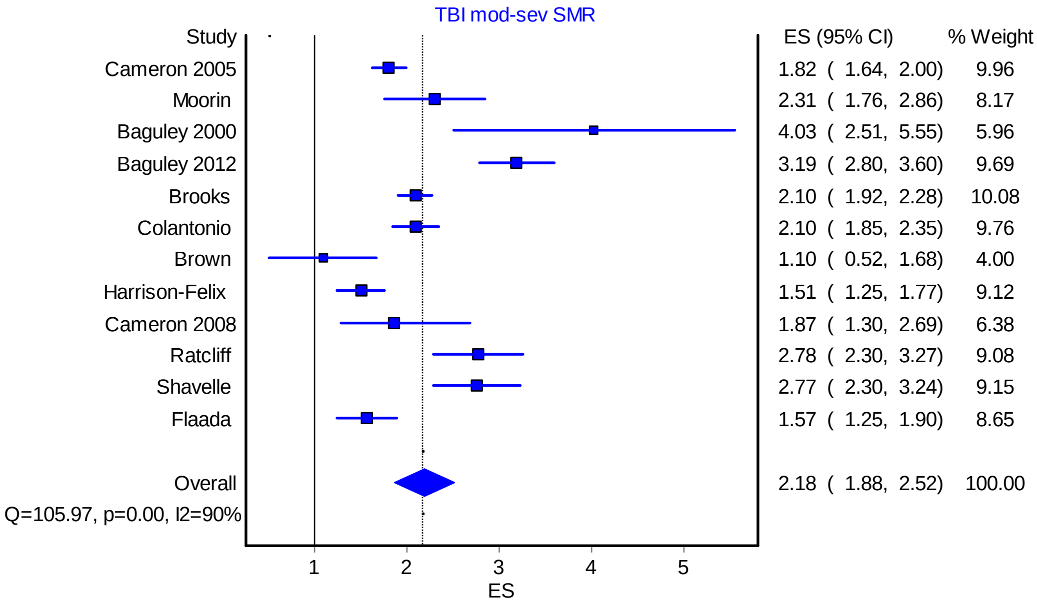
Middleton JW, Dayton A, Walsh J, Rutkowski SB, Leong G, Duong S. Life expectancy after spinal cord injury: a 50-year study. *Spinal Cord* 2012; **50**: 803–11.

Strauss D, DeVivo M, Shavello R. Long-term Mortality Risk After Spinal Cord Injury. *J Insurance Med* 2000; **32**: 11–6.

Traumatic brain injury

Annex Figure 4.7 Forest plot of standardized mortality ratios in individual samples of moderate to severe traumatic brain injury*



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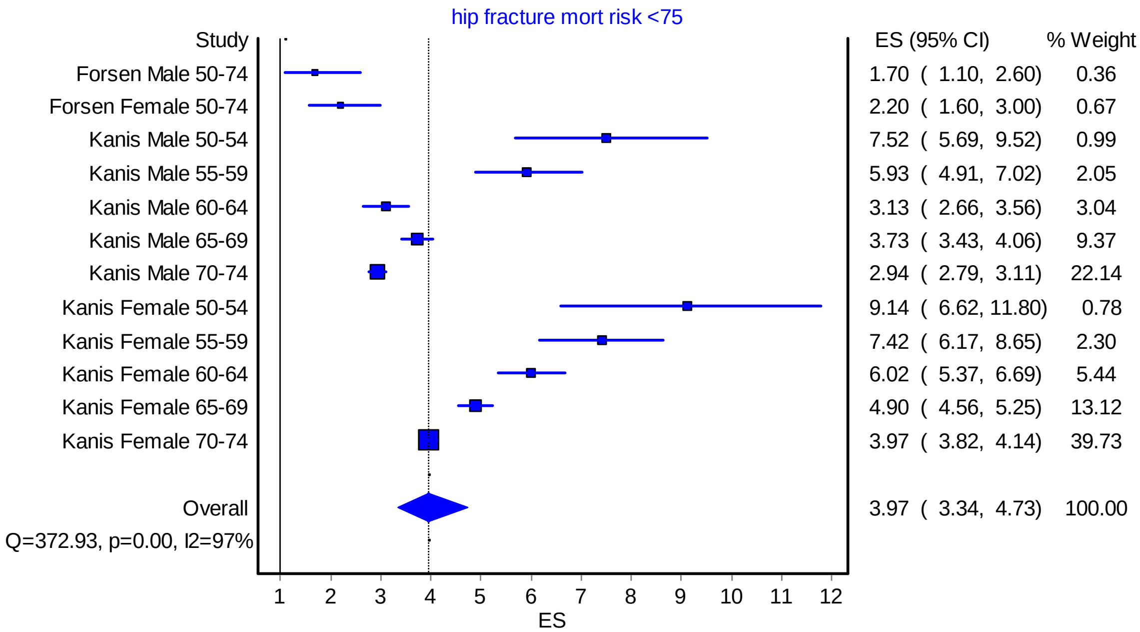
Hip fracture

Annex Figure 4.8 Forest plot of standardized mortality ratios in individual samples of hip fracture patients younger than 75 years*



*Studies:

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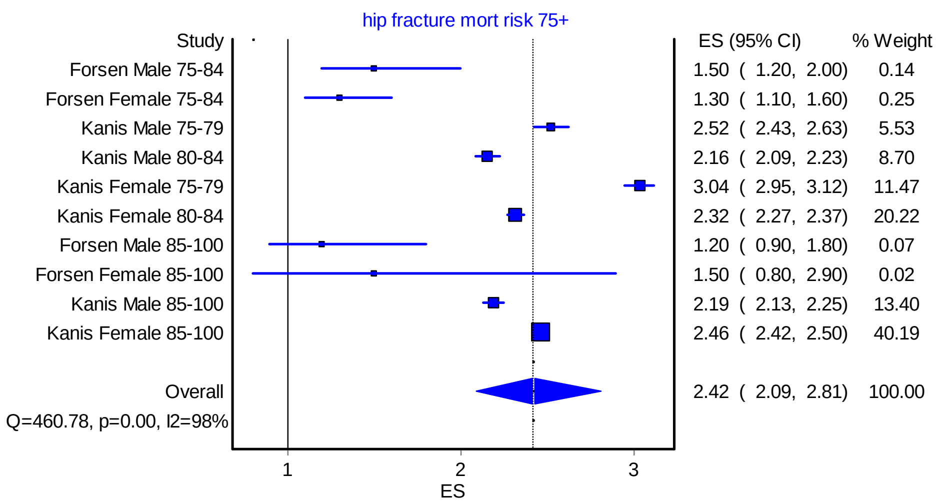
Annex Figure 4.9 Forest plot of standardized mortality ratios in individual samples of hip fracture patients 75 years and older*



*Studies:

Forsén L, Sogaard AJ, Meyer HE, Edna T, Kopjar B. Survival after hip fracture: short- and long-term excess mortality according to age and gender. *Osteoporos Int* 1999; **10**: 73–8.
Kanis JA, Oden A, Johnell O, De Laet C, Jonsson B, Oglesby AK. The components of excess mortality after hip fracture. *Bone* 2003; **32**: 468–73.

Burn injury

It was not possible to conduct a meta-analysis of data on standardized mortality ratios on burns covering more than 20% of the body, because the literature search yielded only one study. The estimated standardized mortality ratios of this study was 5.23 (95% CI 4.16 to 6.28).

Study: Onarheim H, Vindenes HA. High risk for accidental death in previously burn-injured adults. *Burns* 2005; **31**: 297–301.

Multiple significant injury

For multiple significant injury we decided to use the highest standardized mortality ratios of the other injuries (i.e. the 5.23 value for burns covering more than 20% body surface) as we were not able to identify any studies reporting a standardized mortality rate specifically for multiple trauma.

For all other nature-of-injury categories, we assumed no long-term excess mortality. We wrote new code to automate entry of data into DisMod-MR 2.0, application of the correct settings and retrieval of results for the 13,536 combinations of cause-of-injury and nature-of-injury, sex and year. "Application of the correct settings" means that DisMod-MR 2.0 is configured to simply calculate prevalence from incidence numbers, rather than trying to borrow strength through covariates or geographic random effects, because our input already consists of modeled results rather than raw data. Because DisMod-MR 2.0 does not accurately model conditions with sporadic incidence, as occurs with injuries due to forces of nature or war, we developed a simplified differential equation solver that accounted for the epidemiological relationships between incidence, prevalence, and excess mortality without incorporating the Bayesian aspects of DisMod. These Bayesian model fitting techniques, useful when dealing with raw data, were unnecessary for converting modeled incidence to modeled prevalence. By integrating over each year one at a time, our solver properly accounted for geographically and temporally isolated spikes in incidence from these two "shock" causes of injury and allowed us to estimate the prevalence of long-term outcomes for both cause-of-injury categories.

Comorbidity correction

Like all non-fatal estimates in GBD, the prevalence of all causes of long-term injury disability was included in the simulation model to correct for comorbidity assuming a multiplicative rather than additive combination of disability weights for health states that occur in the same person. For pragmatic reasons we did not include short-term disability in the comorbidity simulation modelling as the large number of combinations of cause and nature-of-injury categories would have led to long computing times. The effect of excluding these health states from the comorbidity correction model is small due to the short duration and associated low prevalence.

Section 5. Results - Incidence of injuries by nature-of-injury

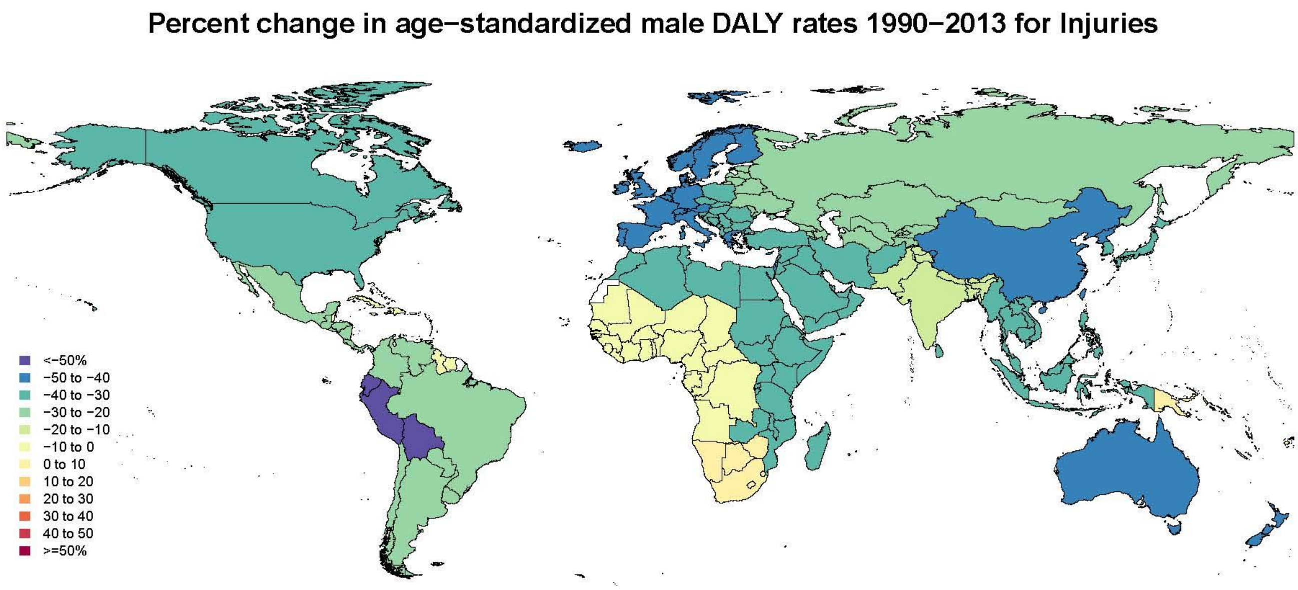
Annex Table 5.1 Incidence of injuries by nature-of-injury

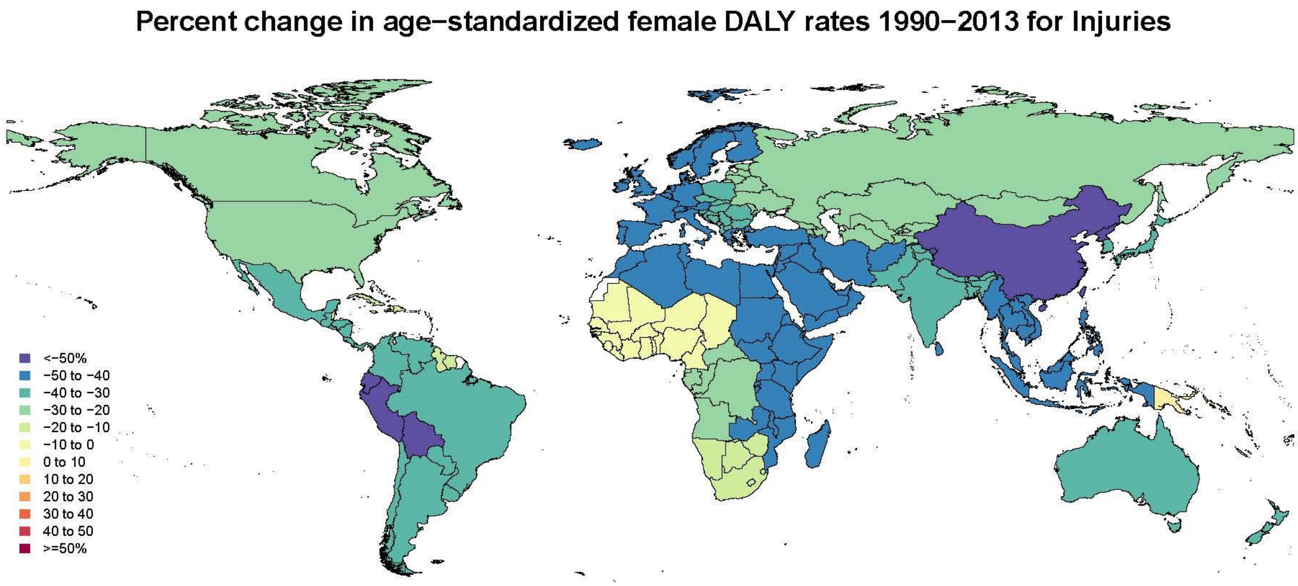
Nature-of-injury	Inpatient Injuries			Outpatient Injuries		
	Incidence (millions)	Incidence rate per 100,000	Proportion (%)	Incidence (millions)	Incidence rate per 100,000	Proportion (%)
Amputations	0.7 (0.6 – 0.7)	9.2 (8.8 – 9.8)	1.2 (1.1 – 1.2)	4.3 (4.0 – 4.5)	58 (55 – 62)	0.5 (0.4 – 0.5)
Burns	2.7 (2.6 – 2.8)	36 (34 – 38)	4.8 (4.6 – 5.0)	3.0 (2.7 – 3.5)	43 (38 – 54)	0.3 (0.3 – 0.4)
Fractures	21.7 (21.3 – 22.0)	290 (286 – 295)	38.5 (38.1 – 39.0)	108 (105 – 112)	1,438 (1,395 – 1,511)	11.7 (11.5 – 12.1)
Head Injury	5.1 (5.0 – 5.3)	71 (70 – 73)	9.1 (8.9 – 9.3)	5.2 (5.0 – 5.6)	73 (69 – 79)	0.6 (0.5 – 0.6)
Spinal Lesions	0.2 (0.2 – 0.2)	2.4 (2.3 – 2.5)	0.3 (0.3 – 0.3)	--	--	--
Minor Injury[#]	8.3 (8.1 – 8.5)	112 (110 – 115)	14.7 (14.5 – 14.9)	689 (672 – 713)	9,404 (9,166 – 9,789)	75.2 (74.5 – 75.6)
Other Injury	17.6 (17.4 – 18.0)	245 (240 – 252)	31.3 (31.1 – 31.6)	107 (104 – 116)	1,509 (1,449 – 1,660)	11.7 (11.4 – 12.2)
Total	56.2 (55.6 – 57.3)	766 (754 – 783)	5.8 (5.7 – 5.9)	916.4 (894.7 – 950.8)	12,525 (12,193 – 13,.168)	94.2 (94.1 – 94.3)

[#] Minor injury includes 'other injuries of muscle tendon and other dislocations'; foreign body in ear; open wound, contusion and superficial injury

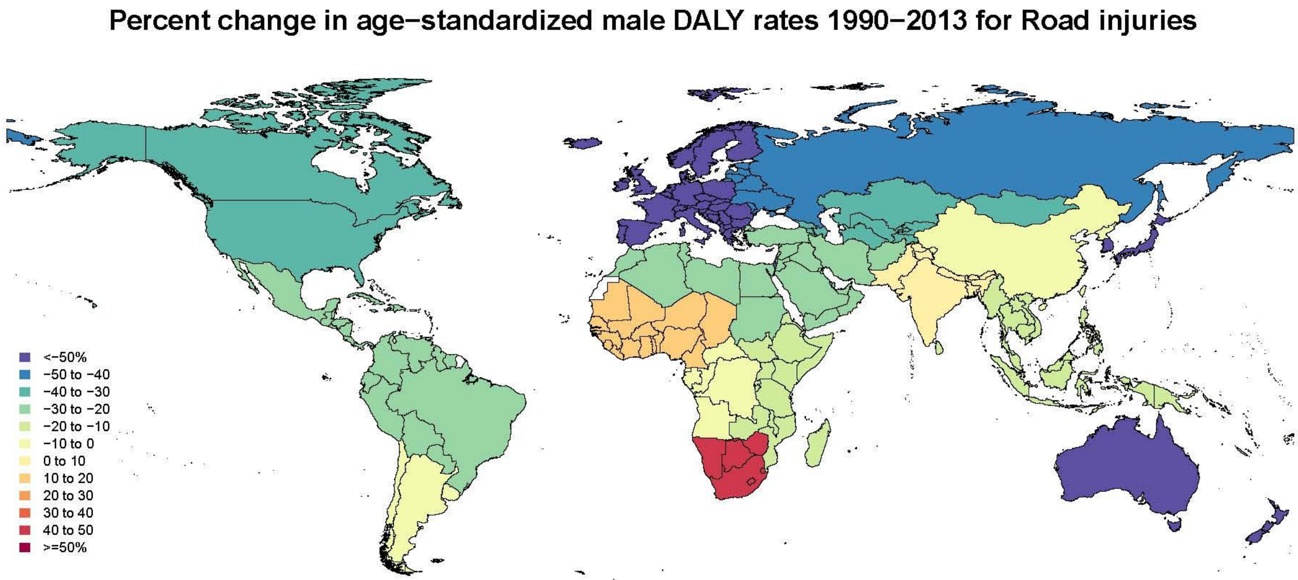
Section 6. Maps by sex of change in injury DALY rates by selected causes

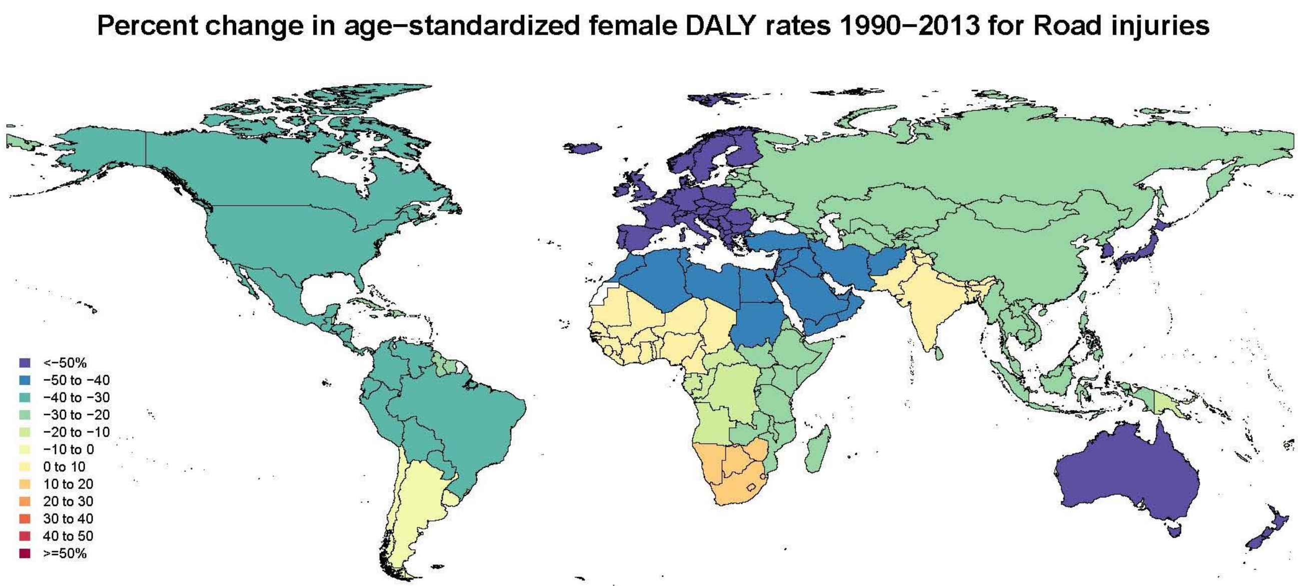
Annex Figure 6.1 Percent change in age-standardized all injury DALY rates 1990-2013 by sex



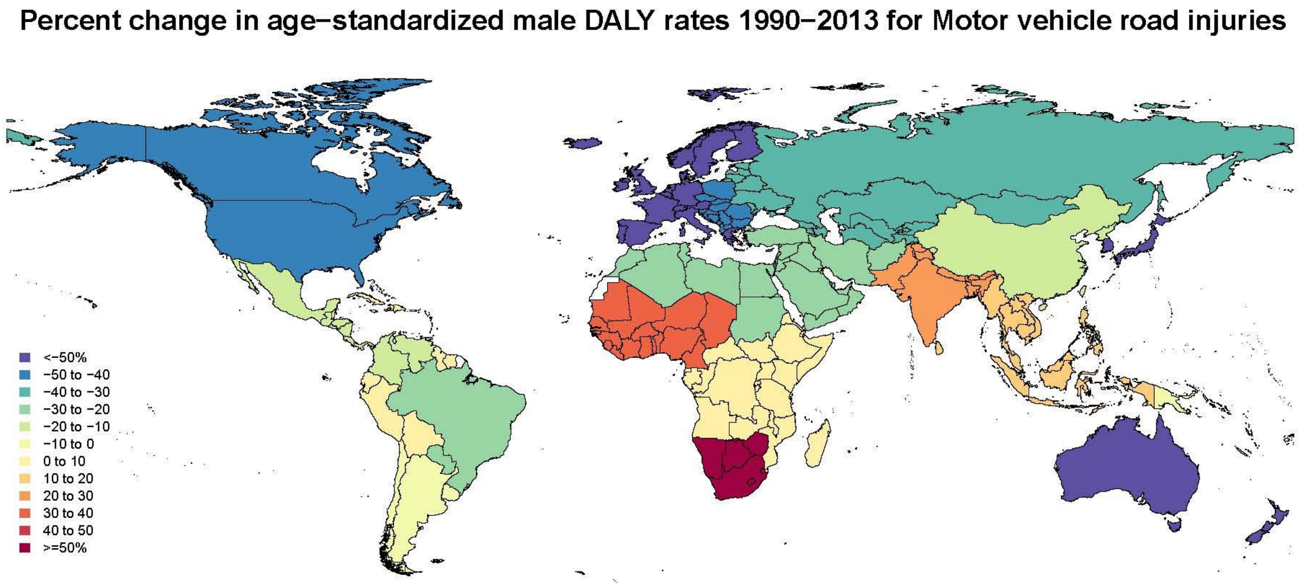


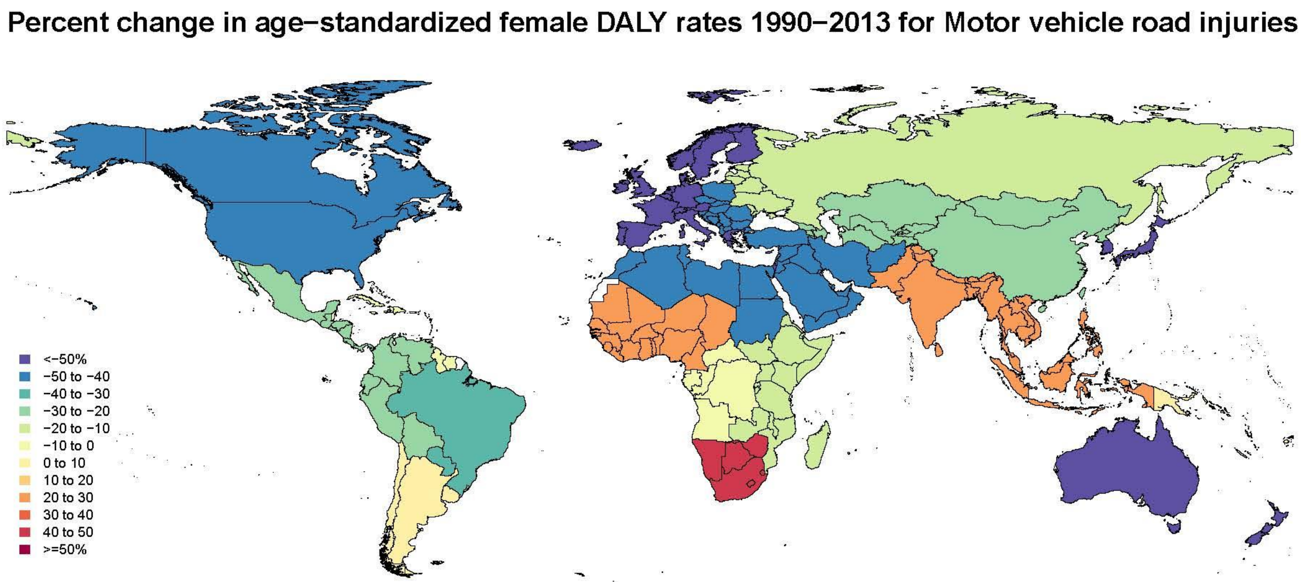
Annex Figure 6.2 Percent change in age-standardized road injury DALY rates 1990-2013 by sex





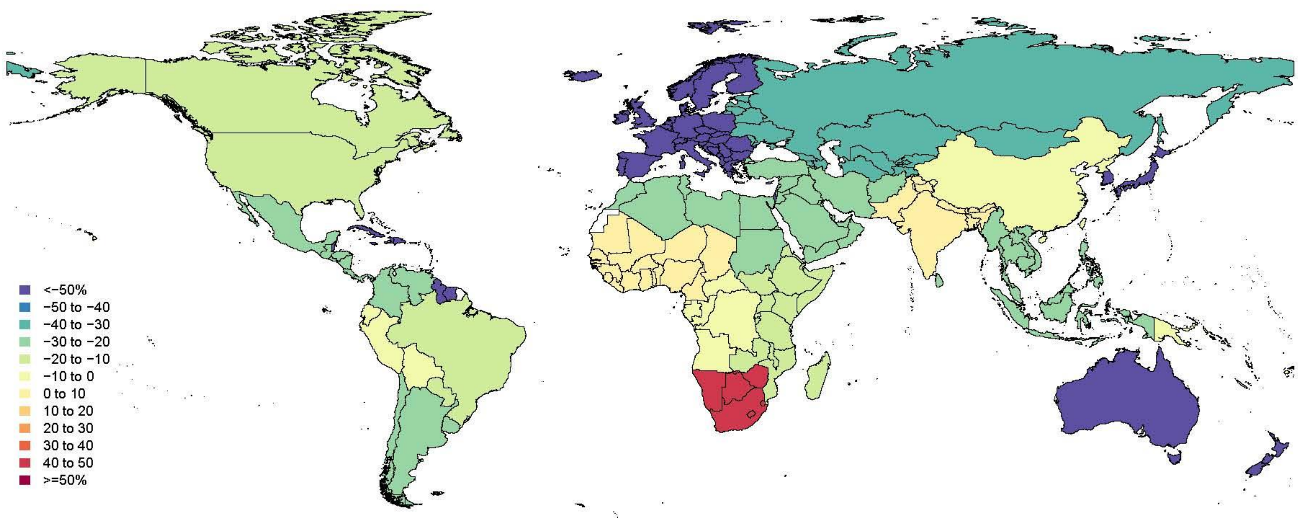
Annex Figure 6.3 Percent change in age-standardized motor vehicle road injury DALY rates 1990-2013, by sex



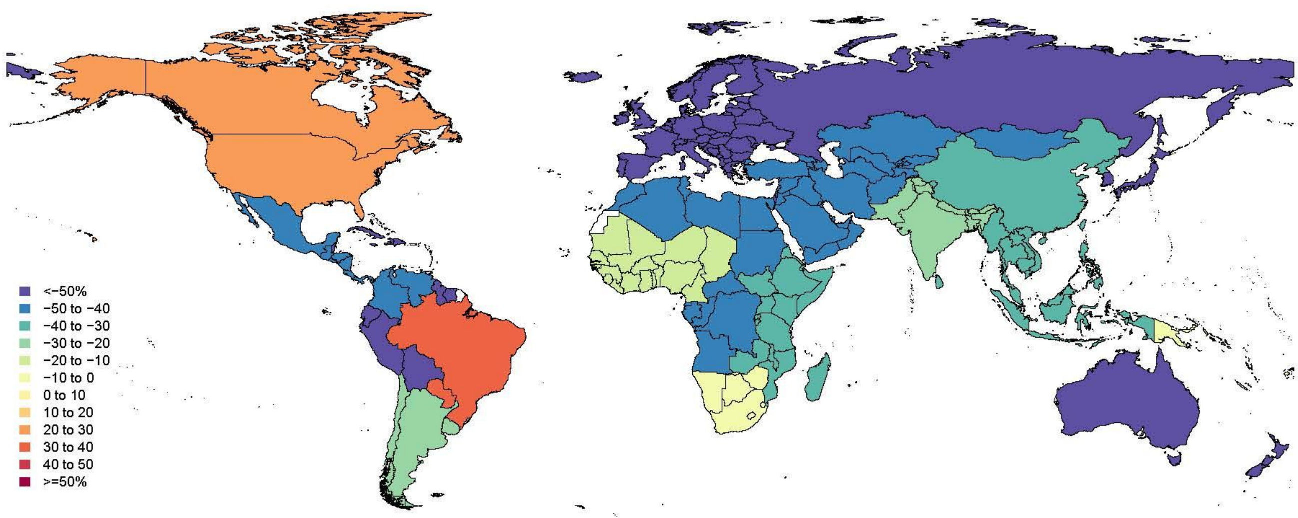


Annex Figure 6.4 Percent change in age-standardized cyclist road injury DALY rates 1990-2013 by sex

Percent change in age−standardized male DALY rates 1990−2013 for Cyclist road injuries

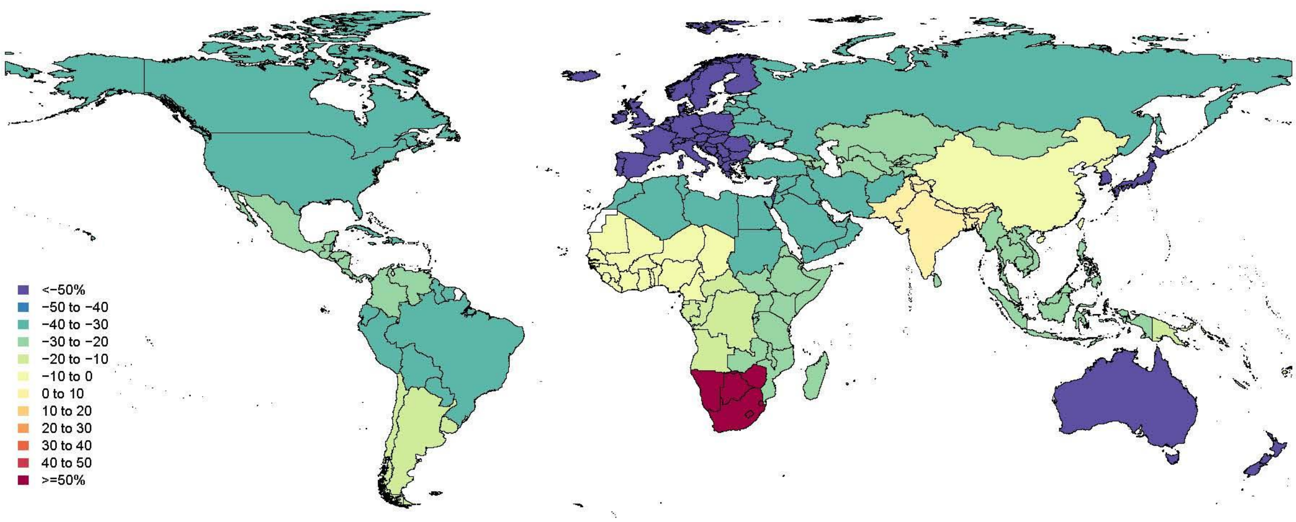


Percent change in age−standardized female DALY rates 1990−2013 for Cyclist road injuries

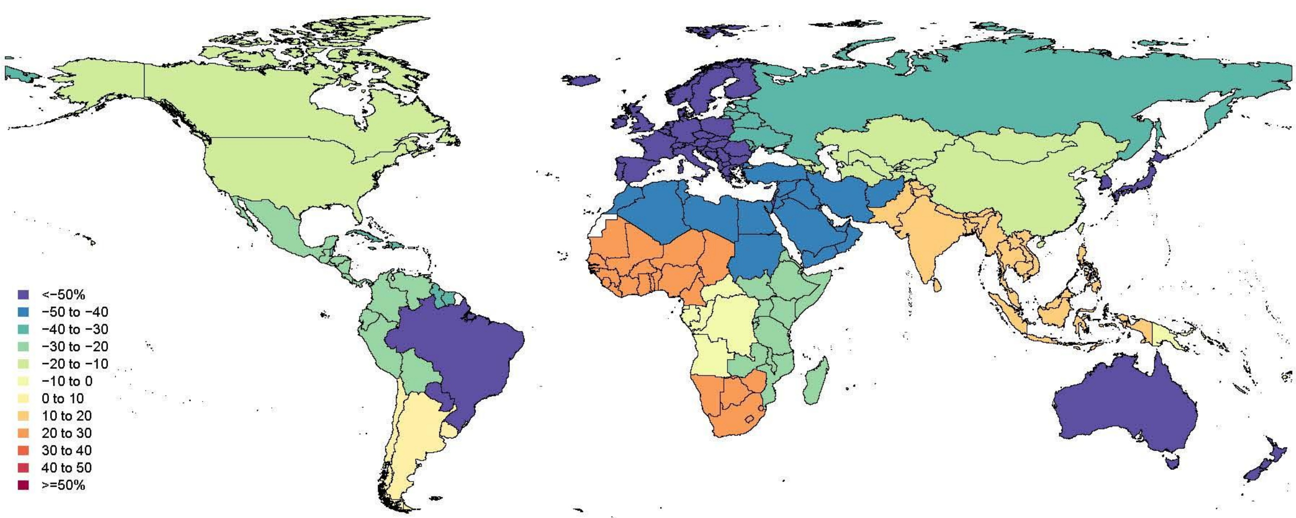


Annex Figure 6.5 Percent change in age-standardized pedestrian road injury DALY rates 1990-2013 by sex.

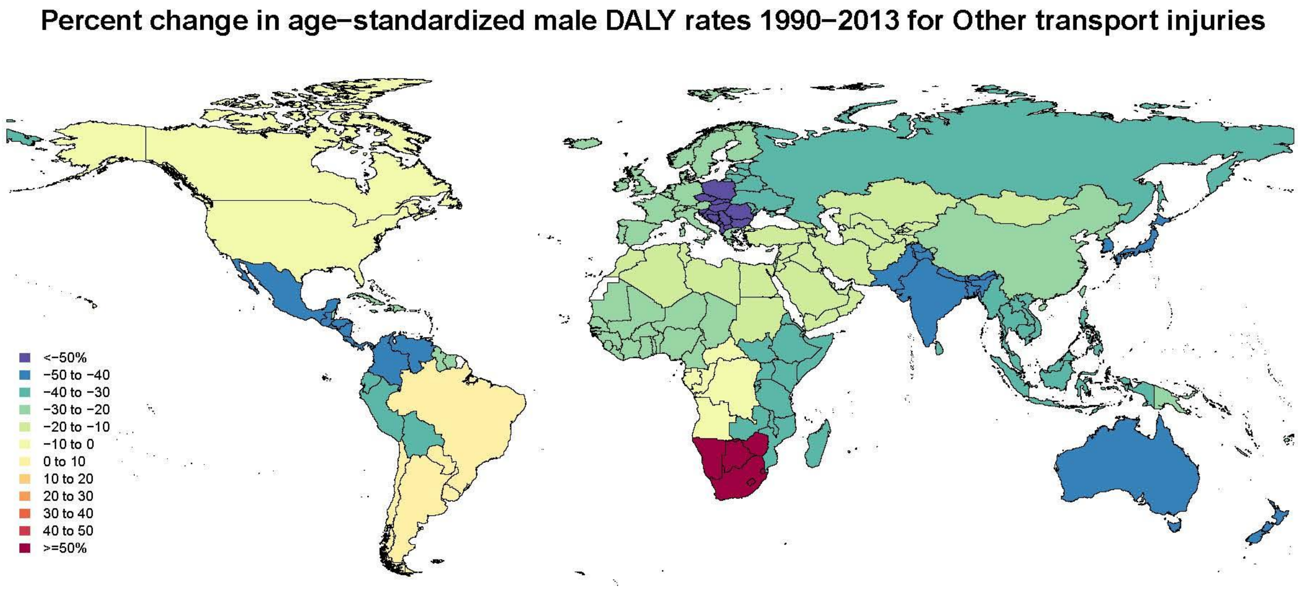
Percent change in age−standardized male DALY rates 1990−2013 for Pedestrian road injuries

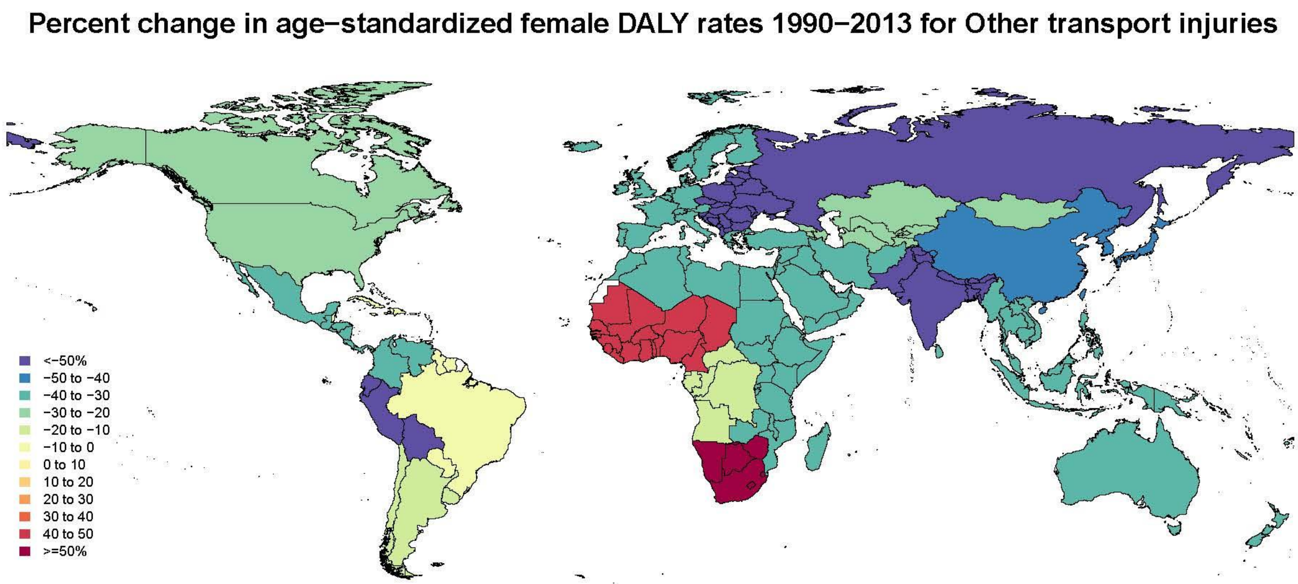


Percent change in age−standardized female DALY rates 1990−2013 for Pedestrian road injuries

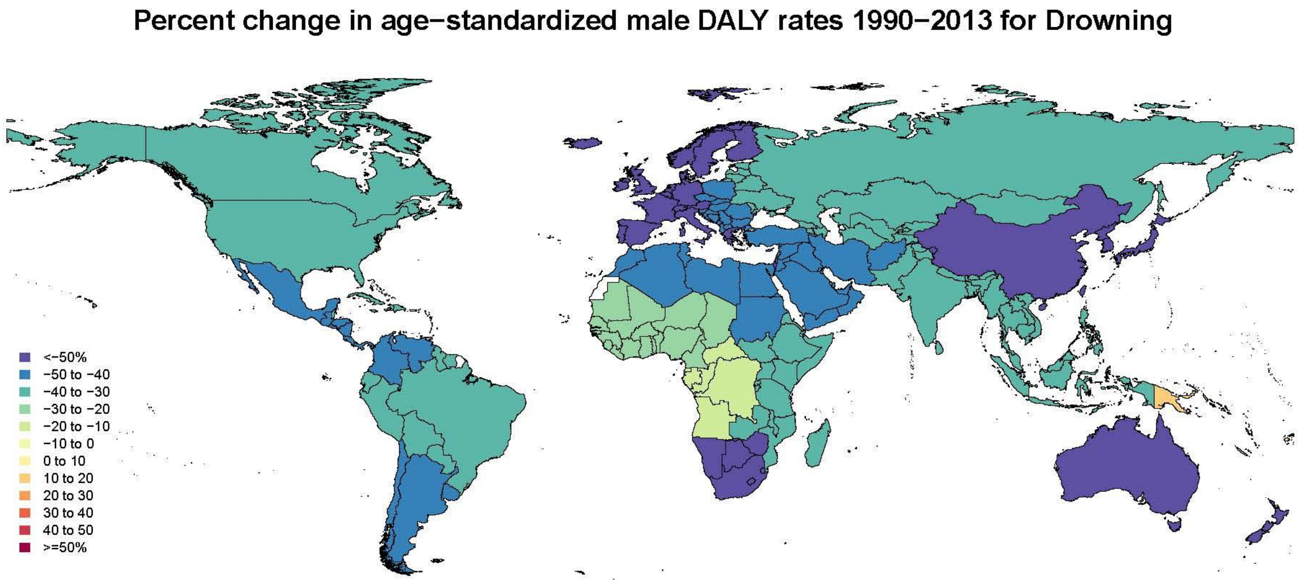


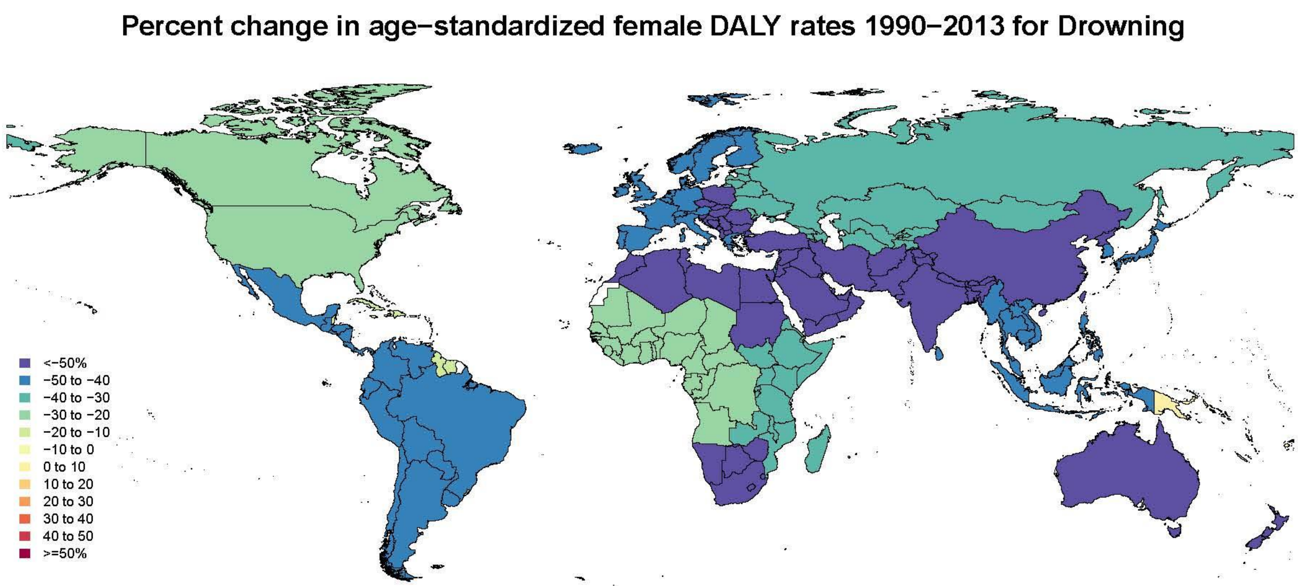
Annex Figure 6.6 Percent change in age-standardized other road injury DALY rates 1990-2013 by sex.



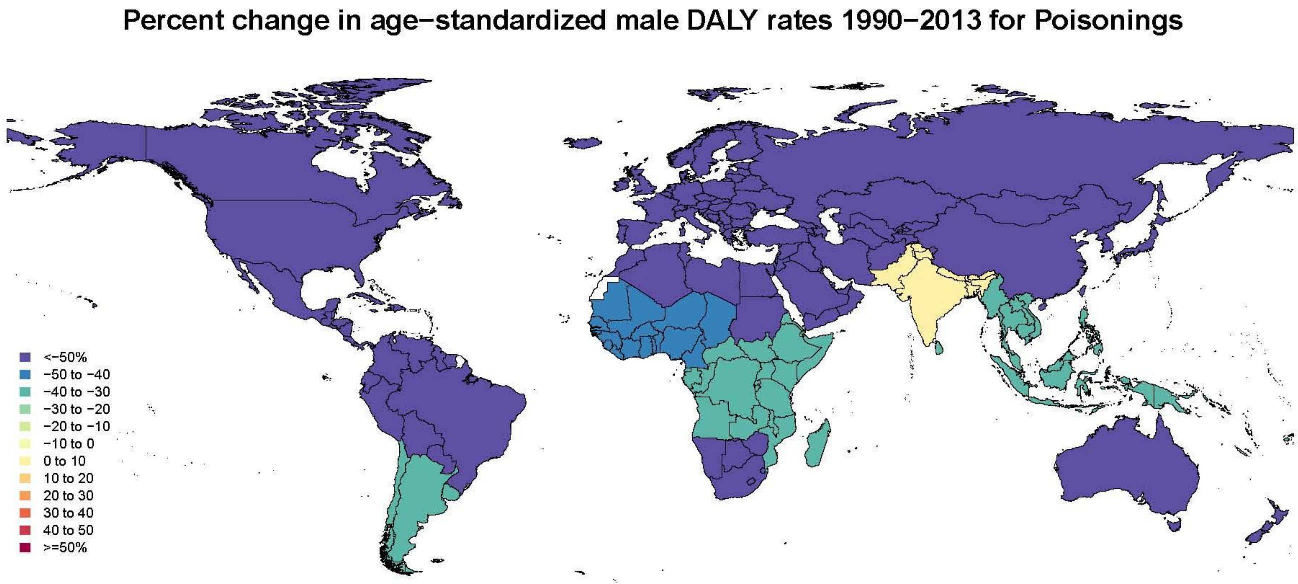


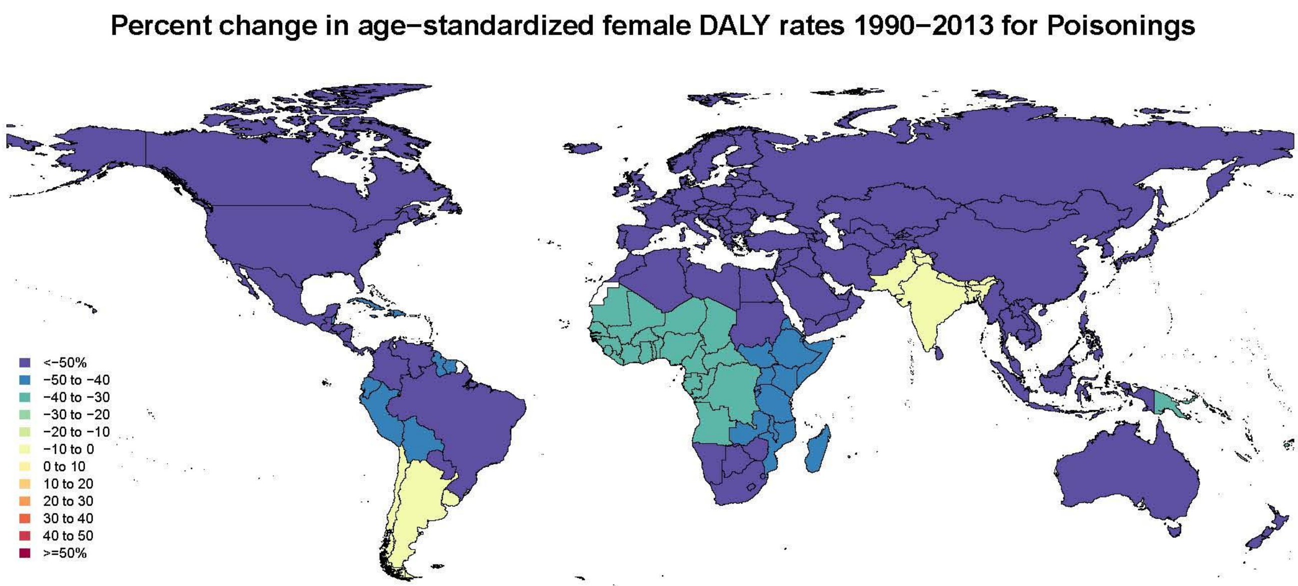
Annex Figure 6.7 Percent change in age-standardized drowning DALY rates 1990-2013 by sex.



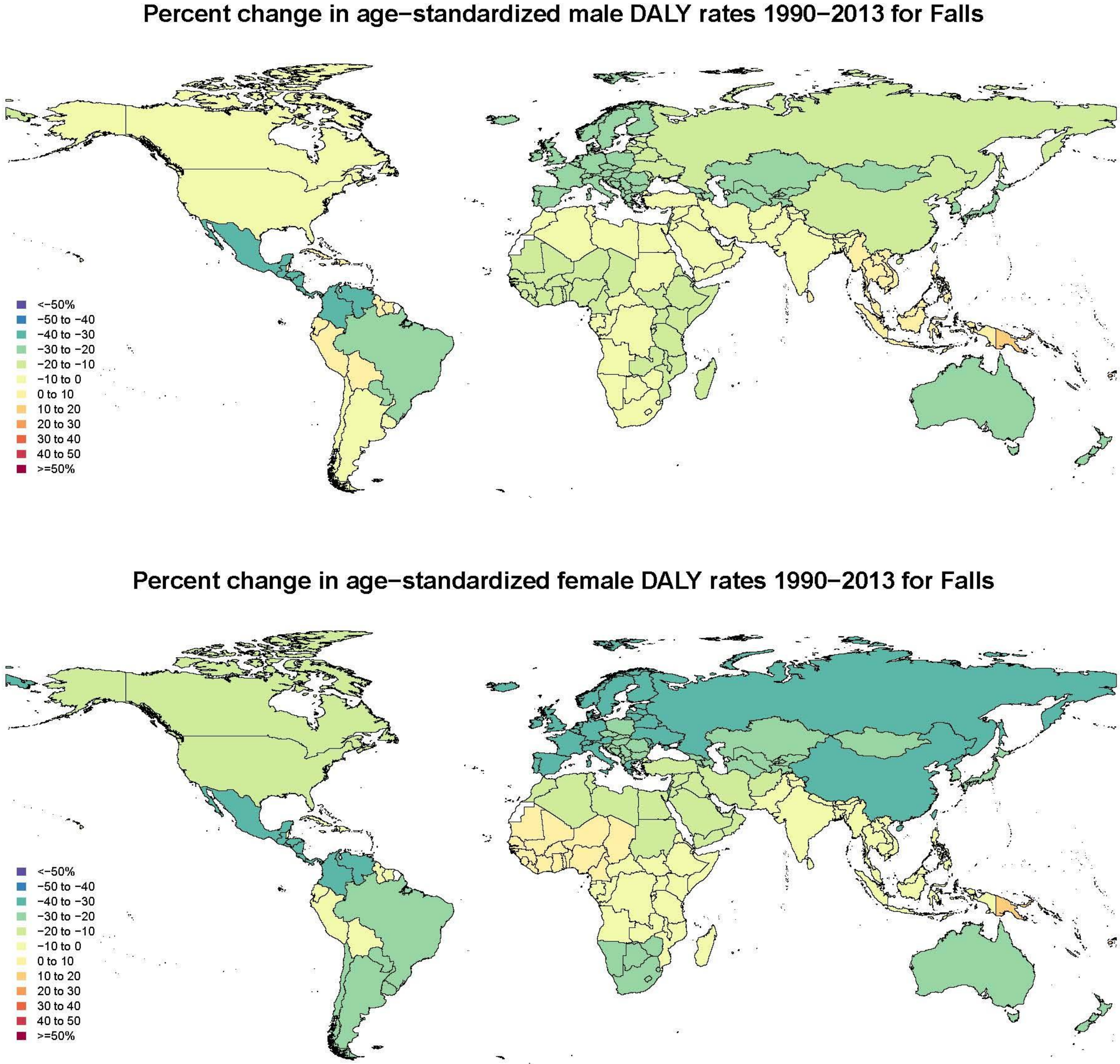


Annex Figure 6.8 Percent change in age-standardized poisonings DALY rates 1990-2013 by sex.

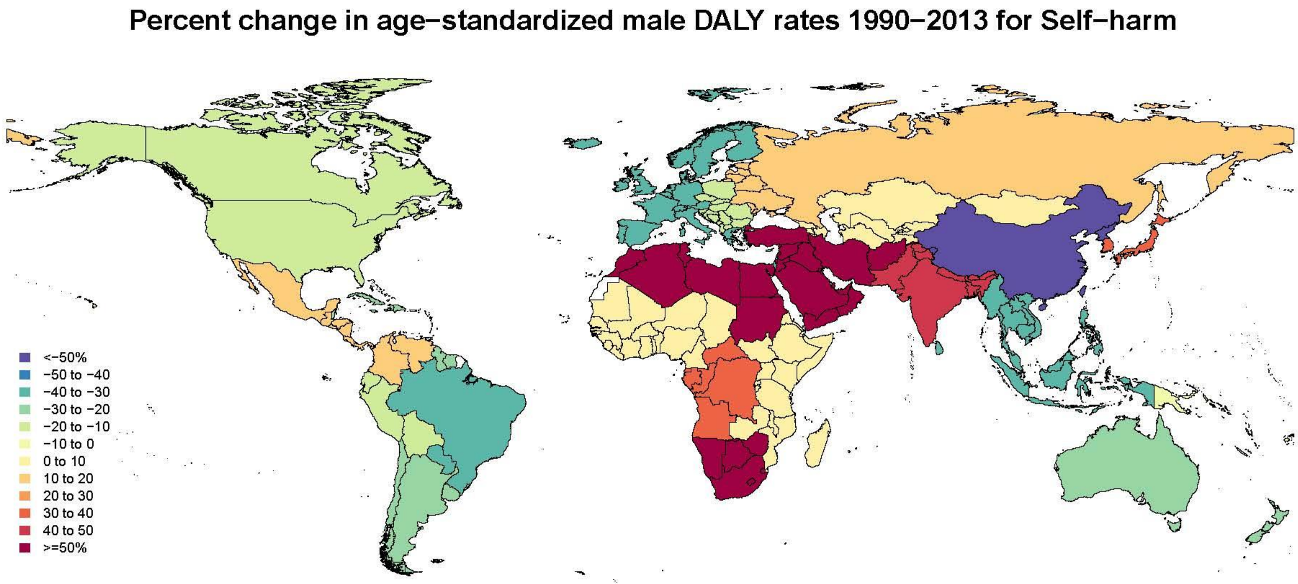


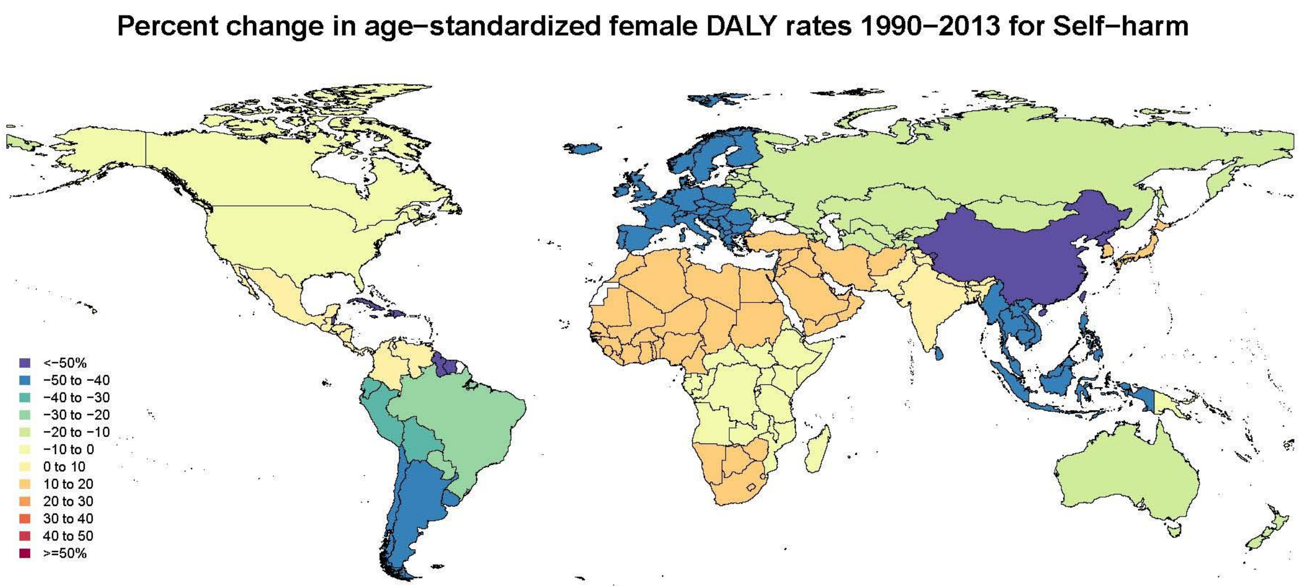


Annex Figure 6.9 Percent change in age-standardized falls DALY rates 1990-2013, by sex

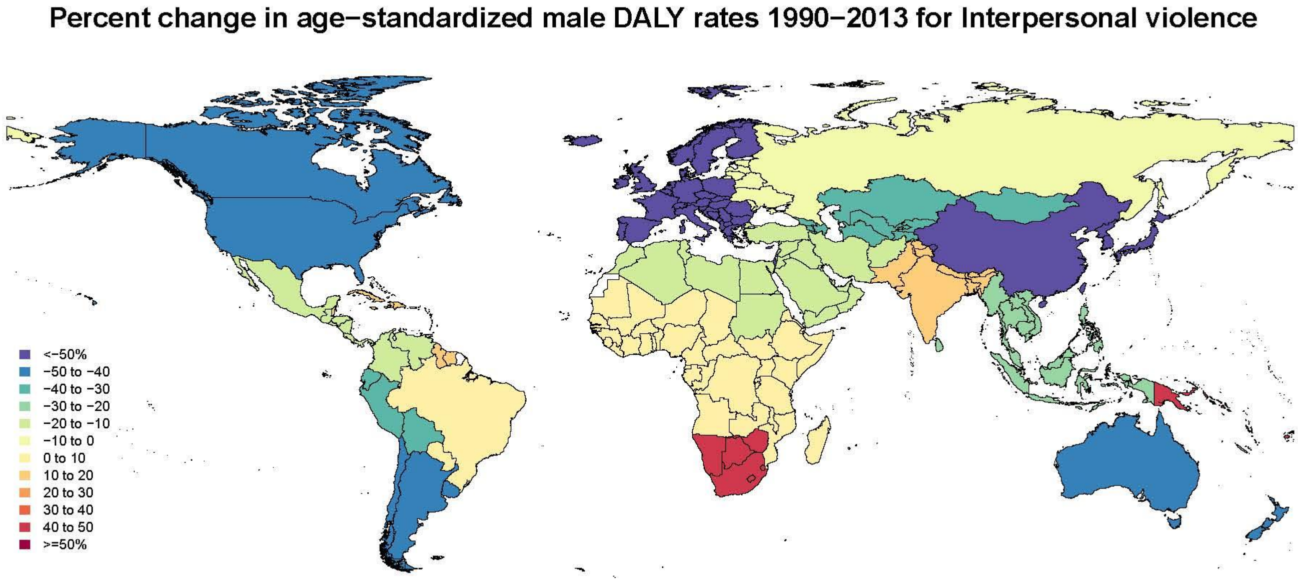


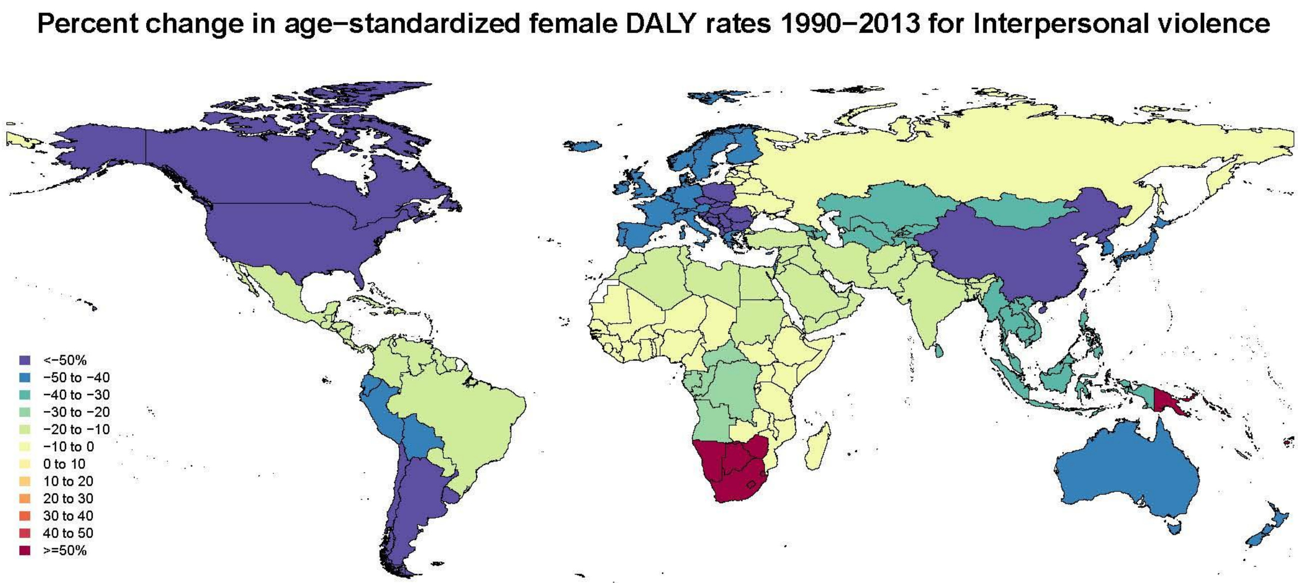
Annex Figure 6.10 Percent change in age-standardized self-harm DALY rates 1990-2013 by sex.





Annex Figure 6.11 Percent change in age-standardized interpersonal violence DALY rates 1990-2013 by sex.





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