Disability Adjusted Life Year (DALY) estimates for injury utilising the European Injury Data Base (IDB)

BRIDGE-Health (WP9 – Injury Surveillance Platform)

Ronan Lyons, Samantha Turner, Angharad Walters, Rupert Kisser, Wim Rogmans, Jane Lyons, Ashley Akbari, Bjarne Larsen, Huib Valkenberg, Dritan Bejko, Robert Bauer, Monica Steiner, Gabriele Ellsaesser

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Contributions and Acknowledgments

This report was made possible by the contribution of many people and groups, including the EU Injury Data Base (IDB) steering group, the National Data Administrators from all the countries that participated and provided data, and the Injury-VIBES consortium that produced disability weights for the groups of disorders included in this report.

Executive Summary

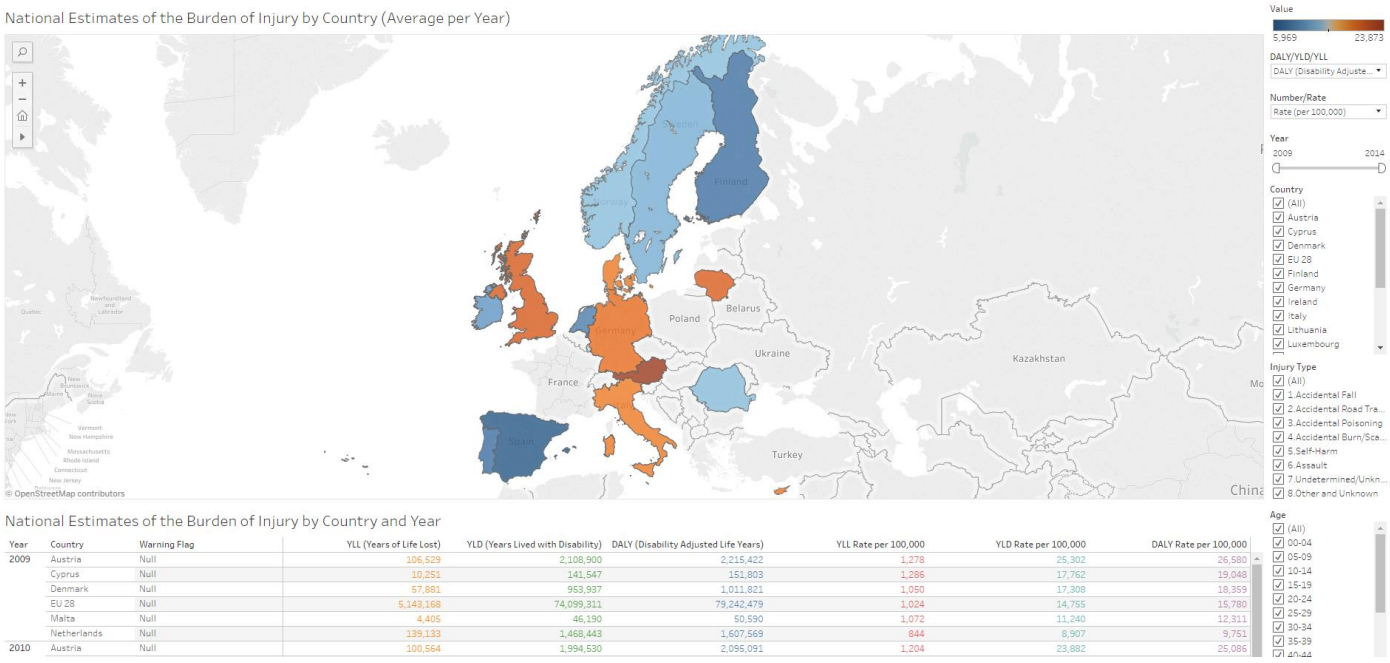
- Injuries are a leading cause of morbidity and mortality in Europe, and not only place a huge burden on individuals and health care services but on society as a whole.
- The European Injury Data Base (IDB) project was commissioned as part of BRIDGE-Health to generate comparable burden of injury estimates across Europe and to support injury prevention research and policy development.
- Traditionally, the impact of injuries have been measured using singular outcomes such as emergency department attendances, hospital admissions and deaths. In recent years, however, the combination of these outcomes in composite measures such as Disability Adjusted Life Years (DALYs) have become increasingly important at providing comparable estimates of the impact of injury.
- DALY estimates were generated for IDB countries and years where both fatal and non-fatal injury data were available. Non-fatal injury data were acquired from Emergency Department data recorded in the IDB Minimum Data Set (MDS), fatal data were obtained from the European Detailed Mortality Database (EDMD) and disability weights from the injury-VIBES study were used to calculate the DALY estimates.
- The general approach to calculating DALYs followed that of the Global Burden of Disease (GBD) study but utilised new and different disability weights created by the analysis of data from the largest injury outcome cohort studies from the Injury-VIBES cohort and detailed injury incidence data from nineteen countries.
- DALY estimates were between 2-10 times larger than estimates generated by previous studies such as the Global Burden of Disease (GBD) study, due to much higher incidence figures and larger disability weights.
- Males, 10-14 year old children and accidental falls have the highest DALY estimates and contribute considerably to the burden of injuries across Europe
- The DALY estimates generated by the IDB project demonstrate that the burden of injury in Europe is considerably higher than previously estimated.
- There is an ongoing need to support national and EU data administrators and policy makers in the calculation of burden of injury metrics and their use in the evaluation of national and EU wide policies and strategies to reduce the burden.

Introduction

Injuries are a leading cause of disability in Europe, and place a huge burden on individuals and society as a whole. Traditionally, the health impact of injuries were measured using singular outcomes e.g. fatalities, hospital admissions or injury related emergency department attendances. However in recent years, composite measures which combine mortality and morbidity outcomes, have become increasingly important at providing comparable population level summaries of disease and injury burden.

A key composite measure, first introduced in 1993 in the World Development Report[1], and widely used to measure the population burden of injury and disease, is Disability Adjusted Life Years (DALYs). DALYs combine healthy years of life lost through premature mortality with healthy years of life lost through disability for any given injury or disease (e.g. the healthy years of life which would have been expected if the injury or disease hadn't occurred). Essentially, one DALY equates to one "healthy" year of life lost, and the sum of these DALYs across a population, can be used to measure the gap between the current and ideal health situation e.g. where the entire population lives to an advanced age free from disease/injury.

The calculation of injury related DALYs requires several data elements including: non-hospitalised injury cases, hospitalised injury cases, injury fatalities, disability weights (indication of the severity of an injury), and remaining years of life. Previous DALY estimates (e.g. Meerding et al's study[2], Dutch Panel study[3], the Global Burden of Disease study[4]) have been based on varying data sources and methods. The following report provides injury related DALY estimates for several European countries, utilising non-fatal injury incidence data from the European Injury Data Base[5] (IDB), fatal injury data from the World Health Organisation (WHO) European Detailed Mortality Database[6] (EDMD), disability weights calculated in the Injury-VIBES study (The Validating and Improving injury Burden Estimates Study) [7], and remaining years of life adopted in the Global Burden of Disease burden calculator [8]. The DALY estimates presented in this report are also accessible through the online IDB-Burden of Injury (IDB-BOI) tool (idb-boi.eu) and are the first estimates in Europe to be based on large scale, comprehensive and comparable injury incidence and disability data.



Year	Country	Warning Flag	YLL (Years of Life Lost)	YLD (Years Lived with Disability)	DALY (Disability Adjusted Life Years)	YLL Rate per 100,000	YLD Rate per 100,000	DALY Rate per 100,000
2009	Austria	Null	106,529	2,108,900	2,215,422	1,278	25,302	26,580
	Cyprus	Null	10,251	141,547	151,803	1,286	17,762	19,048
	Denmark	Null	57,881	953,937	1,011,821	1,050	17,308	18,359
	EU 28	Null	5,143,168	74,099,311	79,242,479	1,024	14,755	15,780
	Malta	Null	4,405	46,190	50,590	1,072	11,240	12,311
	Netherlands	Null	139,133	1,468,443	1,607,569	844	8,907	9,751
2010	Austria	Null	100,564	1,994,530	2,095,091	1,204	23,882	25,086

Figure 1. Image of the IDB-BOI tool, source: idb-boi.eu

How were the IDB DALY estimates calculated?

DALYs are calculated as the sum of Years Life Lost (YLL) due to premature mortality in the population and Years Lost due to Disability (YLD).

DALY = YLL + YLD

Key Data Elements

Five key data elements are required to calculate YLL, YLDs and DALY estimates. Table 1 details these elements and the data sources utilised, in addition to whether each element was utilised in the calculation of YLDs, YLLs or both. Age weighting and time discounting were excluded from the IDB DALY calculations.

Data Element	YLL/YLDs or both?	Data Source
Injury related Emergency Department (ED) attendances not admitted to hospital	YLD	IDB Minimum Data Set (MDS). All injury ED attendances not admitted to hospital were identified using the "Treatment and Follow-up" field in the MDS[9]
Injury related hospital admissions	YLD	IDB Minimum Data Set (MDS). All injury ED attendances admitted to hospital were identified using the "Treatment and Follow-up" field in the MDS[9]
Injury Fatalities	YLL	WHO European Detailed Mortality Database [6] Injury deaths included all underlying causes of death in the ICD-10 codes V-Y, excluding Y40-Y84, Y88.
Disability Weights (DWs)	YLD	Disability weights provide an indication of the severity of an injury and are required to calculate the YLD portion of a DALY. They range on a scale from 0 (which equates to perfect health) to 1 (which equates to death). DWs can be derived through several methods, and several classifications systems have been generated. DWs produced in the Injury VIBES Project were utilised in the IDB DALY estimates[7]. Further information in the main report.
Remaining Years of Life	YLD and YLL	Global Burden of Disease Burden Calculator [8]

Table 1: *Data elements and data sources utilised in the IDB DALY estimates*

Data Coverage

IDB DALY estimates were generated for countries and years where both non-fatal injury data (IDB-MDS) and fatal injury data (EDMD[6]) were available. Table 2 lists the availability of data in the IDB-MDS, WHO EDMD, and consequently data included in the IDB estimates.

Country	IDB-MDS availability (years)	EDMD availability (years)	IDB DALY estimates (years included in IDB estimates)
Austria	2009-2014	2009-2014	2009 - 2014
Cyprus	2009 - 2010	2009 - 2013	2009-2010
Denmark	2009 - 2015	2009 - 2012	2009 - 2012
Estonia	2015	2009 - 2014	
Finland	2010 - 2014	2009 - 2014	2010 - 2014
Germany	2011 - 2012	2009 - 2014	2011-2012
Iceland	2010 - 2013	2009	
Italy	2011	2009 - 2012	2011
Lithuania	2013 - 2015	2009 - 2014	2013 - 2014
Luxembourg	2013 - 2015	2009 - 2014	2013 - 2014
Malta	2009 - 2013	2009 - 2014	2009 - 2013
Netherlands	2009 - 2014	2009 - 2013	2009 - 2013
Norway	2012 - 2014	2009 - 2014	2012 - 2014
Portugal	2011 - 2015	2009 - 2014	2011 - 2014
Romania	2013	2009 - 2014	2013
Slovenia	2011- 2015	2009 - 2010	
Spain	2013	2009 - 2014	2013
Sweden	2009 - 2015	2009 - 2014	2009 - 2014
United Kingdom	2010 - 2015	2009 - 2013	2010 - 2013

Table 2: *IDB-MDS and EDMD data availability, and subsequent data included in the IDB DALY estimates*

Injury-VIBES Disability Weights

Disability weights (DWs) provide an indication of the severity of an injury and are required to calculate the YLD portion of a DALY. They range on a scale from 0 (which equates to perfect health) to 1 (which equates to death).

DWs can be derived through several methods, and several classifications systems have been developed (e.g. Meerding et al [2], Beeck et al's Dutch Panel study[3], and the Global Burden of Disease study[4]).

DWs generated in the Injury-VIBES cohort study[7] were used in our IDB DALY estimates. The Injury-VIBES study used data from six of the largest and most comprehensive cohort studies across five countries, to evaluate methods for determining the disability associated with injury, address issues specific to injury and identify improved methods for burden estimates. The study produced DWs for both short-term disability (disability up to 12 months) and long term disability (disability 12 months post injury), hospitalised and non-hospitalised injuries. Where possible, the IDB-MDS 'Nature of injury' and 'Body part' fields were mapped to Injury-VIBES disability weights. The disability weights utilised in our calculations are detailed in Appendix 1. In several instances, where it was not possible to generate DWs for specific injuries, DWs for similar injuries were utilised. Further, as no DWs were generated for poisonings in the Injury-VIBES study, poisonings DWs generated in the 2013 Global Burden of Disease study were utilised [10].

Remaining Years of Life

To estimate YLL and long term YLDs, an estimation of expected remaining years of life is required to estimate health loss due to premature death or disability at a particular age. In our IDB calculations, default values utilised in the Global Burden of Disease Calculator[8] have been adopted (please see Table 3).

AGE	REMAINING YEARS OF LIFE
0-4	85.01
5-9	78.76
10-14	73.79
15-19	68.83
20-24	63.88
25-29	58.94
30-34	54.00
35-39	49.09
40-44	44.23
45-49	39.43
50-54	34.72
55-59	30.10
60-64	25.55
65-69	21.12
70-74	16.87
75-79	12.89
80-84	9.32
85+	5.05

Table 3: *Remaining years of life utilised in IDB estimates*

IDB DALY calculations

The following acronyms will be utilised in the step by step IDB DALY calculations below:

Non-hospitalised short term disability (**NHST**)
Non-hospitalised long term disability (**NHLT**)
Hospitalised short term disability (**HST**)
Hospitalised long term disability (**HLT**)
Non-hospitalised years lived with disability (**NHYLD**)
Hospitalised years lived with disability (**HYLD**)
Years lived with disability (**YLD**)
Years of life lost (**YLL**)
Disability Adjusted Life Year (**DALY**)

Step 1: The first step involved mapping NHST DWs to non-admitted injury cases in the IDB-MDS using the VIBES DWs.

Step 2: The second step involved mapping NHLT DWs to non-admitted cases in the MDS. These DWs were then multiplied by 'remaining years of life lost' (Table 3).

Step 3: NHYLD were calculated by summing NHST and NHLT together e.g.

NHST + (NHLT x remaining years) = NHYLD

Step 4: HYLD were calculated in the same way as the above but for injury cases admitted to hospital e.g.

HST + (HLT x remaining years) = HYLD

Step 5: YLDs were calculated by summing NHYLD and HYLD e.g.

NHYLD + HYLD = YLD

Step 6: YLLs were calculated by assigning 'remaining years of life' lost to each fatal case.

Step 7: DALYs were calculated by summing YLL and YLD

DALY = YLL + YLD

Step 8: DALYs, YLL and YLDs were then assigned to one of 8 injury groups (please see bulleted points below). At present, it has only been possible to generate DALY estimates for one of the European Core Health Indicators 30b (accidental RTAs). The absence of location data in the WHO EDMD prevents the identification of injuries in the home and during leisure (ECHI 29b) and in the workplace (31), and thus the calculation of YLLs in these locations. However, there may be potential to generate estimates for ECHI 29b and 31 in the future for member countries who can provide location of death.

- Road Traffic Accidents (ECHI 30b)
- Accidental Falls
- Accidental Poisonings
- Accidental Burns and Scalds
- Self-Harm
- Assault
- Undetermined/Unknown Intent
- Other and Unknown

Table 4 lists the IDB-MDS codes and ICD-10 codes assigned to the 8 injury groupings.

Injury Cause	MDS codes	ICD-10 codes
Road Traffic Accidents (ECHI30b)	Intent = 1 and Mechanism = 1	V01-V99
Accidental Falls	Intent = 1 and Mechanism = 2	W00-W19
Accidental Poisoning	Intent = 1 and Mechanism = 4	X40-X49
Accidental Burns and Scalds	Intent = 1 and Mechanism = 5	X00-X19
Self-harm	Intent = 2	X60-X84
Assault	Intent = 3	X85-Y09
Undetermined/Unknown Intent	Intent = 9	Y10-Y34
Other and Unknown	Remaining MDS cases	Remaining injury deaths

Table 4: *IDB-MDS codes and ICD-10 codes assigned to the 8 injury groupings*

Step 9: A master table of DALYs, YLDs, and YLLs grouped by country, year, gender, age and injury type was then created.

Step 10: Whereas the IDB YLLs were based on national data in the WHO-EDMD, most IDB-MDS submissions were based on a sample of the national population rather than the whole population. Thus to generate national YLD estimates (based on IDB-MDS data) reference populations provided by member states were used to obtain national extrapolation factors by country, year, age and gender.

Step 11: YLDs were then multiplied by these extrapolation factors to obtain national YLD estimates.

Step 12: New national level YLD and DALY estimates were generated and a final master results table was populated. The master results table can be downloaded from the IDB-BOI website (idb-boi.eu). The master table also contains additional information, including % of the national population included in the IDB sample, data warning flags and national population figures to enable the calculation of DALY rates.

IDB DALY estimates

DALY estimates for all injuries by country

The EU28 average DALY rate is 16,390 per 100,000 population (figure 2). Austria, Cyprus, Denmark, Germany, Italy, Lithuania and the United Kingdom all have rates higher than the EU28 average. Austria have the highest DALY rate at 23,873 per 100,000 population; Spain have the lowest DALY rate at 5,969 per 100,000 population.

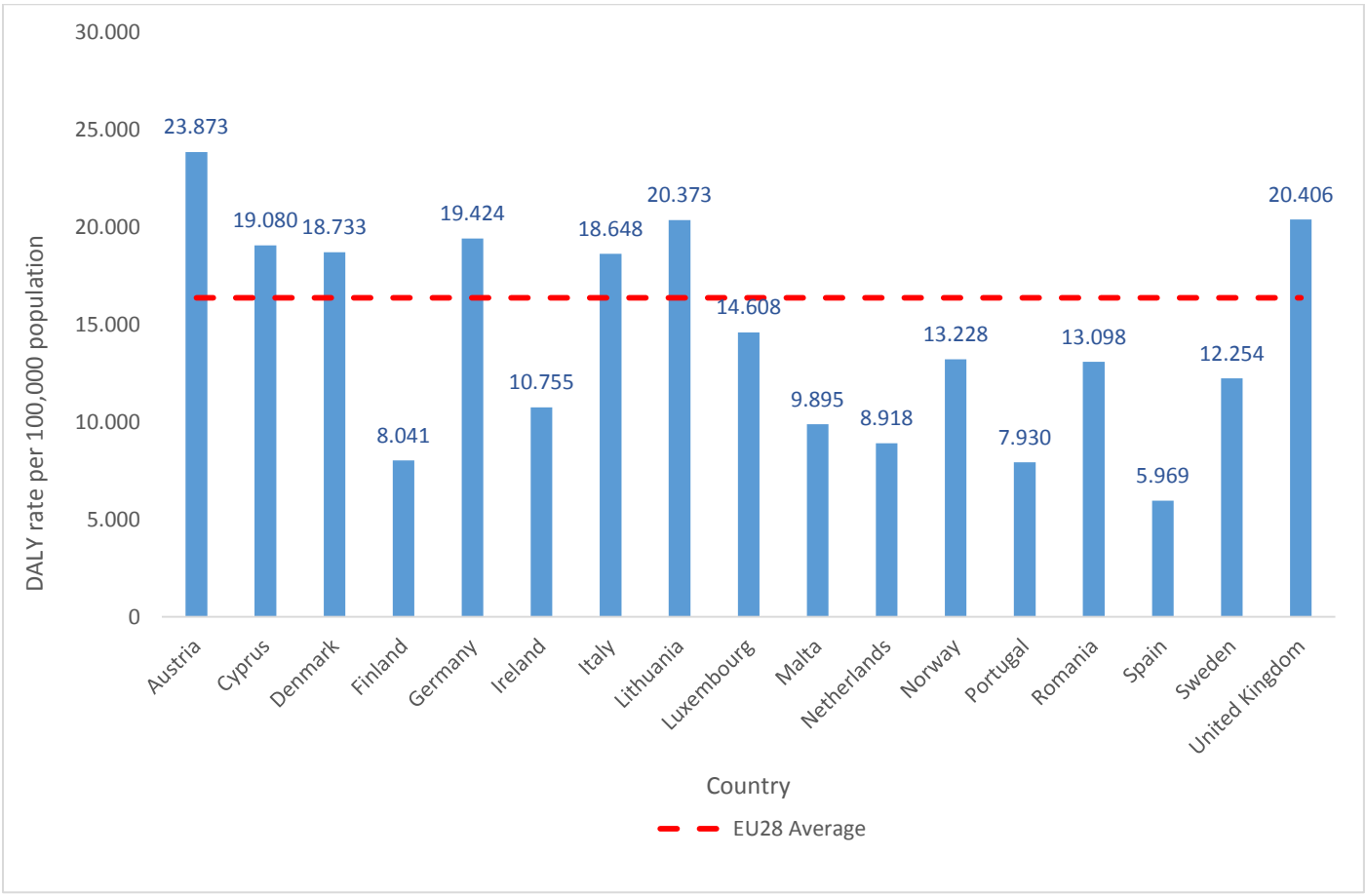


Figure 2. DALY rate per 100,000 population for all cause injuries by country. The red dashed lines represents the EU28 average.

DALY estimates for all injuries by country and gender

Males have the highest DALY rates across Europe with an EU28 average rate of 19,158 per 100,000 compared with an average rate of 13,751 per 100,000 for females (figure 3). Portugal is the only country with a higher rate for females. In all other countries, males have a substantial increased rate compared with females; in particular, there is a large difference between the rate for males and females in Lithuania and Austria.

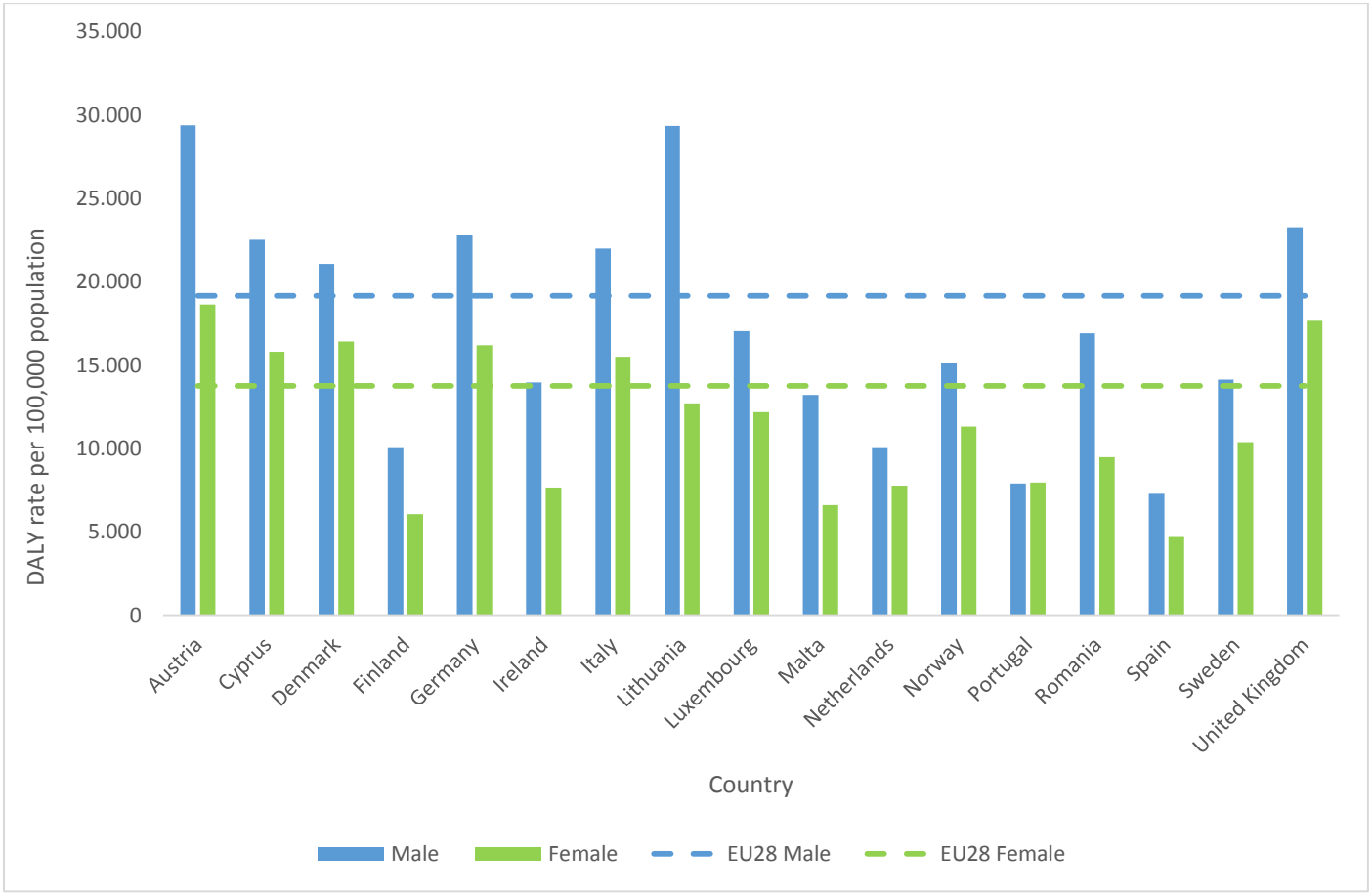


Figure 3. DALY rate per 100,000 population for all cause injuries by country and gender. The dashed lines represents the EU28 average for males and females.

DALY estimates for all injuries by age

Children aged between 10 and 14 have the highest DALY rate of 36,008 per 100,000 population (figure 4). Thereafter, rates decrease though the life-course until age 65-69 (rate of 6,792 per 100,000 population), with a subsequent increase in rates from age 70 onwards.

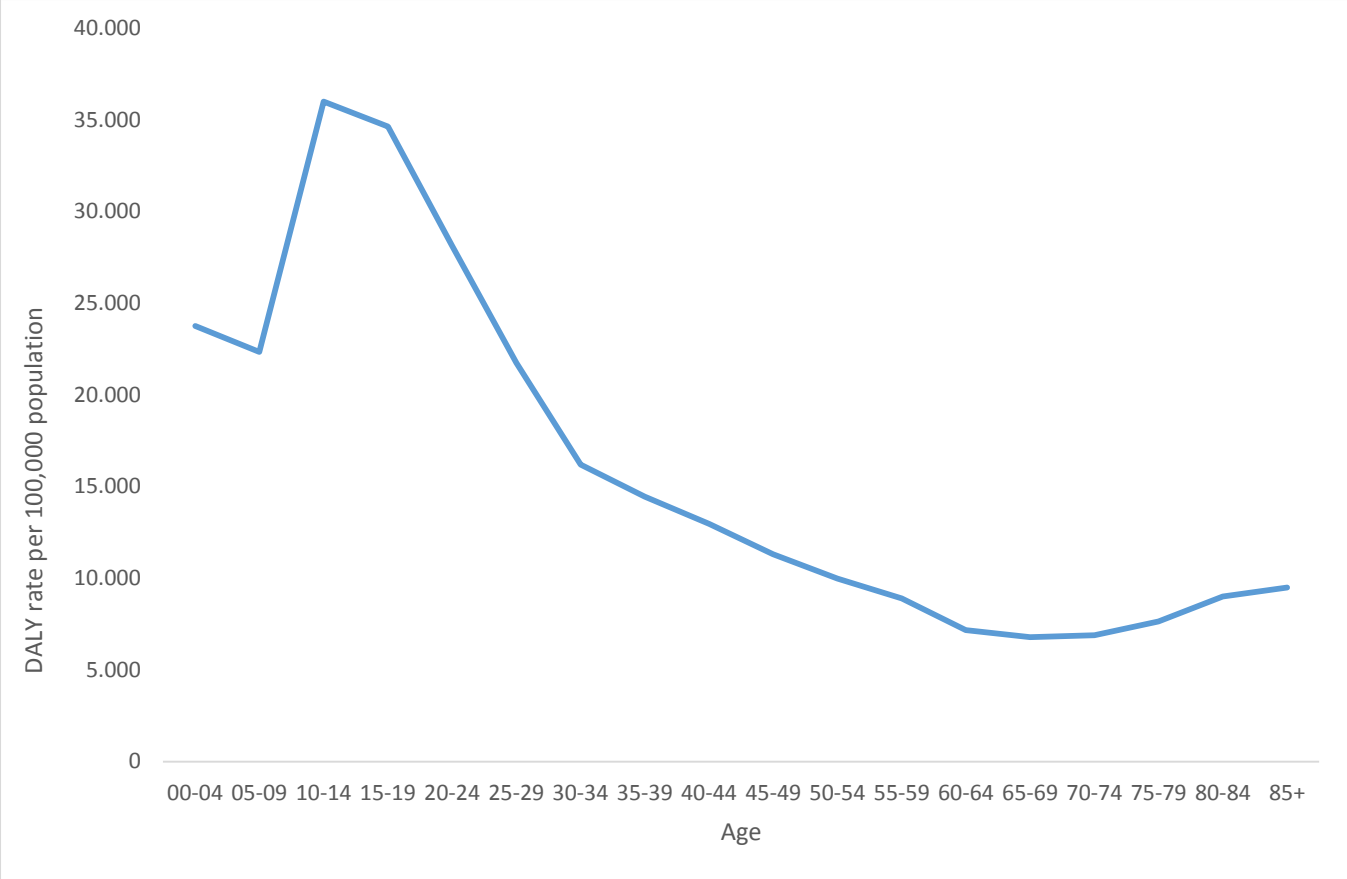


Figure 4. Average EU28 DALY rate per 100,000 population for all cause injuries by age group.

The age profile of road traffic injuries show that young adults aged between 15 and 19 have the highest DALY rate of 6,234 per 100,000 population across the EU (figure 5).

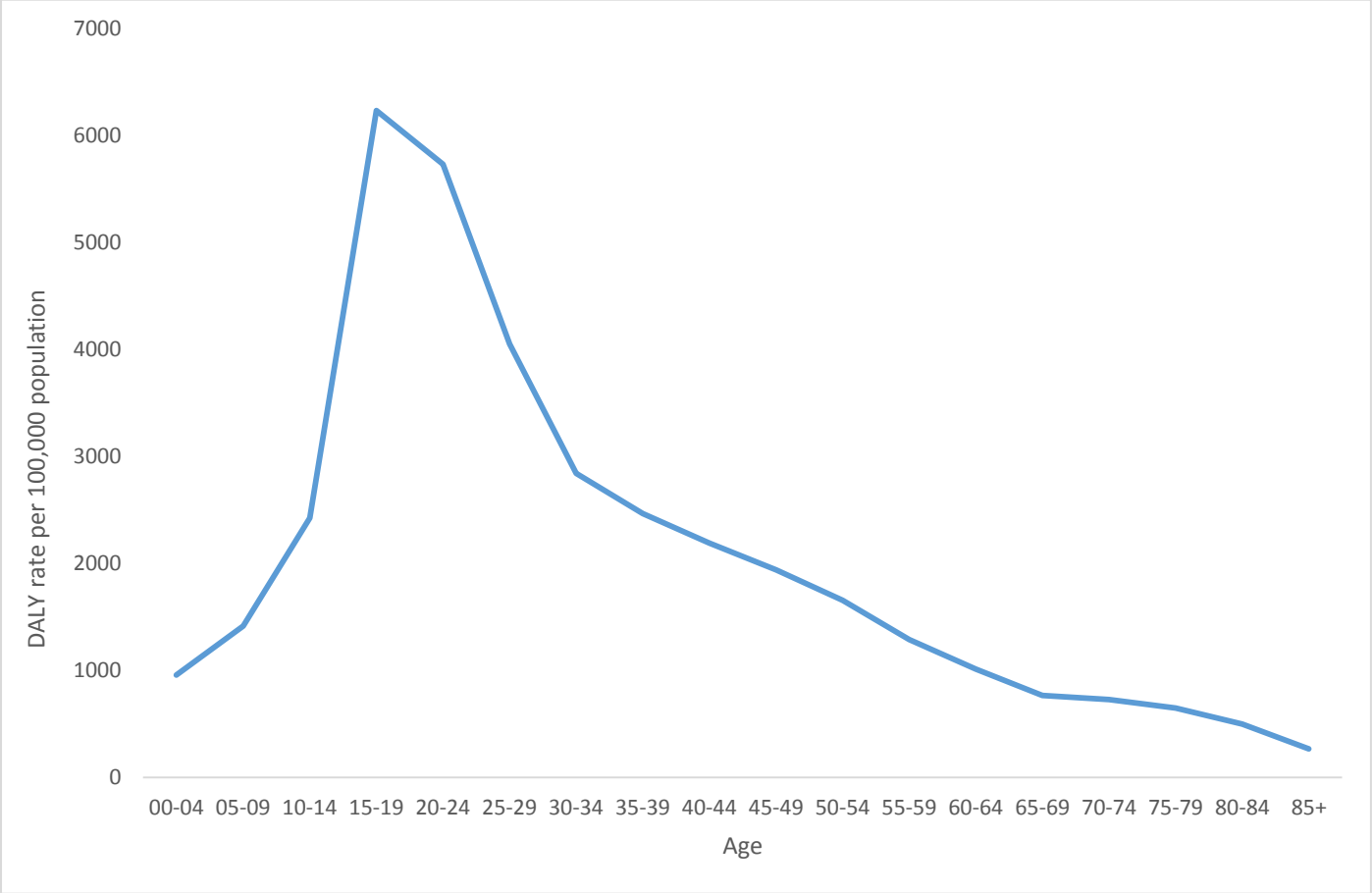


Figure 5. Average EU28 DALY rate per 100,000 population for road traffic injuries (ECHI 30b) by age group.

High DALY rates for self-harm are evident from the age of 15 to 54 (figure 6). Adults aged between 20 and 24 have the highest DALY rate of 724.7 per 100,000 population.

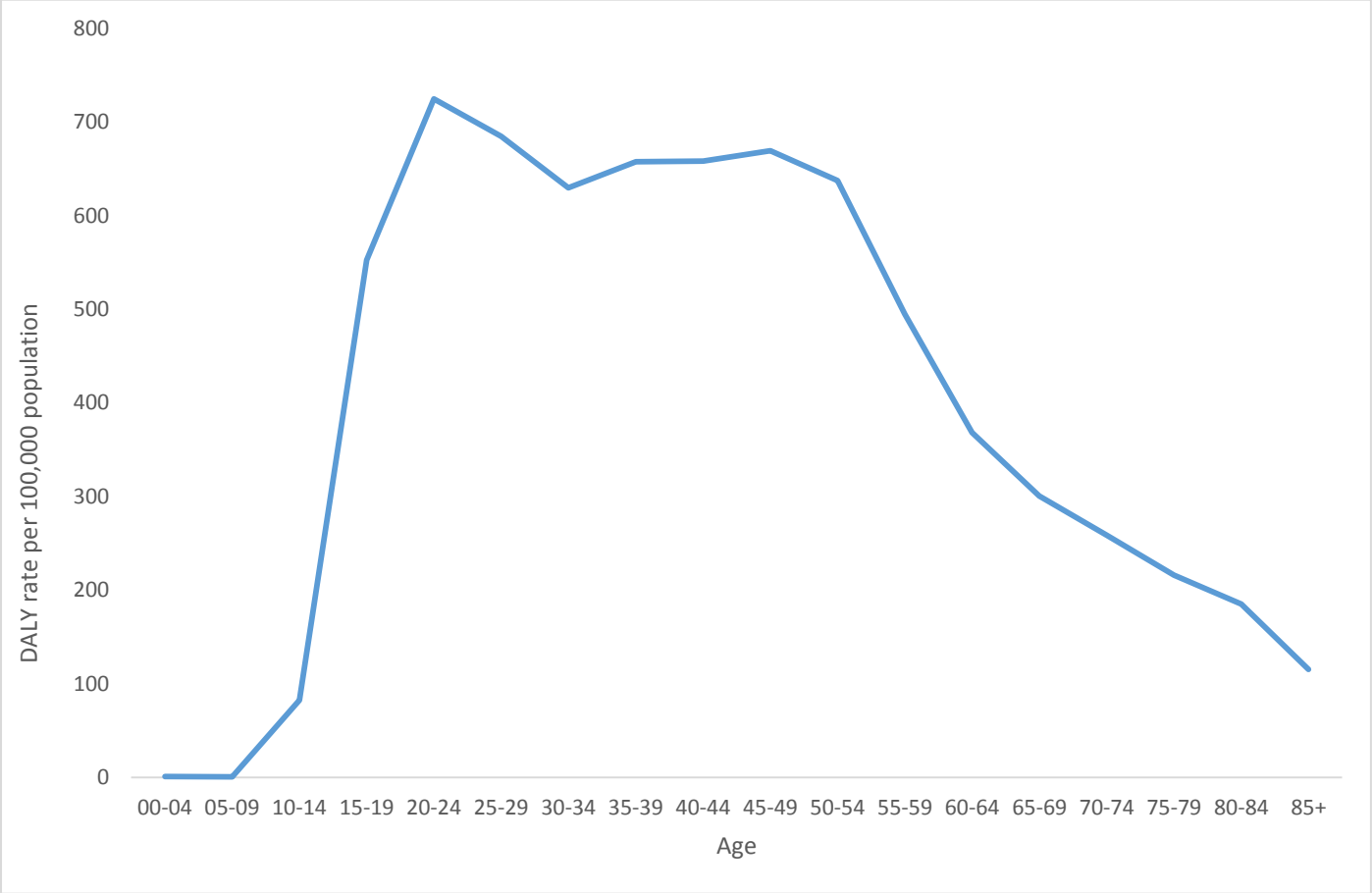


Figure 6. Average EU28 DALY rate per 100,000 population for self-harm injuries by age group.

DALY estimates by type of injury

Of the known injury types, accidental falls contribute the most to the burden of injuries with a DALY rate of 5,965 per 100,000, followed by road traffic accidents, self-harm, assault, accidental poisoning and accidental burns and scalds (figure 7).

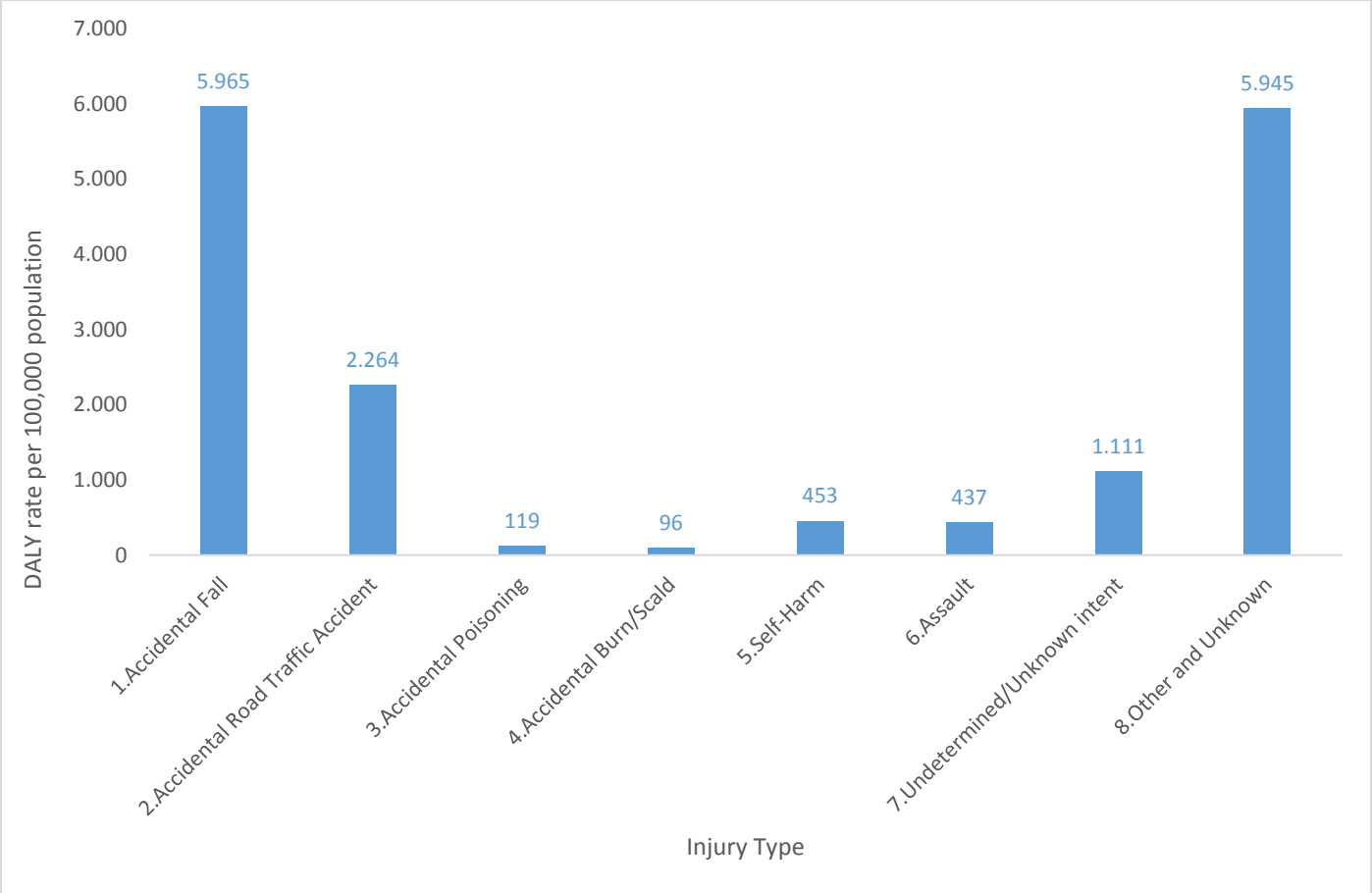


Figure 7. Average EU28 DALY rate per 100,000 population by type of injury.

Strengths and Limitations of the IDB DALY estimates

The IDB is a large scale comparable European injury surveillance system, with the ability to investigate DALY rates across Europe. Comprehensive guidance is available in the form of manuals and data dictionaries to ensure consistency and standardisation across the member states. IDB data suppliers are trained in the IDB methodology and are qualified and experienced in handling statistical data [11]. Data suppliers must confirm that delivered datasets meet basic quality requirements. Rigorous data checks by the network coordinator are integral to ensure high quality data is submitted to the database.

Of the 36 eligible countries, the IDB currently includes data from 26 countries, of which, 23 are EU member states. IDB DALY estimates were generated for countries and years where both non-fatal injury data (IDB-MDS) and fatal injury data (EDMD[6]) were available; 16 countries satisfied this constraint. The IDB-MDS is based on a sample of hospitals from the member states therefore outputs could suffer from sampling error and bias [11]. Mandatory collection of IDB-MDS data initiatives have been introduced in some countries, however implementation has not yet begun. Hospitals provide data on a voluntary basis therefore the sample may be biased towards hospitals interested in research. Due to variation in hospital size, geographical distributions and the quality of the data submitted, there are variations in the accuracy of the statistics reported. Accuracy of estimates could also be affected by non-sampling error such as under-reporting of injury (refusal rate to provide injury information is low), over reporting due to double counting and coding errors.

The VIBES disability weights were derived using case-reported outcomes from high-income country cohort studies [7]. The weights from this study were generally considerably higher than the Global Burden of Disease 2013 weights which largely used panel based studies relying on responses from the public or a panel of experts on their judgements of the impact of living with conditions described in very short vignettes. The VIBES study also identified certain injury groups resulting in long term disability that did not have a corresponding long term weight in the GBD 2013 study. The VIBES disability weights were especially higher in injuries such as fractures and dislocations. It was also found that the general public overestimate disability burden in more severe injuries such as spinal cord lesions. The VIBES disability weights were generated at individual ICD10 code levels; this granularity ensures greater accuracy since variation exists in the burden of injuries of the same body part. Another strength of the VIBES study was the large sample size which used data from multiple studies to estimate the weights for both admitted and non-admitted cases.

The VIBES study did have some limitations. Coding of injury diagnoses may not always be accurate, particularly in emergency departments where injuries may not be recorded by a trained coder [7]. For some injury categories, the disability weights were derived using a small number of cases. There were differing following-up rates and varying amounts of EQ-5D data available within the datasets used. In datasets that did not collect EQ-5D scores, these were estimated using responses from the Short Form Health Survey. Only the primary diagnosis of each case was mapped to injury groups which would not take account of the effect of multiple injuries on disability at 12 month post injury. The method did not take account of recovery within 3 months. The study datasets primarily consisted of falls and road trauma cases; penetrating injuries were underrepresented. The study was based on data from adult cases only and does not take account of comorbidities. The weights were generated using data from high income countries therefore it is not clear if they can be applied in low and middle income countries.

The European Detailed Mortality Database is a large, widely used and publicly available international database [12]. Data are sourced from national vital registration systems from countries within the WHO European Region. The database contains 5 year age groups and 3 digit ICD codes which can be used to find mortality rates by age and underlying cause of death groups. Most of the data is complete and comparable, however, some countries do not use standardised coding practises and the coverage of death registration is incomplete.

How do the IDB DALY estimates compare to other DALY estimates?

The IDB-BOI estimates are between 2-10 times greater than national estimates generated in the Global Burden of Disease study. The VIBES study derived long term disability weights for some injury categories where no weights were provided by the GBD study; this would account for some of the increase. The VIBES DWs are much higher for common injuries like fractures and dislocations. The GBD injury data sources are generally more limited than the IDB; the GBD mainly derives morbidity data from inpatient data and survey data from a relatively small number of countries; in some countries, such morbidity data have not yet been acquired and GBD imputes national values from modelling regional averages [13].

The GBD study is a wonderful initiative that seeks to constantly improve the derivation of metrics on population burden of diseases and injuries. Injury accounts for around 10% of global and European DALYs using the standard GBD approach. Using enhanced data on injury incidence from IDB and the most up to date disability weights derived from the largest longitudinal studies of injured individual through the Injury-VIBES consortium it is clear that injury is an even greater problem than previously estimated, and hence deserves enhanced attention from national and European health officials.

IDB-Burden of Injury (IDB-BOI) Online Interactive Tool

As part of the BRIDGE-Health project, the National Centre for Population Health and Wellbeing Research and Farr Institute of Health Informatics Research at Swansea University has developed the European Injury Database Burden of Injury Tool (IDB-BOI tool). The IDB-BOI tool can be used to visually compare YLLs, YLDs, and DALYs by European country, year, gender, age-group and injury types. Results are presented in several formats including maps, bar/line charts and heat maps. The master results spreadsheet containing YLLs, YLDs, and DALYs by country, year, age, gender and injury type can also be downloaded through the website (idb-boi.eu).

The tool will support health policy decision making in Europe by providing comparative data to support national and EU policy development, including identifying domains that contribute disproportionately to the burden of injury. For example, males, children aged 10-14 and accidental falls contribute considerably to the burden of injuries across Europe. The tool should be used to form strategies and to develop policies to reduce the impact of the burden of injuries.

Funding for the development and maintenance of this tool was provided by the BRIDGE-Health initiative, which ends in October 2017. It is hoped that further funding will be obtained to continue this programme of work and expand the number of countries involved.

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Appendix

Appendix 1: DWs used in the IDB DALY estimates

Part of body injured 1 (MDS code and text)		Nature of Injury 1 (MDS code and text)		Hospitalised short-term DW	Hospitalised long-term DW	Non-hospitalised short-term DW	Non-hospitalised long-term DW
1	Head/Skull	1	Contusion/Bruise	0	0	0.071	0.05
2	Face (excl eye)	1	Contusion/Bruise	0	0	0.063	0.039
3	Eye	1	Contusion/Bruise	0	0	0.063	0.039
4	Neck	1	Contusion/Bruise	0	0	0.063	0.039
5	Thoracic/lumbar spine	1	Contusion/Bruise	0	0	0.063	0.039
6	Chest Wall	1	Contusion/Bruise	0	0	0.063	0.039
7	Abdominal Wall	1	Contusion/Bruise	0	0	0.063	0.039
8	Internal Organs	1	Contusion/Bruise	0	0	0.063	0.039
9	Pelvis	1	Contusion/Bruise	0	0	0.063	0.039
10	Upper arm/shoulder	1	Contusion/Bruise	0	0	0.063	0.039
11	Elbow	1	Contusion/Bruise	0	0	0.063	0.039
12	Lower Arm	1	Contusion/Bruise	0	0	0.063	0.039
13	Wrist	1	Contusion/Bruise	0	0	0.063	0.039
14	Hand	1	Contusion/Bruise	0	0	0.063	0.039
15	Fingers	1	Contusion/Bruise	0	0	0.063	0.039
16	Hip	1	Contusion/Bruise	0	0	0.063	0.039
17	Upper leg	1	Contusion/Bruise	0	0	0.063	0.039
18	Knee	1	Contusion/Bruise	0	0	0.063	0.039
19	Lower leg	1	Contusion/Bruise	0	0	0.063	0.039
20	Ankle	1	Contusion/Bruise	0	0	0.063	0.039
21	Foot	1	Contusion/Bruise	0	0	0.063	0.039
22	Toes	1	Contusion/Bruise	0	0	0.063	0.039
23	Multiple Body Parts	1	Contusion/Bruise	0	0	0.063	0.039
98	Other	1	Contusion/Bruise	0	0	0.063	0.039
99	Unknown	1	Contusion/Bruise	0	0	0.063	0.039
1	Head/Skull	2	Open Wound and Abrasion	0.229	0.205	0.017	0
2	Face (excl eye)	2	Open Wound and Abrasion	0.155	0.145	0.014	0
3	Eye	2	Open Wound and Abrasion	0.155	0.145	0.014	0
4	Neck	2	Open Wound and Abrasion	0.22	0.201	0.035	0.01
5	Thoracic/lumbar spine	2	Open Wound and Abrasion	0.22	0.201	0.035	0.01
6	Chest Wall	2	Open Wound and Abrasion	0.086	0.066	0.014	0

7	Abdominal Wall	2	Open Wound and Abrasion	0.086	0.066	0.014	0
8	Internal Organs	2	Open Wound and Abrasion	0	0	0	0
9	Pelvis	2	Open Wound and Abrasion	0.086	0.066	0.014	0
10	Upper arm/shoulder	2	Open Wound and Abrasion	0.086	0.066	0.014	0
11	Elbow	2	Open Wound and Abrasion	0.086	0.066	0.014	0
12	Lower Arm	2	Open Wound and Abrasion	0.086	0.066	0.014	0
13	Wrist	2	Open Wound and Abrasion	0.034	0.021	0.015	0.01
14	Hand	2	Open Wound and Abrasion	0.034	0.021	0.015	0.01
15	Fingers	2	Open Wound and Abrasion	0.086	0.066	0.014	0
16	Hip	2	Open Wound and Abrasion	0.086	0.066	0.014	0
17	Upper leg	2	Open Wound and Abrasion	0.086	0.066	0.014	0
18	Knee	2	Open Wound and Abrasion	0.112	0.112	0.01	0
19	Lower leg	2	Open Wound and Abrasion	0.112	0.112	0.01	0
20	Ankle	2	Open Wound and Abrasion	0.086	0.066	0.066	0.039
21	Foot	2	Open Wound and Abrasion	0.086	0.066	0.014	0
22	Toes	2	Open Wound and Abrasion	0.086	0.066	0.014	0
23	Multiple Body Parts	2	Open Wound and Abrasion	0.086	0.066	0.014	0
98	Other	2	Open Wound and Abrasion	0.086	0.066	0.014	0
99	Unknown	2	Open Wound and Abrasion	0.086	0.066	0.014	0
1	Head/Skull	3	Fracture	0.154	0.138	0	0
2	Face (excl eye)	3	Fracture	0.155	0.145	0	0
3	Eye	3	Fracture	0	0	0.179	0.165
4	Neck	3	Fracture	0.154	0.138	0.115	0.103
5	Thoracic/lumbar spine	3	Fracture	0.2	0.18	0.143	0.122
6	Chest Wall	3	Fracture	0.143	0.081	0.007	0
7	Abdominal Wall	3	Fracture	0	0	0	0
8	Internal Organs	3	Fracture	0	0	0	0
9	Pelvis	3	Fracture	0.204	0.192	0.09	0.058

10	Upper arm/shoulder	3	Fracture	0.151	0.14	0.03	0
11	Elbow	3	Fracture	0.123	0.105	0.007	0
12	Lower Arm	3	Fracture	0.103	0.087	0.048	0.021
13	Wrist	3	Fracture	0.069	0.061	0.044	0.012
14	Hand	3	Fracture	0.058	0.046	0.041	0.031
15	Fingers	3	Fracture	0.016	0.001	0	0
16	Hip	3	Fracture	0.278	0.27	0.09	0.058
17	Upper leg	3	Fracture	0.279	0.269	0.09	0.058
18	Knee	3	Fracture	0.177	0.156	0.09	0.058
19	Lower leg	3	Fracture	0.214	0.191	0.039	0
20	Ankle	3	Fracture	0.149	0.126	0.076	0.033
21	Foot	3	Fracture	0.191	0.18	0.043	0.018
22	Toes	3	Fracture	0.124	0.105	0	0
23	Multiple Body Parts	3	Fracture	0.143	0.081	0.007	0
98	Other	3	Fracture	0.143	0.081	0.007	0
99	Unknown	3	Fracture	0.143	0.081	0.007	0
1	Head/Skull	4	Dislocation and Subluxation	0.155	0.145	0	0
2	Face (excl eye)	4	Dislocation and Subluxation	0.155	0.145	0	0
3	Eye	4	Dislocation and Subluxation	0	0	0.179	0.165
4	Neck	4	Dislocation and Subluxation	0.215	0.199	0.122	0.108
5	Thoracic/lumbar spine	4	Dislocation and Subluxation	0.215	0.199	0.122	0.108
6	Chest Wall	4	Dislocation and Subluxation	0.049	0.036	0.042	0.007
7	Abdominal Wall	4	Dislocation and Subluxation	0	0	0	0
8	Internal Organs	4	Dislocation and Subluxation	0	0	0	0
9	Pelvis	4	Dislocation and Subluxation	0.129	0.097	0.09	0.058
10	Upper arm/shoulder	4	Dislocation and Subluxation	0.113	0.091	0.095	0.081
11	Elbow	4	Dislocation and Subluxation	0.054	0.044	0.042	0.007
12	Lower Arm	4	Dislocation and Subluxation	0.054	0.044	0.042	0.007
13	Wrist	4	Dislocation and Subluxation	0.049	0.036	0.042	0.007
14	Hand	4	Dislocation and Subluxation	0.049	0.036	0.042	0.007
15	Fingers	4	Dislocation and Subluxation	0.049	0.036	0.042	0.007

16	Hip	4	Dislocation and Subluxation	0.129	0.097	0.129	0.097
17	Upper leg	4	Dislocation and Subluxation	0.129	0.097	0.129	0.097
18	Knee	4	Dislocation and Subluxation	0.079	0.057	0.09	0.058
19	Lower leg	4	Dislocation and Subluxation	0.079	0.057	0.09	0.058
20	Ankle	4	Dislocation and Subluxation	0.181	1.164	0.071	0.049
21	Foot	4	Dislocation and Subluxation	0.181	1.164	0.071	0.049
22	Toes	4	Dislocation and Subluxation	0.049	0.036	0.042	0.007
23	Multiple Body Parts	4	Dislocation and Subluxation	0.049	0.036	0.027	0.023
98	Other	4	Dislocation and Subluxation	0.049	0.036	0.027	0.023
99	Unknown	4	Dislocation and Subluxation	0.049	0.036	0.027	0.023
1	Head/Skull	5	Sprain and Strain	0?	0?	0?	0?
2	Face (excl eye)	5	Sprain and Strain	0.049	0.036	0.042	0.007
3	Eye	5	Sprain and Strain	0	0	0.179	0.165
4	Neck	5	Sprain and Strain	0.215	0.199	0.122	0.108
5	Thoracic/lumbar spine	5	Sprain and Strain	0.215	0.199	0.122	0.108
6	Chest Wall	5	Sprain and Strain	0.049	0.036	0.027	0.023
7	Abdominal Wall	5	Sprain and Strain	0.049	0.036	0.027	0.023
8	Internal Organs	5	Sprain and Strain	0	0	0	0
9	Pelvis	5	Sprain and Strain	0.129	0.097	0.09	0.058
10	Upper arm/shoulder	5	Sprain and Strain	0.113	0.091	0.095	0.081
11	Elbow	5	Sprain and Strain	0.054	0.044	0.042	0.007
12	Lower Arm	5	Sprain and Strain	0.054	0.044	0.042	0.007
13	Wrist	5	Sprain and Strain	0.049	0.036	0.042	0.007
14	Hand	5	Sprain and Strain	0.049	0.036	0.042	0.007
15	Fingers	5	Sprain and Strain	0.049	0.036	0.042	0.007
16	Hip	5	Sprain and Strain	0.129	0.097	0.09	0.058
17	Upper leg	5	Sprain and Strain	0.129	0.097	0.09	0.058
18	Knee	5	Sprain and Strain	0.163	0.142	0.09	0.058
19	Lower leg	5	Sprain and Strain	0.163	0.142	0.09	0.058
20	Ankle	5	Sprain and Strain	0.181	1.164	0.071	0.049
21	Foot	5	Sprain and Strain	0.181	1.164	0.071	0.049
22	Toes	5	Sprain and Strain	0.049	0.036	0.042	0.007
23	Multiple Body Parts	5	Sprain and Strain	0.049	0.036	0.027	0.023
98	Other	5	Sprain and Strain	0.049	0.036	0.027	0.023
99	Unknown	5	Sprain and Strain	0.049	0.036	0.027	0.023

1		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
2		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
3		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
4		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
5		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
6		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
7		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
8		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
9		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
10		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
11		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
12		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
13		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
14		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
15		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
16		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
17		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
18		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
19		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
20		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
21		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
22		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
23		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
98		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011

99		6	Concussion/Brain Injury	0.194	0.182	0.032	0.011
1	Head/Skull	7	Foreign Body	0.116	0.095	0.017	0
2	Face (excl eye)	7	Foreign Body	0.086	0.066	0.014	0
3	Eye	7	Foreign Body	0.086	0.066	0.014	0
4	Neck	7	Foreign Body	0.086	0.066	0.014	0
5	Thoracic/lumbar spine	7	Foreign Body	0.086	0.066	0.014	0
6	Chest Wall	7	Foreign Body	0.086	0.066	0.014	0
7	Abdominal Wall	7	Foreign Body	0.086	0.066	0.014	0
8	Internal Organs	7	Foreign Body	0.086	0.066	0.014	0
9	Pelvis	7	Foreign Body	0.086	0.066	0.014	0
10	Upper arm/shoulder	7	Foreign Body	0.086	0.066	0.014	0
11	Elbow	7	Foreign Body	0.086	0.066	0.014	0
12	Lower Arm	7	Foreign Body	0.086	0.066	0.014	0
13	Wrist	7	Foreign Body	0.086	0.066	0.014	0
14	Hand	7	Foreign Body	0.086	0.066	0.014	0
15	Fingers	7	Foreign Body	0.086	0.066	0.014	0
16	Hip	7	Foreign Body	0.086	0.066	0.014	0
17	Upper leg	7	Foreign Body	0.086	0.066	0.014	0
18	Knee	7	Foreign Body	0.086	0.066	0.014	0
19	Lower leg	7	Foreign Body	0.086	0.066	0.014	0
20	Ankle	7	Foreign Body	0.086	0.066	0.014	0
21	Foot	7	Foreign Body	0.086	0.066	0.014	0
22	Toes	7	Foreign Body	0.086	0.066	0.014	0
23	Multiple Body Parts	7	Foreign Body	0.086	0.066	0.014	0
98	Other	7	Foreign Body	0.086	0.066	0.014	0
99	Unknown	7	Foreign Body	0.086	0.066	0.014	0
1	Head/Skull	8	Burns and Scalds	0.131	0.11	0	0
2	Face (excl eye)	8	Burns and Scalds	0.131	0.11	0	0
3	Eye	8	Burns and Scalds	0.131	0.11	0	0
4	Neck	8	Burns and Scalds	0.131	0.11	0	0
5	Thoracic/lumbar spine	8	Burns and Scalds	0.131	0.11	0	0
6	Chest Wall	8	Burns and Scalds	0.131	0.11	0	0
7	Abdominal Wall	8	Burns and Scalds	0.131	0.11	0	0
8	Internal Organs	8	Burns and Scalds	0.131	0.11	0	0
9	Pelvis	8	Burns and Scalds	0.131	0.11	0	0
10	Upper arm/shoulder	8	Burns and Scalds	0.131	0.11	0	0
11	Elbow	8	Burns and Scalds	0.131	0.11	0	0
12	Lower Arm	8	Burns and Scalds	0.131	0.11	0	0
13	Wrist	8	Burns and Scalds	0.131	0.11	0	0
14	Hand	8	Burns and Scalds	0.131	0.11	0	0
15	Fingers	8	Burns and Scalds	0.131	0.11	0	0
16	Hip	8	Burns and Scalds	0.131	0.11	0	0

17	Upper leg	8	Burns and Scalds	0.131	0.11	0	0
18	Knee	8	Burns and Scalds	0.131	0.11	0	0
19	Lower leg	8	Burns and Scalds	0.131	0.11	0	0
20	Ankle	8	Burns and Scalds	0.131	0.11	0	0
21	Foot	8	Burns and Scalds	0.131	0.11	0	0
22	Toes	8	Burns and Scalds	0.131	0.11	0	0
23	Multiple Body Parts	8	Burns and Scalds	0.131	0.11	0	0
98	Other	8	Burns and Scalds	0.131	0.11	0	0
99	Unknown	8	Burns and Scalds	0.131	0.11	0	0
1	Head/Skull	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
2	Face (excl eye)	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
3	Eye	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
4	Neck	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
5	Thoracic/lumbar spine	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
6	Chest Wall	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
7	Abdominal Wall	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
8	Internal Organs	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
9	Pelvis	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076

10	Upper arm/shoulder	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
11	Elbow	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
12	Lower Arm	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
13	Wrist	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
14	Hand	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
15	Fingers	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
16	Hip	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
17	Upper leg	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
18	Knee	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
19	Lower leg	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
20	Ankle	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
21	Foot	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076

22	Toes	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
23	Multiple Body Parts	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
98	Other	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
99	Unknown	9	Injury to muscle, tendon, blood vessels and nerves	0.068	0.048	0.096	0.076
1		10	Injury to internal Organs	0	0	0.186	0.165
2		10	Injury to internal Organs	0	0	0.186	0.165
3		10	Injury to internal Organs	0	0	0.186	0.165
4		10	Injury to internal Organs	0	0	0.186	0.165
5		10	Injury to internal Organs	0	0	0.186	0.165
6		10	Injury to internal Organs	0	0	0.186	0.165
7		10	Injury to internal Organs	0	0	0.186	0.165
8		10	Injury to internal Organs	0	0	0.186	0.165
9		10	Injury to internal Organs	0	0	0.186	0.165
10		10	Injury to internal Organs	0	0	0.186	0.165
11		10	Injury to internal Organs	0	0	0.186	0.165
12		10	Injury to internal Organs	0	0	0.186	0.165
13		10	Injury to internal Organs	0	0	0.186	0.165
14		10	Injury to internal Organs	0	0	0.186	0.165
15		10	Injury to internal Organs	0	0	0.186	0.165
16		10	Injury to internal Organs	0	0	0.186	0.165

17		10	Injury to internal Organs	0	0	0.186	0.165
18		10	Injury to internal Organs	0	0	0.186	0.165
19		10	Injury to internal Organs	0	0	0.186	0.165
20		10	Injury to internal Organs	0	0	0.186	0.165
21		10	Injury to internal Organs	0	0	0.186	0.165
22		10	Injury to internal Organs	0	0	0.186	0.165
23		10	Injury to internal Organs	0	0	0.186	0.165
98		10	Injury to internal Organs	0	0	0.186	0.165
99		10	Injury to internal Organs	0	0	0.186	0.165
1		11	Poisoning	0.163	0	0.163	0
2		11	Poisoning	0.163	0	0.163	0
3		11	Poisoning	0.163	0	0.163	0
4		11	Poisoning	0.163	0	0.163	0
5		11	Poisoning	0.163	0	0.163	0
6		11	Poisoning	0.163	0	0.163	0
7		11	Poisoning	0.163	0	0.163	0
8		11	Poisoning	0.163	0	0.163	0
9		11	Poisoning	0.163	0	0.163	0
10		11	Poisoning	0.163	0	0.163	0
11		11	Poisoning	0.163	0	0.163	0
12		11	Poisoning	0.163	0	0.163	0
13		11	Poisoning	0.163	0	0.163	0
14		11	Poisoning	0.163	0	0.163	0
15		11	Poisoning	0.163	0	0.163	0
16		11	Poisoning	0.163	0	0.163	0
17		11	Poisoning	0.163	0	0.163	0
18		11	Poisoning	0.163	0	0.163	0
19		11	Poisoning	0.163	0	0.163	0
20		11	Poisoning	0.163	0	0.163	0
21		11	Poisoning	0.163	0	0.163	0
22		11	Poisoning	0.163	0	0.163	0
23		11	Poisoning	0.163	0	0.163	0
98		11	Poisoning	0.163	0	0.163	0
99		11	Poisoning	0.163	0	0.163	0
1	Head/Skull	12	Multiple Injuries	0.049	0.036	0.042	0.007
2	Face (excl eye)	12	Multiple Injuries	0.049	0.036	0.042	0.007
3	Eye	12	Multiple Injuries	0.049	0.036	0.042	0.007
4	Neck	12	Multiple Injuries	0.049	0.036	0.042	0.007
5	Thoracic/lumbar spine	12	Multiple Injuries	0.049	0.036	0.042	0.007

6	Chest Wall	12	Multiple Injuries	0.049	0.036	0.042	0.007
7	Abdominal Wall	12	Multiple Injuries	0.049	0.036	0.042	0.007
8	Internal Organs	12	Multiple Injuries	0.049	0.036	0.042	0.007
9	Pelvis	12	Multiple Injuries	0.049	0.036	0.042	0.007
10	Upper arm/shoulder	12	Multiple Injuries	0.049	0.036	0.042	0.007
11	Elbow	12	Multiple Injuries	0.049	0.036	0.042	0.007
12	Lower Arm	12	Multiple Injuries	0.049	0.036	0.042	0.007
13	Wrist	12	Multiple Injuries	0.049	0.036	0.042	0.007
14	Hand	12	Multiple Injuries	0.049	0.036	0.042	0.007
15	Fingers	12	Multiple Injuries	0.049	0.036	0.042	0.007
16	Hip	12	Multiple Injuries	0.049	0.036	0.042	0.007
17	Upper leg	12	Multiple Injuries	0.049	0.036	0.042	0.007
18	Knee	12	Multiple Injuries	0.049	0.036	0.042	0.007
19	Lower leg	12	Multiple Injuries	0.049	0.036	0.042	0.007
20	Ankle	12	Multiple Injuries	0.049	0.036	0.042	0.007
21	Foot	12	Multiple Injuries	0.049	0.036	0.042	0.007
22	Toes	12	Multiple Injuries	0.049	0.036	0.042	0.007
23	Multiple Body Parts	12	Multiple Injuries	0.049	0.036	0.042	0.007
98	Other	12	Multiple Injuries	0.049	0.036	0.042	0.007
99	Unknown	12	Multiple Injuries	0.049	0.036	0.042	0.007
1	Head/Skull	98	Other	0	0	0	0
2	Face (excl eye)	98	Other	0	0	0	0
3	Eye	98	Other	0	0	0	0
4	Neck	98	Other	0	0	0	0
5	Thoracic/lumbar spine	98	Other	0	0	0	0
6	Chest Wall	98	Other	0	0	0	0
7	Abdominal Wall	98	Other	0	0	0	0
8	Internal Organs	98	Other	0	0	0	0
9	Pelvis	98	Other	0	0	0	0
10	Upper arm/shoulder	98	Other	0	0	0	0
11	Elbow	98	Other	0	0	0	0
12	Lower Arm	98	Other	0	0	0	0
13	Wrist	98	Other	0	0	0	0
14	Hand	98	Other	0	0	0	0
15	Fingers	98	Other	0	0	0	0
16	Hip	98	Other	0	0	0	0
17	Upper leg	98	Other	0	0	0	0
18	Knee	98	Other	0	0	0	0
19	Lower leg	98	Other	0	0	0	0
20	Ankle	98	Other	0	0	0	0
21	Foot	98	Other	0	0	0	0
22	Toes	98	Other	0	0	0	0
23	Multiple Body Parts	98	Other	0	0	0	0

98	Other	98	Other	0	0	0	0
99	Unknown	98	Other	0	0	0	0
1	Head/Skull	99	Unknown	0	0	0	0
2	Face (excl eye)	99	Unknown	0	0	0	0
3	Eye	99	Unknown	0	0	0	0
4	Neck	99	Unknown	0	0	0	0
5	Thoracic/lumbar spine	99	Unknown	0	0	0	0
6	Chest Wall	99	Unknown	0	0	0	0
7	Abdominal Wall	99	Unknown	0	0	0	0
8	Internal Organs	99	Unknown	0	0	0	0
9	Pelvis	99	Unknown	0	0	0	0
10	Upper arm/shoulder	99	Unknown	0	0	0	0
11	Elbow	99	Unknown	0	0	0	0
12	Lower Arm	99	Unknown	0	0	0	0
13	Wrist	99	Unknown	0	0	0	0
14	Hand	99	Unknown	0	0	0	0
15	Fingers	99	Unknown	0	0	0	0
16	Hip	99	Unknown	0	0	0	0
17	Upper leg	99	Unknown	0	0	0	0
18	Knee	99	Unknown	0	0	0	0
19	Lower leg	99	Unknown	0	0	0	0
20	Ankle	99	Unknown	0	0	0	0
21	Foot	99	Unknown	0	0	0	0
22	Toes	99	Unknown	0	0	0	0
23	Multiple Body Parts	99	Unknown	0	0	0	0
98	Other	99	Unknown	0	0	0	0
99	Unknown	99	Unknown	0	0	0	0

Appendix 2: Remaining Years of Life – Global Burden of Disease Study 2013

AGE	REMAINING YEARS OF LIFE
0-4	85.01
5-9	78.76
10-14	73.79
15-19	68.83
20-24	63.88
25-29	58.94
30-34	54.00
35-39	49.09
40-44	44.23
45-49	39.43
50-54	34.72
55-59	30.10
60-64	25.55
65-69	21.12
70-74	16.87
75-79	12.89
80-84	9.32
85+	5.05