

Disability Weight Determination for Road Traffic Injuries in the Philippines: Metro Manila Scenario

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ABSTRACT

Objective. To determine the Disability Adjusted Life Year (DALY) weights of road traffic injuries and use the DALY weights in determining the total DALYs lost in Metro Manila using available data.

Methods. Consensus on DALY weights for each of the 31 International Classification of Diseases (ICD)10 codes related to road traffic injuries was done using Delphi Process. Experts from different fields were invited to participate in 2 rounds of discussion-and-scoring were done to obtain consensus were obtained for each DALY weight. Philippine Health Insurance Corporation (PHIC) data on the counts of the 31 ICD 10 coded claims for the years 2011, 2012, and 2013 were obtained and used to calculate the total DALY lost due to vehicular injuries for Metro-Manila.

Results. Road traffic related injuries affected mostly young people (mean 34 yo + 15) and affected mostly men (81%). There were a total of 3,199 injuries seen in 2,573 patients. 98.1% of the patients had a < 1 year type of injury with an average disability weight of 0.34154 and a total DALYs lost of 300.4. 0.5% of the patients had a ≥ 1 year type of injury with an average disability weight of 0.2726 and a total DALYs lost of 218.08. 1.4% of the patients most likely died from their injuries earning a total DALYs lost of 1,440. The sum of DALYs lost is equivalent to a total of 1,958.12.

Conclusion. The Metro Manila loses roughly Php 76.6 Million per year due to road traffic injuries and accidents. These events are highly preventable. Without proper interventions, road traffic injuries may lead to impoverishment of the young families who pick up the pieces, or are left behind.

Key Words: DALY, quality of life, road traffic injury, years of life lost, years lost to disability, Delphi method

INTRODUCTION

According to the World Health Organization (WHO), road traffic accidents are the fifth leading cause of burden of disease in the Western Pacific Region and the fourth in middle-income countries in 2004.¹ There is a noted plateau of the number of road traffic injuries since 2007, which stands at 1.25 million in 2013. This may be attributed to the interventions on global road safety implemented in the last few years. This occurrence has been documented despite the global population and motorization increase.²

Based on a systematic review of articles over 35 years, road traffic accidents accounted for 15% of all injury

Presented during the First ASEAN Patient Safety Congress, June 25-26, 2015, Sofitel Philippine Plaza Manila.

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deaths and were found to increase by 600% from 1960 to 1995. Moreover, it emphasized the need for improvements on injury surveillance and documentation of non-fatal injury outcomes.³

Several data suggest that despite this steady state, low to middle income countries, reflect unfavorable trends on road traffic injuries. There are more than twice the percentages of fatalities for low – income countries compared to high – income countries. Even if low to middle income countries only have 54% of the world’s vehicles, around 90% of deaths occur in them.² Furthermore, due to the projected economic growth of low-middle income countries, such as the Philippines, and resultant increase in motor vehicle ownership, deaths due to road traffic accidents are expected to increase from 1.3 million in 2004 to 2.4 million in 2030.¹

The Department of Health (DOH) reported accidents as the fifth leading cause of mortality in the whole population⁴ and the fourth leading cause of mortality in children aged 10 to 14 years in 2010.⁵

The Department of Public Works and Highways, in coordination and partnership of other private and international agencies is responsible for transport evaluation, and implementation of road development and safety. Responsibility for the maintenance of the National Roads are given to them while the local roads are under the supervision of the different local government units.⁶

An increase in the number of different modes of road transport can be seen in Metro Manila which would lead to a delay in traffic and affecting the different sectors of the country. This is mainly due to the inefficient regulation of public transport vehicles accompanied with substandard enforcement of traffic laws.⁶ The rise in the number of vehicles leading to road congestion accompanied with minimal improvement on road structures play a role in the development of road traffic injuries in lower-middle income countries.⁷

Health status has become one of the important outcome measurements in the evaluation of medical interventions, in addition to the more traditionally used outcome of mortality.⁸ Disability-adjusted life years (DALYs) in burden of disease and injury studies have been developed by the World Health Organization to measure the quality of life of the population by combining information on the impact of premature death, disability and other non-fatal health outcomes.⁹

The disability-adjusted life-year (DALY) is an indicator that combines the years of life lost from early death (YLL) and the years of life lost due to disability (estimated from the years lived with disability (YLD) (Figure 1). It can identify which diseases and injuries have the greatest health loss which can be used to guide policymakers in prioritizing health programs.

By representing the quality of life of a population as a mathematical equation, the method is standardized, allowing comparison of the data over a period of time and even between different populations.¹⁰ DALYs are considered more advanced over other composite indicators, such as quality adjusted life years because the value choices are made explicit and thus open to scrutiny and influence. It has become the standard outcome measure in public health and the primary outcome for priority-setting in health care and prevention.¹¹

While the World Health Organization (WHO) has provided global disability weights to compute for DALYs for various regions, it may not necessarily reflect the socio-economic impact of disease and injury in the Philippine setting. Consideration of the unique socio-economic milieu will lessen underestimation of the burden associated with disadvantaged populations. It will also lessen overestimation of the burdens among more advantaged populations.¹⁰ However, some studies suggest that they do not factor socioeconomic status, access to health care, environmental barriers and coping strategies in computing for disability weights.¹²

This study aims to provide local specific DALYs for road traffic injuries in Metro Manila using the Delphi Process based on available data by identifying, discussing and ranking the specific health states resulting from road traffic injuries included in this study.

METHODS

This study was submitted to and approved by the University of the Philippines Research Ethics Board prior to its implementation.

Experts coming from different multidisciplinary sections were invited to participate in the Delphi method (Table 1). Purposive sampling was done in the determination of participants from each field. Due to the difficulty in getting

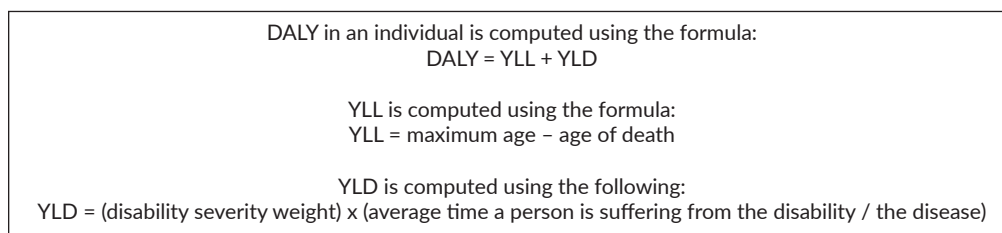


Figure 1. Formula for the computation of DALYS.

DALY, Disability Adjusted Life Years; YLL, Years Life Lost; YLD, Years Lived with Disability.

Table 1. List of the Different Specialties Invited to Participate in the Delphi Process

Burn
Emergency Medicine
ENT
Epidemiology
Family Medicine
Highschool Teacher
HMO industry
Human Resources Management
Internal Medicine
Medico legal
Neurosurgery
Nursing
Obstetrics and Gynecology
Occupational Therapy

all the participants in one venue at one particular time, we decided to do multiple small group meetings with different participants. The Delphi method were done from June to November 2014 on the following specific dates: (1) June 19, 2014 at the Center for Community Oriented Medical Education, 1st floor, Paz Mendoza Building, UP Manila College of Medicine with participants from the following fields: Orthopedic Surgery, Pediatrics, Emergency Medicine ENT, Ophthalmology, Rehabilitation Medicine, Physical Therapy, Occupational Therapy, Nursing, Highschool teacher, Social Worker, Epidemiologist; (2) August 15, 2014 at the Alumni Hall Conference Room, 1st floor, Paz Mendoza Memorial Building, UP Manila College of Medicine with the following participants: Medico-legal, Psychiatry, Family Medicine, Burn, Internal Medicine and (3) November 28, 2014 at the Research Implementation and Development Office Conference Room, 2nd floor, Paz Mendoza Memorial Building, UP Manila College of Medicine with participants from the following fields: Human resources management, obstetrics and gynecology, Religious sector, orthopedic patient, social security system, traffic expert.

English was the primary language used in all the materials and during the discussions with some participants using the Filipino language. No translation to Filipino or Filipino to English was needed.

The Delphi method is a technique designed to elicit opinions from a group to generate a group response. Delphi replaces direct confrontation and debate by a carefully planned, anonymous, orderly program of sequential individual interrogations usually conducted by questionnaires.¹³ The process takes 2 or more 'rounds' in which the second and later rounds of the survey are given as feedback. Content of Delphi studies are always issues about which incomplete knowledge exists. As a kind of consensus development method, the Delphi technique offers a practical means of arriving to a consensus using a relatively small number of people who can participate.

Informed consent for the participation in the study was obtained before the Delphi processes began.

The list of conditions for disability weighting was taken from Disability weights for diseases: A modified protocol and results for a Western European region (2000). European Journal of Public Health and Internal Classification of Diseases tenth edition (ICD 10).

The effects of illness and injuries are captured through disability classes that were assigned increasing weight associated with the extent of loss of physical functioning.¹⁴ Weights of the six classes have been chosen by a group of independent experts.

The disability weight is a measure of the impact of a health condition and its calculation is based on the preferences of a panel of experts for each health state relative to full health and to death.¹⁰ It is a value ranging from 1, indicating the worst imaginable health state, to 0, indicating full health. It quantifies the societal preferences for health states in relation to the societal 'ideal' of good health.¹⁵

Disability weighting was based on the Visual Analog Scale (VAS) valuation method. Participants were asked to rate each disease by marking its place in his or her opinion on the VAS sheet that was provided. There were no strict guidelines in assigning weights. However, participants were encouraged to give their opinions on how they arrived at their VAS scores. Selection of one VAS score to represent the disability weight of a particular disease was done using the Delphi method.

For the first round of discussion, the panel was asked to discuss the VAS score they gave for each condition based on their field of expertise. After all the participants have discussed their scores, they were asked to rescore all the conditions based on the things they learned and heard from the other participants during the discussion. After the second round, the panel was asked to discuss again the scores they gave and the reasons they changed their scores.

The VAS scores from the panel session were converted into weights using the formula. (Figure 2)^{16,17}

$$\text{DALY Weight} = \frac{\text{Average VAS Score } \alpha}{Q * \text{incidents}}$$

where Average VAS score = the mean score for each ICD10 code obtained through the Delphi rounds;
Q = condition as represented by the ICD10 code, and
Incidents = total counts in the PHIC dataset of that specific ICD10 code or condition.

Figure 1. Formula for the computation of disability weights.^{16,17}

VAS, Visual Analog Scale; PHIC, Philippine Health Insurance Corporation; ICD 10, International Classification of Diseases tenth edition.

Data processing and analysis

The panel determined VAS scores for every indicator condition at the end of the deliberation process using the Delphi method. The VAS scores were encoded into MS Excel (Microsoft Office Professional Plus 2013). Disability weights were computed using the formula above using MS

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Excel. Interpolation was done by the panel based on the computed disability weights. The interpolated disability weights were encoded into MS Excel.

A dataset of admissions related to road injuries (diagnosis contains ICD10 code V00 to V89) in accredited hospitals in Metro Manila from Calendar Year (CY) 2011-

2013 were obtained from the Philippine Health Insurance Corporation (PHIC). The following variables were requested: age, sex, admission period, and illness ICD codes. The dataset was cleaned using Microsoft Excel. However, out of the 60 indicator condition from the list, only 28 ICD-10 codes were found in the PHIC data (Table 2).

Table 2. Range of Disability Weights for each of the ICD-10 Codes

ICD Code	Description	Disability Weight (Philippines)	ICD Code	Description	Disability Weight (Philippines)
Death	Loss of Life within 30 days	1.0 DALY per year of life lost	H54.2	Distance vision: moderate impairment	0.326
S14.0	Spinal cord lesion at neck level; untreated	0.798	S72.0	Fracture other than neck of femur: short term, with or without treatment	0.324
S14.0	Spinal cord lesion at neck level; treated	0.694	S72	Fracture other than neck of femur: long term, without treatment	0.320
S58.9	Amputation of both arms: long term, without treatment	0.665	S32	Fracture of Vertebral column	0.315
F43.1	Post Traumatic Stress Disorder	0.658	S22.3	Fracture of Rib or sternum	0.313
H54.0	Distance vision blindness	0.645	S54	Injured nerves: long term	0.313
S88	Amputation of both legs: long term, without treatment	0.634	S52	Fracture of Radius or ulna, with treatment	0.312
S34	Spinal cord lesion below neck; untreated	0.632	S28.0	Severe Chest Injury	0.306
H91.93	Hearing loss, complete	0.601	S82	Fracture of Patella, tibia, or fibula, or ankle: long term, with or without treatment	0.306
S06.2X9D	Traumatic brain injury: long term consequences, severe, with or without treatment	0.594	S02	Fracture of Skull: short-term or long term	0.305
H91.93	Hearing loss, profound	0.530	S68.1	Amputation of finger(s), excluding thumb: long term, with treatment	0.303
T30.0	Burns of ≥20% total surface area or ≥10% total surface area of head or neck, or hands or wrist involved: long term	0.530	S43006A	Dislocation of shoulder: long term, with or without treatment	0.3
S06.2X9D	Traumatic brain injury: long term consequences, moderate, with or without treatment	0.490	S28.0XXA	Severe chest injury: long term, with or without treatment	0.3
H54.2	Distance vision: severe impairment	0.487	S68.02	Amputation of thumb: long term	0.289
S07	Crush injury: short or long term, with or without treatment	0.473	S62.90XS	Fracture of Hand bones, long term	0.286
S58.9	Amputation of one arm: long term, with or without treatment	0.455	S83	Dislocation or knee: long term, with or without treatment	0.284
S88	Amputation of one leg: long term, without treatment	0.444	S02.9	Fracture of facial bones	0.275
T30.0	Burns of ≥20% total surface area: short term	0.436	S62.90XS	Fracture of Hand bones, short term, with or without treatment	0.272
S06.307A	Severe traumatic brain injury: short term, with or without treatment	0.434	T30.0	Burns of <20% total surface area or <10% total surface area of head or neck, or hands or wrist involved: long term	0.263
S14.1	Spinal cord lesion below neck; treated	0.426	S42.009A	Clavicle, scapula or humerus	0.262
S32	Fracture of Pelvis, long term	0.407	H91.93	Hearing loss, moderate	0.256
S06	Traumatic brain injury: long term consequences, minor, with or without treatment	0.406	S54	Injured nerves, short term	0.248
S32	Fracture of Pelvis, short term	0.396	S92.909S	Fracture of foot bones: short-term, with or without treatment	0.237
H91.93	Hearing loss, severe	0.393	S88	Amputation of one leg: long term, with treatment	0.226
S88	Amputation of both legs: long term, with treatment	0.377	S73	Fracture of hip: long term, with or without treatment	0.225
S28.0XXA	Severe chest injury: short term, with or without treatment	0.376	T30.0	Burns of <20% total surface area without lower airway burns: short term	0.198
S52	Fracture of radius or ulna, without treatment	0.354	S54	Other injuries of muscle and tendon (includes sprains, strains, and dislocations other than shoulder, knee, or hip)	0.197
S58.9	Amputation of both arms: long term, with treatment	0.339	S98.1	Amputation of toe	0.168
S05	Injury to eyes: short term	0.33	H54.2	Distance vision: mild impairment	0.168
S82	Patella, tibia, or fibula, or ankle: short term, with or without treatment	0.328	H91.93	Hearing loss, mild	0.166
			T14.8	Open wound: short term, with or without treatment	0.136

ICD, International Classification of Diseases

RESULTS AND DISCUSSION

Out of 5139 patients hospitalized in the PHIC data from CY 2011-2013, 2,573 patients were classified under the ICD-10 codes from our list. The data consists of a total of 5,139 patients comprised of 3,119 patients from government institutions (1 patient from a government infirmary/dispensary, 120 patients from primary hospitals, 68 patient from secondary hospitals and 2,930 patients from tertiary hospitals) and 2,020 patients from private institutions (1 patient from an ambulatory/surgical clinic, 119 patients from primary hospitals, 371 patients from secondary hospitals and 1,529 patients from tertiary hospitals).

Road traffic related injuries affected mostly young people (mean 34 yo \pm 15) and affected mostly men (81%). With an average life expectancy of 71 years old for Filipinos,¹⁸ the total DALYs lost for injuries of <1 year, \geq 1 year and injuries resulting to death were computed.

The biggest disability weight of 0.798 was given to an injury of the spine at the neck level without any treatment followed by the 0.694 for an injury of the spine at the neck level with treatment. While the 2 conditions given the lowest disability weight were given to a mild hearing loss (0.166) and open wound (0.136).

The percentage of DALYs from injuries has remained stable from 10% in 1990 to 11% in 2010. The largest component among the DALYs from injuries is the due to road traffic injuries comprising 27%. Vehicular crashes, termed road traffic injury in the 2010 Global Burden of Disease (GBD) study, accounted for 75.5 million DALYs. Injuries affect mostly young people, often causing long-term disability.¹⁹ Most causes of road traffic injuries are said to be preventable and many effective strategies to reduce this problem are available. Thus, the 2010 GBD study calls for continued initiatives to address this problem.²⁰

Majority of deaths and DALYs caused by road injuries in lower middle-income countries in 2002 were observed, accounting for 34% and 28% respectively.⁷

A retrospective study done in Honiara, Solomon Islands which focused on the extent, causes and impact of road traffic accidents revealed that road traffic crashes were predominantly male (73%) and were between the ages of 10-29 (48%).²¹

When compared to a high-income country such as France, it showed some similarities with the results of this study. A study pertaining to the burden of road traffic accidents done in France showed high YLD and YLL in the 15-24 years age bracket. Furthermore, the highest disability weight was given to spinal cord injury (0.725) while the lowest disability weight was given to sprains (0.064).²² The study used a compatibility table listing the similarities of the ICD10 codes with the AIS90 codes.

There were a total of 3,199 injuries seen in 2,573 patients. 98.1% of the patients had a < 1 year type of injury with an average disability weight of 0.34154 and a total DALYs lost of 300.4. Less than one percent (0.5%) of the patients had a \geq 1 year type of injury with an average disability weight of 0.2726 and a total DALYs lost of 218.08. The PHIC data did not show the outcomes on discharge. Of all these patients, 1.4% most likely died from their injuries earning a total DALYs lost of 1,440 (Table 3).

In 2,573 patients, we noted 3,199 number of injuries. Of the patients with a < 1 year type of injury, there is a ratio of 1 patient :1.2 injuries and for those with a \geq 1 year type of injury, there is a ratio of 1 patient: 1.7 injuries (Table 4).

The disability weights from the GBD Study have been touted to have a 'strong egalitarian flavor' by its global, fixed context. However, some health scientists argue that by ignoring social, cultural, or environmental context of the condition the realities of the burden of disease cannot be

Table 3. Dimensions of Disability

Dimensions of Disability	DALYs Metro Manila (2,573 hospitalized victims)				
	No. of patients	No. of injuries	Disability weight for 1 year	Total # of years	Total DALYs lost
< 1 year	2,525	3,143	0.34154	0.2795	300.04
\geq 1 year	12	20	0.2726	40	218.08
Death	36	36	1	40	1,440.00
Totals	2,573	3,199			1,958.12

DALY, Disability Adjusted Life Year

Table 4. Distribution of Severity

Distribution of Severity	DALYs Metro Manila (2,573 hospitalized victims)					
	No. of patients	%	No. of injuries	%	Total DALYs lost	%
< 1 year	2,525	98.1%	3,143	98.24%	300.04	15%
\geq 1 year	12	0.5%	20	0.63%	218.08	11%
Death	36	1.4%	36	1.13%	1,440.00	74%
Totals	2,573	100%	3,199	100%	1958.12	100%

DALY, Disability Adjusted Life Year

clearly established. Some traditional societies that stigmatize and reject individuals with specific permanent impairments. Governments provide varying degrees of support for people of disabilities. For example, paraplegics in Australia have more access to wheelchairs as opposed to those in Cameroon. Australian building codes provide for equity of access to persons with disability where wheelchairs may be a useful intervention. The burden of disease measured by DALYs do not reflect the individuals' differential ability to cope with their functional limitation.²³ This ability is heavily influenced by the society in which the person with disability lives. Studies which estimate disability weights on a national level could estimate the national injury burden more reliably than utilizing those published in the GBD study.¹⁹

The sum of DALYs lost is equivalent to a total of 1,958.12. Taking into consideration the 2013 Gross Domestic Product (GDP) per capita of Php 117,374.25,¹⁸ and total GDP of NCR which is 36.3% of the National GDP (Php 4,162,859,941,086.00)²⁴ total economic equivalent of the DALYs lost is Php 229.8 Million (in 3 years) which is roughly a minimum Php 76.6 Million per year in Metro Manila representing 0.0055% of the GDP of NCR. This represents the lowest value of injuries in NCR but it can be higher than the computed value because the GDP per capita approximates only the minimum wage in the Philippines so that a person earning more than the minimum wage will lose more. In a report from the Developmental Bank of the Philippines (DBM), it was indicated in the Statement of Receipts and expenditures, By Cities, 2013, that the total expenditure of NCR is Php 63,321,170,000.00 while the revenues amounted to Php 111,161,600,000.00 which leaves a balance of Php 47,840,430,000.00.¹⁶ Php 76.6M is only 0.12% of the total NCR expenditure. NCR could have allotted the surplus for the prevention of RTIs.

The main purpose of the study is to determine the DALYs which was done on primary data. The second part of the study is projection of the consensus on a physical data, but for this study, secondary data was used. Hence, the limitations would include: inherent errors in data set and limited scope of the data set (only PHIC accredited hospitals and patients were used in the report). We used the National GDP per capita which reflects only the minimum productivity of a resident so that if an RTI victim earns more than the minimum wage, then our study would be underreporting. But at the same time, we give the minimum amount for an unemployed resident, in that case, it would be over reporting. Since this study is designed to identify the minimum burden, we found it just to use the average or the GDP per capita.

The average economic losses due to road traffic injuries in developing countries was found to be equivalent to 1% of the GDP in 2000.⁷ In 2005, the assessment on the cost of road accidents in the Philippines was equal to 2.8% of the nation's GDP.⁶ Other lower middle income countries like Vietnam was estimated to have losses due to road traffic injuries equivalent to 2.45% of their GDP in the same year.²⁵

Methodologically, the Delphi method is very efficient in its process.²⁶ This is due mainly to the practical nature of the Delphi method especially in its facilitation. It must be noted that in the selection of participants, it is important that they represent the target audience for the output. In this particular study, persons whose work are connected to vehicular accidents related disabilities. "In practice, given the multi-professional or multidisciplinary nature of most health care activities, it is advisable to ensure that all relevant professional or stakeholder groups are represented".²⁶ Another reason for utilizing this kind of consensus development method is it takes into consideration the potential chronically ill individuals' ability to cope. Underestimation of disease burden results from the ability to adapt.¹²

Although there are many cases that the Delphi process has proved to be effective and efficient, it is still important that a way to standardize results be established to eliminate bias. Questionnaires and data collection tools are used to maintain reliability of results. Rules in facilitating are established as well so that each round of the Delphi process will not interfere with the credibility of the results.²⁷

CONCLUSION

Road traffic injuries occur due to several factors but mainly due to poor implementation of traffic safety and failure to regulate public transport. As a result, people from the work force are mainly affected leading to an economic loss of roughly Php 76.6 million per year. The creation of local data on DALYs and disability weights has provided insight on the current situation of the country and can be used to generate possible health policies in the future.

Acknowledgments

This study was made possible by an unrestricted grant from the Patient Safety Program of the UP College of Medicine and the dataset from the Philippine Health Insurance Company.

Statement of Authorship

All authors approved the final version submitted.

Author Disclosure

All authors declared no conflicts of interest.

Funding Source

This paper was funded by the College of Medicine, University of the Philippines Manila.

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