

ESTIMATION OF SOCIO-ECONOMIC COST OF ROAD ACCIDENTS IN METRO MANILA

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Abstract: The increasing number of Filipinos involved in **road accidents** each year is a serious concern. Each accident entails economic cost, not to mention the social cost of pain, grief, and suffering of families of the victims. It also has an adverse impact on the resources of the government. Using the **Human Capital Approach** that focuses on the **Gross Output** of road accident victims, costs are classified into three main components, namely: Victim Related Cost; Property Damage; and Administration Cost. The monetary value of each of these components is estimated in this study in accordance with four types of accident severity, namely fatal, serious injury, minor injury, and property damage only. This study estimated that PhP 3.5 Million is lost per fatal road accident showing a clear picture of their economic effects. In addition, social cost or pain, grief, and suffering are valued at PhP 506,450 per fatal accident.

Key Words: road vehicular accidents, accident costing, human capital approach, gross output

1. INTRODUCTION

Road vehicular accidents have been so frequent and common to everyday life that people tend to disregard that these “high velocity moving lumps of metal” are very lethal and sometimes pose as “weapons of mass destruction”. The problem in road safety transcends the transport sector. It is a health, social, and economic problem as well. The health sector would have to stretch its bed capacity in order to administer to the victims while still overseeing other important illnesses. Families are displaced and their futures shattered because of the sudden demise of their breadwinners, which is a social welfare problem. Accidents lay off workers, which eventually, if summed up, will translate to millions of pesos of potential lost productivity thereby affecting domestic production and the economy. It was observed that in Metro Manila, traffic management policies have been implemented without much study, translating to confusion and eventually mishaps. The scale and magnitude of the effects of road accidents on the lives of the people involved and the society in general must be clearly defined for purposes of raising awareness and as an input to the planning and evaluation of the government’s road safety intervention measures.

Using the Gross Output methodology, which employs the Human Capital Approach to costing, economic and social costs of accidents have been determined. Medical expenses and lost incomes of the victims have been taken into account. Administration cost incurred by legal entities that oversee accident investigation was also considered. Property damages such as vehicle repair costs were also analyzed and were added up to the total resources lost. An amount for the pain grief and suffering of the victim and their dependents was also calculated. The authors wish that road safety be given importance by providing a picture of the worsening effects of road accidents to our society and economy.

2. GLOBAL ROAD SAFETY REPORT

The World Health Organization (WHO) has identified through studies in disability-adjusted life years that road accidents would be the third leading cause of death by 2020 (see Table 1).

Table 1. Change in Rank for the 10 Leading Causes of the Global Burden of Disease

1990	2020
1. Lower Respiratory infections	1. Ischaemic heart disease
2. Diarrhoeal diseases	2. Unipolar major depression
3. Conditions during Perinatal period	3. Road traffic injuries
4. Unipolar major depression	4. Cerebrovascular disease
5. Ischaemic heart disease	5. Chronic obstructive pulmonary disease
6. Cerebrovascular disease	6. Lower respiratory infections
7. Tuberculosis	7. Tuberculosis
8. Measles	8. War
9. Road traffic injuries	9. Diarrhoeal diseases
10. Congenital abnormalities	10. HIV

Source: WHO (2004). World Report on Road Traffic Injury Prevention, Geneva.

In a research of the WHO's Ad hoc Committee on Health Research Relating to Future Intervention Options, the most economically active and productive age group, specifically those aged between 15 and 44 years, figures heavily in road traffic injuries. This will inevitably affect the economy by the slack that they create in the workforce. In addition, the physically disabled victims that are within the lowest-income group's earning capacity are heavily affected since they "most likely rely on physical activity" (WHO 1996). Moreover, road accident victims represent between 30 to 86% of all hospital trauma admissions. According to Odero, et al (1997), victims tend to stay longer in the hospital than average patients. In University of the Philippines-Philippine General Hospital (UP-PGH 2003) for example, vehicular collisions contribute to 25% of its total admissions of medico legal cases. This has an adverse impact on the resources of public hospitals and the government in general as these hospitals shoulders an average of 25% to 75% of the victims' total costs of medication and treatment. This is aggravated by the fact that 80% of seriously injured and 50% of slightly injured road accident victims seek medical attention in government owned and managed hospitals (Herbst 2002).

3. STUDY OBJECTIVES

This paper primarily aims to estimate the cost of road vehicular accidents and classify these costs into different items according to origin by using the Asian Development Bank (ADB)

and Transport Research Laboratory (TRL) of the United Kingdom, preferred Human Capital Method (Gross Output) of costing road accident for developing countries.

Costing will include costs incurred by the victim, the society, and the government in general. Measuring emotional damages translated to social costs puts values to non-monetary terms such as the pain, grief and suffering (PGS) of the victim and the affected family. These are things not bought nor sold, otherwise known as non-market values. Though debatable, it becomes essential to justify accident reduction measures and traffic improvement policies in Metro Manila to beg for a fair share of the national budget. The authors wish that this study create awareness and effective decision-making.

4. HUMAN CAPITAL APPROACH OF ACCIDENT COSTING

Cognizant of the magnitude of the ill effects of vast motorization, the United States with its National Highways Traffic Safety Administration (NHTSA) and the TRL pioneered in developing methodologies for costing accident. Since then, they have developed guidelines for use of developing countries after previous studies have noticed the vulnerability and greater effect of accidents on the poor. Their approach – the Human Capital Approach – has been adopted in this study.

4.1 Accident Cost Components

To simplify the process of identifying the sources costs, the Human Capital Approach, otherwise known as the Gross Output Method, classifies accident cost into three main components as shown in Figure 1. Victim related costs are directly associated with the resources lost of the casualties. To be humane and considerate of the social impacts of accidents, a notional sum is also added to quantify the PGS of the victim’s families. Property damage consists of vehicle repair, lost of economic productivity of public utility vehicles and cost of towing services. The first two components make the largest portion of property damage and are given due attention in this paper. The third and last component of accident cost consists of costs associated with police investigation, legal activities and insurance administration.

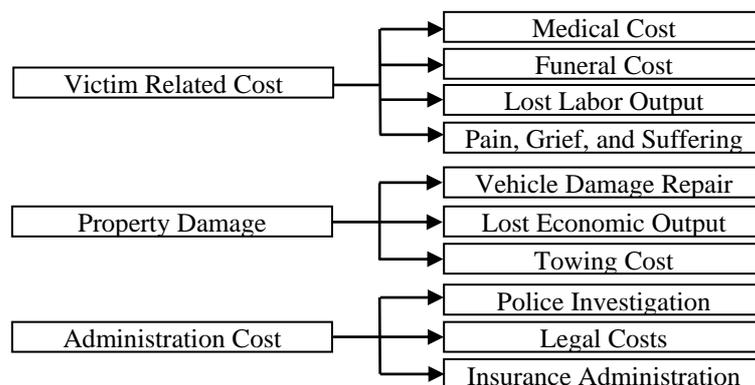


Figure 1. Classification of Accident Cost Components

4.2 Method of Estimation

Accident data used in this study is based on the modified (August 2002) Metro Manila Development Authority (MMDA) Metro Manila Accident Recording and Analysis System

(MMARAS) database. Its limitation however is dictated by the diligence of police officers investigating the crash and the limited variables in the report. It is noteworthy that an important fact such as driver/casualty age was disregarded in the new form. Others include the reduced classification of crashes into fatal and non-fatal from the previous four accident severity classifications of fatal, severe injury, slight injury, and property damage only. The change on the form however can be attributed to MMDA's prioritization on the identification of accident "black spots" around the metropolis and to evaluate traffic improvement programs implemented by the agency.

Shown in Table 2 is the method of estimation for each accident component. For ease of analysis, it is assumed that all casualties are employed and are productive members of the society. It is assumed that income is constant over their productive years and that females have the same economic opportunity as males. It is assumed that minors start work at fifteen (15) years old and all casualties as employees retire at sixty-five (65) years old. It is assumed that the permanently disabled accident victims receive the best and proper medical treatment and home care until the rest of their lives and that all fatalities are given funeral services and buried. For property damages particularly damaged vehicles, it is assumed that they are repaired as closely as possible to their condition before the accident if not according to manufacturer's specifications. For administration costs on the other hand, it is assumed that a police responded to the incident. Although there are some incidents of under reporting, for purposes of the study, the author will give a cost allowance for the administration of accidents.

Table 2. Estimation Method of Cost Components

Cost Component	Estimation
Lost labor output	Calculated as the average daily wage rate of each person involved in the crash, multiplied by the number of days off work, then added up for all the people involved in the crash. For fatalities and permanent disabilities the calculation is performed over the rest of their expected productive working life and discounted to an equivalent present value
Pain, grief and suffering	Calculated as a percentage of lost output cost
Vehicle damage	Calculated as the average cost of vehicle repairs multiplied by the average number of vehicles involved in the crash.
Administration cost	Calculated as a percentage of resource costs in line with ADB recommendations (0.2% for fatal accidents, 4% for serious injury accidents, 14% for minor injury accidents and 10% for property damage-only accidents)

The average number of casualties depending on accident severity is shown in Table 3. They are derived from MMDA and DPWH. Internationally accepted statistics were also used to compensate for the lacking Metro Manila data for casualty figures.

The values in Table 3 are used in conjunction with Table 2 to compute the cost components per accident.

Table 3. Accident Casualty Distribution

Casualty Severity		Fatalities	Serious Injuries	Minor Injuries	PDO
Accident Severity	Fatal Accident	1.64	1.4	1.4	1.95
	Serious Injury Accident		1.7	2.2	1.5
	Minor Injury			1.5	1.5
	PDO				1.8

5. Discounted Costs

In terms of economic costs, the study considers the effects of time over money. These was calculated using the current value of future costs and income and an equation that considers the discount rate and the number of years lost between now and up until when the costs occur. This is illustrated by the Present Value formula:

$$PV = \frac{P}{(1+r)^n} \quad (1)$$

wherein: P = amount
n = years in the future
r = effective discount rate = $(d - g)$
wherein d = economic discount rate
g = real income growth rate

The present values of all future amounts is summed up to calculate the cumulative present value (CPV) of the amounts over period (N) assuming no change on the amount. This is demonstrated by:

$$PV_{\text{cumulative}} = \sum_{n=1}^N \frac{P}{(1+r)^n} \quad (2)$$

$$= P \times F(N, r)$$

wherein:

$$F(N, r) = \sum_{n=1}^N \frac{1}{(1+r)^n} \quad (3)$$

wherein: $F(N, r)$ is called the Uniform Series Present Value Factor.

6. COST ESTIMATION

6.1 Victim Related Cost

Medical Cost

Due to dwindling funds for the DOH administered tertiary hospitals, recording of patients' charts and databases are still painstakingly tabulated manually using the International Classification of Diseases (ICD) system, produced by the WHO. The system attributes deaths and injuries to a single underlying cause using the rules and conventions of ICD. For this paper, ICD 10 codes' V01-04, V06, V09-V80, V87, V89, V99 for land transport accidents are used.

Medical costs have been derived from actual payments made by patients at two tertiary hospitals, Philippine General Hospital (PGH) and Philippine Orthopedic Center (POC). Hospital case numbers of victims sorted from medical records were verified from the Billing section and the corresponding patients' hospital bill were extracted. For the case of the PGH's Trauma ward, patients are not billed completely (patient buys own medicine separately from private pharmacies after being given necessary prescriptions, unlike other private hospitals wherein the patients are billed down to the minutest detail) the authors with the aid of a medical practitioner painstakingly tabulated from the patient charts expenditures for operations, laboratory test and medicines. These were then billed using the equivalent hospital pay room rates and charges and list of drugs and other medicines listed at retail prices. This procedure compensates for the subsidized rates of government hospitals.

The computations have produced an average of PhP 88,530 for serious injury, which includes among others ambulance fees, hospitals charges, medicines and professional fees from medical specialists. On average, the patients were confined for 17 days. It was discovered that 22 patients out of 964 seriously injured persons died after an average of 9 days. It was found that the average cost of hospitalization of fatal injuries amounted to PhP 63,159. For minor injury (injury which does not need hospitalization for more than a day), the average cost of treatment is estimated at PhP 3,957. This covers first aid and other emergency medical services like ambulance service and emergency room treatment.

Serious injuries because of an accident will sometimes result to irreversible acquired disabilities. This will result to added financial burden to the family. It is assumed that the disabled will be taken care of until his death. PhP 118,428 average wage of nurses was the result of the Occupational Wages Survey (OWS) of the Bureau of Labor Employment and Statistics (BLES) and has been adopted. Assuming this amount to remain unchanged throughout the lifetime of the disabled, a present value of PhP 1,745,247 is obtained at a discount rate of 6% per annum.

Funeral Cost

Instead of hospital costs, the lump of medical costs incurred by fatalities is on funeral services. A survey of funeral services providers showed an average funeral service package of PhP 25,000. Meanwhile public and private cemeteries sent back forms of their services containing their memorial lot costs and showed an average of PhP 50,000 for lot package including succeeding lease payments. However, as all people die anyway, the cost should be adjusted to correspond to an earlier than expected death from natural causes. Using lifetime expectancy of 67 years old (NSO 2003), and ages of fatalities gathered from hospital records, the present value of funeral costs due to untimely death has been calculated at an average of PhP 23,925 per fatality.

Lost Labor Output

Potentially productive years of life lost as a result of an accident are also considered. Lost output is typically the largest casualty related cost incurred. The study found that the average age of fatalities is 31 years and 30 years for injuries. Using the National Labor Code's (Presidential Decree 442) compulsory retirement age of 65, we can deduct the average lost economic years of fatalities as 34 years. Tabulating the ages of the victims and its resulting cumulative lost years, the cumulative present value of lost incomes can be derived. The OWS 2003 done by BLES showed a PhP 10,911 average monthly wage rate across the covered

occupations for Metro Manila. Without data on patient's economic profile, the paper assumes that all the victims are working with capabilities to earn this wage. Lost labor output of fatalities was computed using the cumulative present values of the assumed wages of the tabulated lost years of the fatalities. This produces a lost labor output of fatalities pegged at PhP 1,459,509. Short term lost wages refers to economic output lost due to non-productivity as a result of an injury or spent time recovering from an injury. This also includes the days spent of a serious injury in a hospital before eventually dying. The amount of PhP 545 average wage per day has been used. The table below show how lost outputs for different accident severity are derived.

Table 4. Cost Computations for Long term Lost Labor Output by Accident Severity

Fatal Crash	
Lost output of fatalities	PhP 2,393,595= 1.64* 1,459,509
Wherein:	
1.64	= average number of fatalities per fatal crash
PhP 1,459,509	= cumulative present value lost output of fatalities
Permanent disabilities	PhP 120,969= (1.4 * 0.05)* 1,728,127
Wherein:	
1.4	= average number of serious injuries per fatal crash
0.05	= percentage of serious injuries that lead to permanent disability
PhP 1,728,127	= cumulative present value lost output of permanent disabilities
Serious Injury Crashes	
Lost output of fatalities	PhP 58,756= (1.7* 0.02) * 1,728,127
Wherein:	
1.7	= average number of serious injuries per serious injury crash
0.02	= (2%) percentage of serious injuries that lead to death
PhP 1,728,127	= cumulative present value lost output of serious injuries that lead to death
Permanent disabilities	PhP 146,891= (1.7 * 0.05) * 1,728,127
Wherein:	
1.7	= average number of serious injuries per serious injury crash
0.05	= percentage of serious injuries that lead to permanent disability
PhP 1,728,127	= cumulative present value lost output of permanent disabilities

Pain, Grief and Suffering

In order to quantify the social cost and emotional burden accidents bring about to the victim and their families, a notional amount to reflect 'pain, grief and suffering' is added to the total costs for each accident severity when using the Human Capital method. The Willingness-To-Pay method is considered the most relevant method for accident costing of PGS and has now been adopted by many developed countries. However, this method is difficult to apply in

developing countries, for it is based on complex questionnaires asking about perceived risk and payment for the avoidance of hypothetical risk.

The amount to be added in the human capital method could be considered as part of a social objective of poverty alleviation, as accidents are known to have a greater adverse effect upon the poor. The amount to be added is often a political and subjective decision, and an element of judgment is unavoidable. As recommended by the ADB, experience from previous international studies is used. These values are:

20% of total lost income for fatal accident.

50% of total lost income for serious injury accident.

30% of total lost income for minor injury accident.

6.2 Property Damage

Vehicle Repair

The largest portion of property damage is that which stems from damage to vehicles due to mishaps and lost economic productivity of wrecked public transport vehicles. Other property damage are less significant. Sources of data were private companies within the Chamber of Automotive Manufacturers Association of the Philippines (CAMPI) providing vehicle repair services, bus, taxi, tricycle, and jeepney drivers and operators. Repair garages down to informal 'shade tree or back yard' mechanics were also surveyed. This method is more likely to be representative of the true cost of damage to vehicles, since it includes both insured and uninsured vehicles of different vehicle types. Data of vehicle involvement from the MMDA MMARAS 2003 records were obtained.

Table 5. Fatal Vehicle Accident Repair Cost

Vehicle Type	No. of Units Involved	%	Repair Cost (PhP)	Weighted Values (PhP)
Cycle/ Pedicab	14	5.17%	500	25.83
Motorcycle	21	7.75%	1,500	116.24
Motor Tricycle	22	8.12%	2,000	162.36
Car	58	21.40%	28,645	6,130.66
Jeepney	40	14.76%	9,500	1,402.21
Taxi/FX	13	4.80%	28,645	1,374.11
Bus	16	5.90%	148,500	8,767.53
Van	33	12.18%	28,645	3,488.14
Truck	54	19.93%	20,000	3,985.24
Total	271	Average cost of repair		PhP 25,452

Table 6. Non Fatal Vehicle Accident Repair Cost

Vehicle Type	No. of Units Involved	%	Repair Cost (PhP)	Weighted Values (PhP)
Cycle/ Pedicab	95	3.02%	500	15.09
Motorcycle	521	16.56%	1,500	248.33
Motor Tricycle	302	9.60%	2,000	191.93
Car	761	24.18%	28,645	6,926.87
Jeepney	566	17.99%	9,500	1,708.61
Taxi/FX	248	7.88%	28,645	2,257.38
Bus	128	4.07%	148,500	6,040.04
Van	366	11.63%	28,645	3,331.45
Truck	160	5.08%	20,000	1,016.84
Total	3147	Average cost of repair		PhP 21,737

Table 7. Cost of Vehicle Repair per Fatal Accident

Average Major Repair Cost per Vehicle	PhP 25,452
Adjustment Factor for Fatal Accident Vehicle Repair	1.55
Vehicle Repair Cost per Fatal Accident	PhP 39,451
Average No. of Vehicles Involved in a Fatal Accident	1.95
Cost of Vehicle Repair per Fatal Accident	PhP 76,930

Table 8. Cost of Vehicle Repair per Serious Injury Accident

Average Minor Repair Cost per Vehicle	PhP 21,737
Adjustment Factor for Serious Injury Accident Vehicle Repair	1.40
Vehicle Repair Cost per Serious Injury Accident	PhP 30,431
Average No of Vehicles Involved in a Serious Injury Accident	1.50
Cost of Vehicle Repair per Serious Injury Accident	PhP 45,647

Table 9. Cost of Vehicle Repair per Minor Injury Accident

Average Minor Repair Cost per Vehicle	PhP 21,737
Adjustment Factor for Minor Injury Accident Vehicle Repair	1.25
Vehicle Repair Cost per Minor Injury Accident	PhP 27,171
Average No of Vehicles Involved in a Minor Injury Accident	1.50
Cost of Vehicle Repair per Minor Injury Accident	PhP 40,756

Table 10. Cost of Vehicle Repair per PDO Accident

Average Minor Repair Cost per Vehicle	PhP 21,737
Adjustment Factor for PDO Accident Vehicle Repair	0.85
Vehicle Repair Cost per PDO Accident	PhP 18,476
Average No of Vehicles Involved in a PDO Accident	1.8
Cost of Vehicle Repair per PDO Accident	PhP 33,257

According to the TRL's Costing Road Accidents in Developing Countries (1995), an adjustment factor is needed to compensate for lack of information on vehicle repairs according to accident injury severities. These are as follows:

Fatal Accident	1.55 times average repair cost
Serious Injury Accident	1.40 times average repair cost
Minor Injury Accident	1.25 times average repair cost
PDO Accident	0.85 times average repair cost

Lost Economic Output of Vehicles

This paper has also evaluated the effects of accident on public transport sector since public utility vehicles (PUV) such as buses are frequently involved in accidents. Moreover, jeepneys and buses are not protected well enough by insurance, so this aspect in crash costing methodology will correct the inaccuracy of insurance data. PUVs were surveyed and asked for their daily income quotas and were tabulated against the number of units involved per vehicle type (from MMDA MMARAS) to get the average losses of PUVs per day.

The survey also produced data on the length of days for repairs to be finished. The respondents however had no information whether they were repairing a vehicle involved in a fatal accident. Accordingly, fifteen (15) days repair for major repairs is assumed to be fatal accident, seven (7) days for injury accident and three (3) days for PDO accident is used. Though it is yet to be proven that the extent of vehicle damage has a direct relation on accident severity, theoretically however, the greater is the vehicle damage, then the more chances of death will occur.

It was also considered that 50% of vehicles involved are either public transport vehicles or other vehicles used primarily for economic purposes (MMDA).

The survey produced the following data on lost economic opportunity per vehicle type:

Table 11. Lost Economic Opportunity of Damaged Vehicles

Fatal Accident					
Vehicle Type	Tricycle	Truck	Taxi/FX	Bus	Jeepney
Loss per day (PhP)	200	15000	1400	15000	800
Units Involved	22	54	13	16	40
Percentage	0.15	0.37	0.09	0.11	0.28
	30	5586	126	1655	221
PhP 7,618	Average Loss per day for Fatal Accident				

Non-Fatal Accident					
Vehicle Type	Tricycle	Truck	Taxi/FX	Bus	Jeepney
Loss per day (PhP)	200	15000	1400	15000	800
Units Involved	302	160	248	128	566
Percentage	0.22	0.11	0.18	0.09	0.40
	43	1709	247	1368	323
PHP 3,690	Average Loss per day for Non-Fatal Accident				

The computations used for calculation of lost output per accident severity are as follows:

Lost economic opportunity for fatal accident = PhP 57,135
 = 0.5* 15 days major vehicle repair * PhP 7,618 average loss per day of fatal accident

Lost economic opportunity for serious injury accident = PhP 12,915
 = 0.5* 7 days minor vehicle repair * PhP 3,690 average loss per day of non-fatal accident

Lost economic opportunity for minor injury accident = PhP 12,915
 = 0.5* 7 days minor vehicle repair * PhP 3,690 average loss per day of non-fatal accident

Lost economic opportunity for PDO accident = PhP 5,535
 = 0.5* 3 days minor vehicle repair * PhP 3,690 average loss per day of non-fatal accident

Towing Services Cost

An average amount of PhP 1,500 for towing services within Metro Manila was discovered. This amount has been added to the cost of vehicle repairs.

7.3 Administration Cost

It is usual in previous international studies that police and administration costs are low compared to other cost components. The reason being is these costs are not direct costs that can be associated to accidents. It is advised not to spend much time and effort in producing detailed estimates of these costs because of the sector's complexity. Alternatively, TRL advises developing countries to use the following values for administration costing after their analysis from previous international case studies wherein:

Total resource cost	= (lost output + medical cost + property damage).
Fatal Accident	0.2% of total resource cost
Serious Injury Accident	4.0% of total resource cost
Minor Injury Accident	14 % of total resource cost
PDO Accident	10 % of total resource cost

7.4 SUMMARY OF ACCIDENT COSTS

The results of all of the computations for accident cost components is collated and summarized in Table 4. It is noteworthy that a single accident may produce multiple casualties of different injury severities and multiple vehicle damages as seen in Table 3. Again the author reminds the readers to take note that these are costs per accident and not per casualty basis.

Table 12. Summary of Accident Cost Components by Accident Severity

Accident Cost Components	ACCIDENT SEVERITY							
	Fatal	%	Serious	%	Minor	%	PDO	%
VICTIM RELATED								
A. Lost Labor Output								
a.) Long Term								
Fatalities	2,393,595	68.9	58,756	8.0				
Permanent Disability (Serious Injuries)	120,969	3.5	146,891	20.0				
b.) Short Term								
Fatalities	137	0.0	167	0.0				
Serious Injuries	15,260	0.4	18,530	2.5				
Minor Injuries	2,289	0.1	3,597	0.5	2,453			
Subtotal	2,532,250	72.9	227,941	31.0	2,453	3.4		
B. Medical Cost								
a.) Short-term								
Fatalities	1,768	0.1	2,147	0.3				
Serious Injuries	123,942	3.6	150,501	20.5				
Minor Injuries	5,540	0.2	8,705	1.2	5,936			
b.) Long-term Care for Permanently Disabled	122,167	3.5	148,346	20.2				
C. Funeral Services								
	39,907	1.1	813	0.1				
Subtotal	293,324	8.4	310,513	42.3	5,936	8.3		
D. Human Cost								
Pain, Grief and Suffering	506,450	14.6	113,970	15.5	736	1.0		
PROPERTY DAMAGE								
A. Lost Economic Opportunity	57,135	1.6	12,915	1.8	12,915	18.1	5,535	13.0
B. Vehicle Repair Cost	76,930	2.2	45,647	6.2	40,756	57.0	33,257	77.9
Subtotal	134,065	3.9	58,562	8.0	53,671	75.1	38,792	90.9
ADMINISTRATION COST								
Police, Legal, Insurance	5,919	0.2	23,881	3.2	8,688	12.2	3,879	9.1
T O T A L	3,472,008	100	734,867	100	71,483	100	42,671	100

8. CONCLUSIONS

It was discovered that in fatal accidents, 73 % percent of its costs are due to lost income of fatalities and permanent disabilities. Amounting to PhP 2,532,250 per fatal accident, this discrepancy produces a ripple effect on the victims' dependents. Part of it could have been disposable income that could have helped the economy. It is noteworthy that medical costs constitute 8% of the total costs, while pain, grief, and suffering are marked at 14%. A slightly higher

Medical cost of serious injuries comprises the bulk of the total cost for serious injury accident. Amounting to PhP 310,513 per serious accident, this gives explanation for the incidence of intentional "rolling-over" for hit-and-run cases. Since life indemnity from court rulings would only require offenders to pay the petitioner a measly amount of PhP 50,000, instead of paying for the medical expenses of the injured.

Majority of the cost acquired from minor injury accident are mostly property damages. Following closely is the administration cost. The value of administration cost clearly shows the resources required by concerned authorities to perform their duties properly. Without this,

more under-reporting and inaccuracy of data for accident will be expected, thus giving the vague impression of roadworthiness and road user safety. The wide occurrence of underreporting is one of the threats for any study. Accurate reporting could have given the authorities and policymakers factual values on the damages involved thus they have tools to evaluate existing policies and programs on road safety.

9. RECOMMENDATIONS

The extent of underreporting of accidents must be explored. Another topic needing to be scrutinized upon is the complexity of accident administration costing. Doing so will help justify added resource allocations for the improvement of existing databases and equipment being used in accident investigation. Improved knowledge on administration costing will rationalize added road emergency services and mobile traffic patrols.

The study is limited to Metro Manila due to geographic, communication and financial constraints among others,. It is recommended that a national costing of road accidents be done immediately to address worsening state of road safety in the provinces. If left alone, accident statistics will remain inaccurate and unrepresentative of the true state of road safety in the country.

It is essential that coordination be made between concerned national agencies and NGOs in the safekeeping of their accident databases and road safety programs. This will identify, correct, and even prevent loopholes in the system. It needs to be reiterated that road safety is not only a transport problem; it is also a social, health, and economic problem as well.

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Appendix

Medical Cost per Accident Severity

Fatal Crash

An average of 1.64 deaths, 1.4 serious injuries and an average of 1.4 minor injuries for a fatal crash were adopted.

Fatalities	PhP 1,768 = $(1.4 * 63,159) * 0.02$
Wherein:	
1.4	= average no. of serious injuries per fatal crash
PhP 63,159	= average cost of hospitalization of fatal injuries
0.02	= (2%) percentage of serious injuries that lead to death
Serious injuries	PhP 123, 942 = $(1.4 * 88,530)$
Wherein:	
1.4	= average number of serious injuries per fatal crash
PhP 88,530	= average hospitalization cost for serious injuries
Minor injuries	PhP 5,540 = $(1.4 * 3,957)$
Wherein:	
1.4	= average number of minor injuries per fatal crash
PhP 3,957	= average medical treatment cost for minor injuries
Long term care for permanently disabled	PhP 122,167 = $(1.4 * 1,745,247) * 0.05$
Wherein:	
1.4	= average number of serious injuries per fatal crash
PhP 1,745,247	= cumulative cost of long term care for permanently disabled
0.05	= (5%) percentage of serious injuries that lead to permanent disability
Early funeral cost	PhP 39,907 = $(1.64 * 23,925) + (1.4 * 0.02) * 23,925$
Wherein:	
PhP 23,925	= early funeral cost
1.64	= average number of fatalities per fatal crash
$1.4 * 0.02$	= average number of fatal injuries per fatal crash

Serious Injury Crash

An average figure of 1.7 serious injury casualties and 2.2 minor injury casualties will be used to compute for the medical costs of serious injury crashes

Fatalities	PhP 2,147 = $(1.7 * 0.02) * 63,159$
Wherein: 1.7	= average number of serious injuries per serious injury crash
0.02	= (2%) percentage of serious injuries that lead to death
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Serious injuries	PhP 150,501 = $1.7 * (88,530)$
Wherein: 1.7	= average number of serious injuries per serious injury crash
PhP 88,530	= average hospitalization cost of serious injuries
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Medical cost of minor injuries	PhP 8,705 = $2.2 * (3,957)$
Wherein 2.2	= average number of minor injuries per serious injury crash
PhP 3,957	= average medical treatment cost of minor injury crash
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Long term care for permanently disabled	= PhP148,346 = $(1.7 * 0.05) * 1,745,247$
Wherein 1.7	= average number of serious injuries per serious injury crash
0.05	= (5%) percentage of serious injuries that lead to permanent disabilities
PhP 1,745,247	= cumulative cost of long term care for permanently disabled
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Early funeral cost	PhP 813 = $(1.7 * 0.02) * 23,925$
Wherein PhP 23,925	= early funeral cost
1.7 * 0.02	= average number of fatal injuries per serious injury crash

Minor Injury Crash

International statistics have shown that a minor injury crash results to an average 1.5 minor injury casualties.

Medical cost of minor injury	= PhP 5,936 = $1.5 * (3,957)$
Wherein 1.4	= average number of minor injuries per minor injury crash
PhP 3,957	= average medical treatment cost of minor injuries