Costs of Injuries Due to Interpersonal and Self-Directed Violence in Thailand, 2005

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Violence, a serious public health problem in Thailand, remains largely unknown for its economic costs. This study is a national-level economic cost-estimates of injury from interpersonal and self-directed violence for Thailand during 2005 using the World Health Organization-US Centers for Disease Control and Prevention's guidelines. Direct medical costs from self-directed violence totaled 569 million Baht (THB) while the cost of interpersonal violence was THB 1.3 billion. Productivity losses for injuries due to self-directed violence were estimated at THB 12.2 billion and those for interpersonal violence were THB 14.4 billion. The total direct medical cost, thus, accounted for about 4% of Thailand's total health budget while the productivity losses accounted for approximately 0.4% of Thailand's GDP. In summary, interpersonal and self-directed violence caused a total loss of 33.8 billion baht for Thailand in 2005. More than 90% of the economic loss was incurred from productivity loss and about four-fifths came from men.

Keywords: *Violence, Suicide, Economic cost*

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Globally, Disability Adjusted Life Year (DALY) loss from interpersonal and self-directed violence is about 4.2% and 1.7% of total DALY losses in men and women respectively[1,2].

In Thailand, violence accounted for a slightly higher burden than the world's average, at 5% and 2% of total DALY loss in men and women, respectively in 1999[3]. In addition to lives and health loss, violence places a massive burden on national economies. Various estimates of societal loss resulting from interpersonal and collective (civil war included) violence range from 0.3-90 per cent of annual GDP[4].

While our understanding of the epidemiological profile and the burden of violence in Thailand has improved, no study has investigated the economic costs of injury from interpersonal and self-directed violence in monetary terms.

To fill the knowledge gap, this paper estimated the costs of injuries due to interpersonal and self-directed violence occurring during 2005 in Thailand using guidelines from the World Health Organization (WHO) and the US Centers for Disease Control and Prevention (CDC)[5].

This study serves as an example for estimating the economic loss due to other diseases and risk factors for Thailand and also for other countries with similar levels of data sources available.

Material and Method

Economic costs of injuries from interpersonal and self-directed violence were estimated using the WHO-CDC Guidelines for estimating the economic costs of injuries due to interpersonal and self-directed violence. Table 1 provides detailed information on methods applied.

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Table 1. Information and formulas used in economic costing calculations

Parameter	Formula	Data source
Fatal incidence (I1)	= (reported deaths from self-directed and interpersonal violence) x (incomplete registration rate)	2005 National Vital Registry
Serious injury(I2)	= (injured inpatient admissions) x (utilization rates)	2005 National Health Security Office inpatient data and National Health and Welfare Survey
Slight injury (I3)	= (serious injury) x (ratio of non-admission to admission rate)	2005 National Health Security Office inpatient data and National Health and Welfare Survey
Direct medical cost	Serious Injury => {Serious injury incidence x (IP unit cost adjusted by charge weights for violence causes + OP unit cost adjusted weights for violence causes} Slight Injury => {Non-serious injury incidence x OP unit cost adjusted weights for violence causes}	
Indirect productivity cost	Fatal injury => { I1 fatal injuries x 365 x P5 x D1 } Serious => { (I2 short term injuries) x P3a x P5 } + { (I2 long term injuries) x 365 x P5 x D2 x Disability weight} Slight => { I3 x P4 x P5 }	
• Average age at death from violent injury (P1)		2005 National Vital Registry
• Average age at retirement / at which a person ceases to work (P2)		Formal national retirement age
• Average number of days a victim of a serious injury is unable to resume her/his normal activities (at the hospital and recovering from home) (P3a)		Global Burden of Disease Study, 2000
• Average number of years a victim of a serious injury is unable to resume her/his normal activities (at the hospital and recovering from home) for long term sequelae See D2 (P3b)		Global Burden of Disease Study, 2000
• Average number of days a victim of a slight injury is unable to resume her/his normal activities (recovering from home and during out-patient visits) (P4)		2006 National Health and Welfare Study
• Average income loss per capita per day, incorporates paid and unpaid work as described above (P5)		2006 National Labour Force Survey
• Ratio avg unpaid work hours to avg paid work hours		2004 National Time Use Survey
• Discount factor (D)	$D1 = 1 / 0.03 – 1 / [0.03 \times (1.03)^{P2-P1+1}]$ $D2 = 1 / 0.03 – 1 / [0.03 \times (1.03)^{P3b}]$	

Definition

Self-directed violence is defined as an act of violence inflicted upon oneself, whereas interpersonal violence is an act of violence inflicted by another individual or by a small group of individuals.

Violent injuries are categorized based on the severity of the injury into one of three groups. First, a fatal injury is defined as one in which the patient died as a result of that incident. Second, a serious injury is defined as one that did not cause the patient's death

within 30 days but was serious enough for the victim to be admitted into hospital as an in-patient. Third, a slight injury is one that required an accident and emergency department (A&E) visit but was not followed by hospital admission.

Incidence data and data sources

The data used in this study are derived from violent events occurring during 2005 and identified using existing national data. Violence-related injuries are classified using the International Classification of Diseases, 10th Revision Thai Modification (ICD-10-TM) codes (self-directed: codes X60-X84; interpersonal: codes X85-Y09) and were stratified by age and sex as well as by their intention either self-directed or interpersonal, related mechanisms and type of injury.

Fatal incidence is derived from national vital registration data classified by ICD-10-TM and redistributed for unknown causes of death. Mortality data from vital registry were compared with police data and other health reports.

The incidence of non-fatal violence-related injuries was estimated using the 2005 national inpatient dataset from the National Health Security Office and admission rate information from the 2005 National Health and Welfare Survey, a national representative household survey conducted by the National Statistical Office. The national inpatient database covers all patients entitled to national health security and civil service medical benefit regardless of hospital types.

Non-fatal incidence that did not require admission to hospital is derived from age-sex specific ratios of outpatient to inpatient utilization from the 2003 National Health Examination Survey. Information on the mechanism of violence (self-directed or interpersonal) was not available for non-hospitalized incident cases and was assumed to be similar to that for hospitalized incidence.

Cost data and estimation

The WHO guidelines provide a broad framework of cost categorized as direct and indirect cost. Direct cost is grouped into medical and non-medical cost. Direct non-medical costs include those incurred by the criminal justice system, costs of foster care, and private security contracts.

Indirect costs refer to resources and opportunities lost as a consequence of violence, both tangible and intangible. Productivity loss measures the loss of earning experienced by victims of violence and concerned family members, friends and employers. Other tangible costs include lost investments in social capital (e.g. education of the victim and perpetrator), life insurance costs, reduced productivity or output by the perpetrator, and macro-economic costs (e.g. reduction in property values or foreign investment due to violence). Intangible costs refer to reductions in quality of life.

Our study provides the estimates of 2 categories, namely direct medical cost, and productivity loss. All cost data is expressed in values of Thai Baht (THB). A lifetime approach is employed to estimate the economic cost of injury based on the incidence data described above and disaggregated national unit cost data.

Direct medical cost data is derived from health service utilization and costs occurring during the year 2005. Hospital unit cost (THB 2,537 per admission) was derived from reported national hospital costs for all causes adjusted by relative diagnostic related groups (DRGs) charge weights and length of stay for inpatient violence-related cases. Medical costs for fatal injuries were derived by applying the hospital unit cost to admission discharged as death.

Outpatient unit cost (THB 795 per visit) was also obtained from the same source and applied similar weights as that for in-patient cost to adjust for violence caused due to the absence of cause linkage to the outpatient unit cost. It should be noted that the database captured only public hospitals under the jurisdiction of the MOPH, there is no systematic data in non-MOPH hospitals. However, it covered more than 70% of total admissions nationwide. Direct medical costs are classified into fatal, slight and serious injuries.

Indirect costs are estimated for fatal, serious, and slight injuries using a human capital approach by measuring the value of time lost due to absence from work or reduced productivity. Future earnings are discounted at a rate of 3%. Age at death from violent injury was obtained from vital registry data. The average age at retirement was 60 years old, based on the formal national age at retirement. Inactive days caused by slight injuries were derived from the average number of days with limited daily activities ascertained from a 2006 National Health and Welfare Survey, and inactive days caused by serious injuries were derived from the average duration of injuries by body part provided by the Global Burden of Disease Study[6].

Average income loss per day due to violence was estimated by age and sex group. This estimate was derived from the summation of the product of the average national wage per day and the average number

of days of lost work; and the product of the average national wage per day and the average number of days of lost work weighted by the ratio of the average number of unpaid work hours to paid work hours.

Average national wages before taxes were obtained from the 2005 National Labor Force Survey conducted by the National Statistical Office, which incorporated formal and informal income but not unpaid or in-kind work. Days spent on unpaid productive activity were obtained from a national time use survey conducted in 2004. The unemployment rate, while known for the period (1.8%)[7], was not applied as we assumed that there was economic loss for the entire working population.

Results

In 2005, self-directed and interpersonal violence claimed 6,586 and 5,645 deaths, respectively, in total. They also resulted in 52,348 and 86,032 incidences of non-fatal serious injuries, and 270,418 and 332,133 incidences of non-fatal slight incidence respectively. Violent injuries claimed deaths among the prime of life, peaking at 30-44 in both men and women for self-directed violence, and at 15-29 in men and 30-44 in women for interpersonal violence (Fig. 1).

Self-directed violent injuries claimed 2% fatalities, 16% serious and 82% slight injuries. The profile is quite similar to the interpersonal violence injuries which claimed 2% fatalities, 20% serious and 78% slight injuries.

However, there is a specific, epidemiological profile type of violence by gender (Fig. 2). A high peak of self-directed violence among women was observed among those aged 15-29 years; this figure is twice as high as for men. In contrast, interpersonal violence, among men, peaked at the age of 15-29 years, and was three times higher than that of self-directed violence. Injuries damaged the health of prime age young adults, both men and women.

Poisoning was the most common form of serious self-directed injury for both men and women (84% men, 95% women). Sharp/blunt objects (men, 67%, women, 43%) and assault by bodily force (men, 15%, women, 35%) were the most common mechanisms of serious interpersonal injury; firearms accounted for 10% (n 8,275) of serious interpersonal injury.

When we combine serious and slight violent injuries, there was a gender specific mechanism (Fig. 3). More women applied poisoning than men, but more men applied sharp and blunt objects than women.

Direct medical costs for injuries due to self-directed and interpersonal violence totaled THB 1.9 billion in 2005 (Table 2).

The total direct medical cost for fatal and non-fatal injuries from self-directed violence was THB 569 million and that for interpersonal violence THB 1.3 billion. Nearly 75% (THB 1.4 billion) of direct medical costs were attributable to injuries among men.

The direct medical cost per incident event for THB 26,719 or 1.7 times greater than the overall

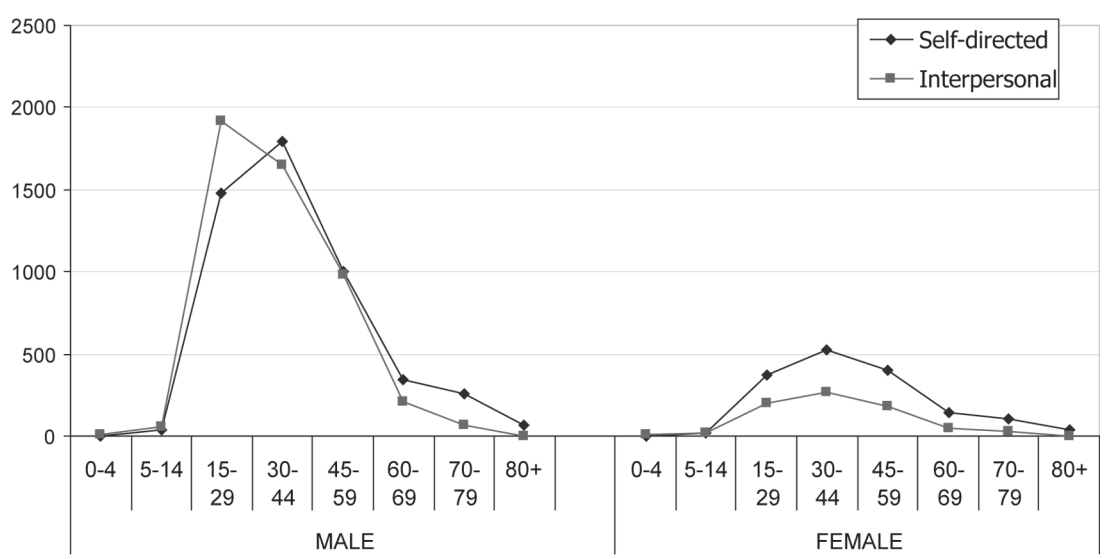

Fig. 1 Number of fatal violent injuries by types, 2005

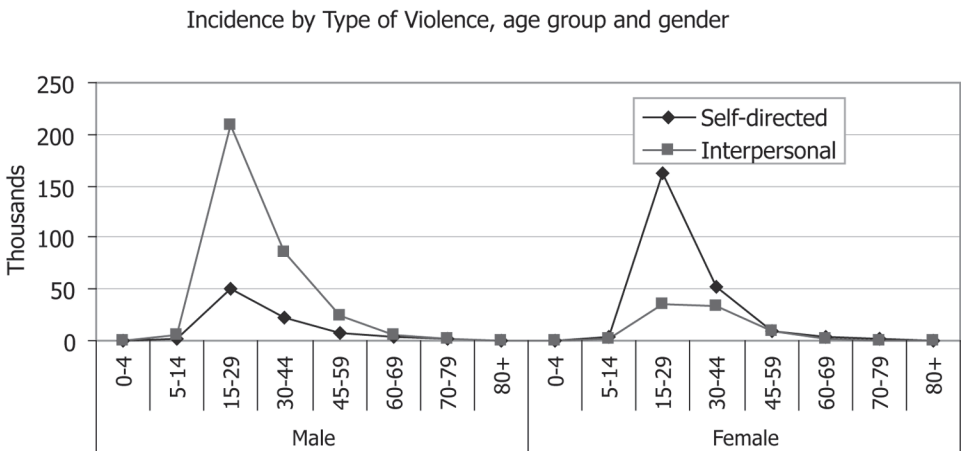

Fig. 2 Incidence of serious and slight injuries from violence by types, 2005

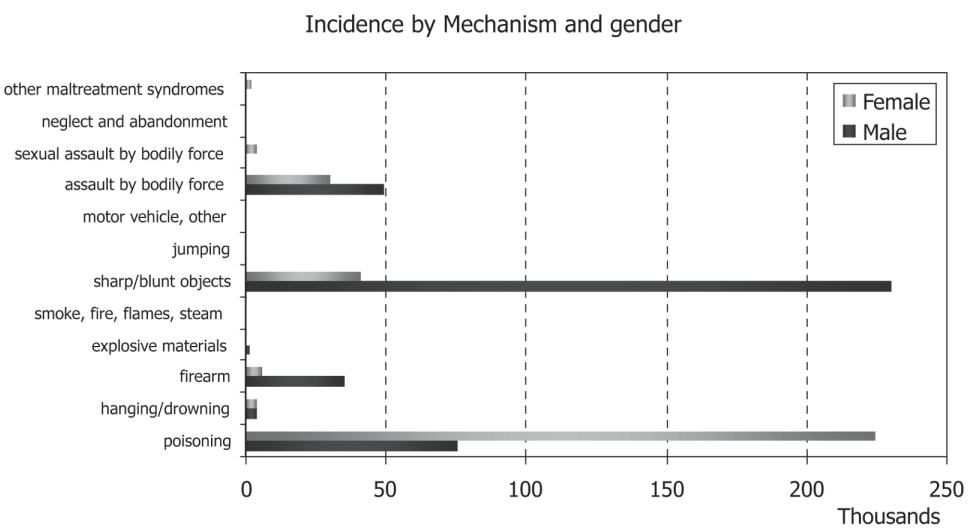

Fig. 3 Incidence of serious and slight injuries from violence by mechanisms, 2005

direct medical cost per incident event for serious interpersonal violent injuries (THB 15,911).

The share of medical costs for all violent incidence are shown in Fig. 4. Among self-directed violence, poisoning incurred the largest cost both in men and women (72%, and 91% respectively). On the other hand, violence from sharp/blunt objects resulted in the highest medical cost for both men and women. Second to this were firearm in men (19%) and assault by bodily force in women (25%).

Productivity losses from injuries due to self-directed and interpersonal violence totaled THB 31.9 billion (Table 2). Indirect medical cost for self-directed injuries totaled THB 15.4 billion and that for interpersonal injuries was THB 16.5 billion. More than 80% of productivity losses were attributable to injuries among men, and as might be expected due to the incorporation of lost productivity due to premature death, productivity losses for fatal injuries were notably greater than those for serious or slight injuries.

The direct medical cost of injuries due to violence accounted for about 4% of Thailand's total health budget in 2005 (approximately THB 50 billion). Productivity losses due to violence related injuries

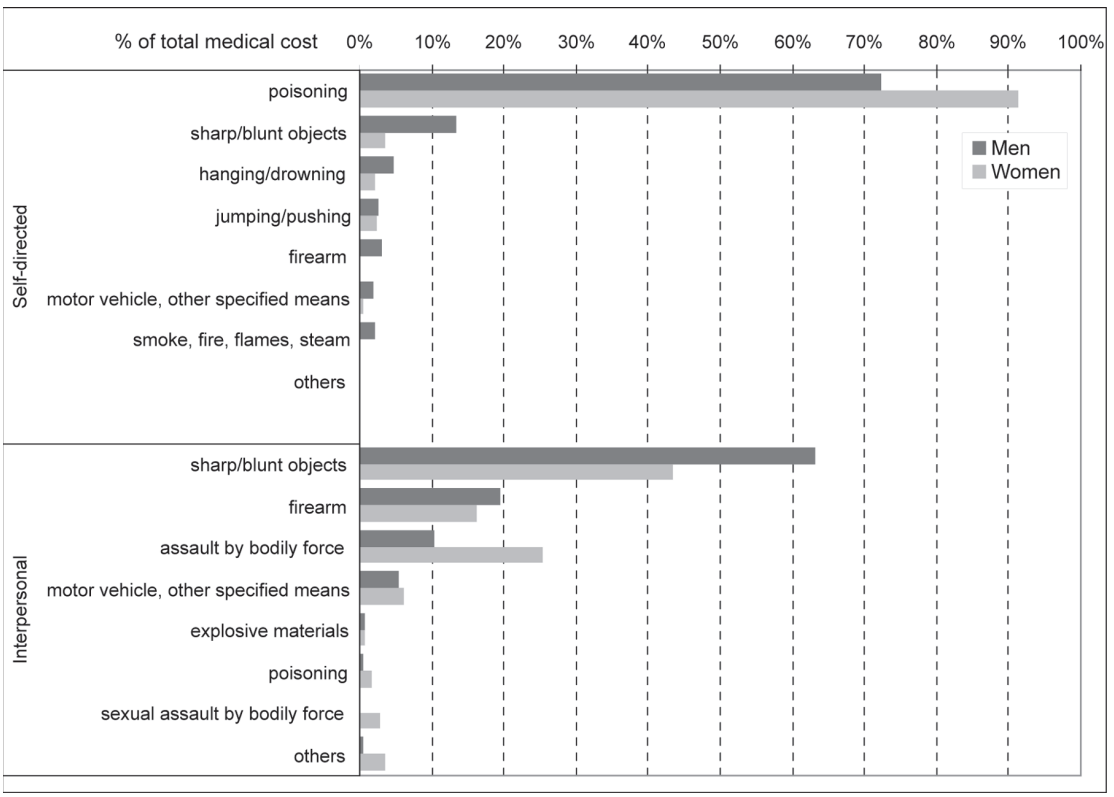

Fig. 4 Total direct medical cost by mechanism of injuries

accounted for approximately 0.4% of Thailand's GDP (THB 6.9 trillion) in 2005†. During 2005, estimated economic costs per incident violence related injury ranged from THB 795 for direct medical costs of slight injuries to nearly THB 2 million for productivity losses associated with fatal self-directed injuries among men.

Discussion and policy recommendations

Costs of violence across studies vary depending on the definitions applied, the types of costs included, and the methodologies used[8]. The US Department of Justice[9] reported the estimated direct costs of violent crime to victims resulting from short-term medical expenses and work loss at $1.8 billion, equivalent to 0.02% of the US GDP in 1994. When including indirect cost, the total amount is significantly higher. A study including psychological costs of pain and suffering into the estimate resulted in the cost equivalent to 6.5% of GDP, or $1100 per person in the US[10].

This study provides the economic loss from medical expenses and productivity loss due to self-directed and interpersonal violence in Thailand in 2005. It employs international guidelines with existing national data sources. Due to data limitation, we did not attempt to measure non-injury health effects, which are life-long and therefore likely to be many times greater in magnitude than the costs of treating physical injuries alone.

These cost estimates almost certainly underestimate the actual totals due to incomplete reporting systems and the illicit nature of interpersonal violence. Nevertheless, death estimates in this study are slightly higher than reported cases in police records. Information

† Evans and colleagues advise that only the indirect cost component involving market production (e.g., formal labour force) should be expressed as a percentage of GDP, and otherwise advise against such comparison. However, in the absence of a suggested alternative, readers will undoubtedly make comparisons to GDP; thus, the information is provided here with a note of caution. See also Evans DB, Chisholm D, Adam T, Tan Torres Edejer T. Cost of illness studies: counting what matters. Unpublished manuscript.

Table 2. Incidence of violent injuries and associated direct medical costs and productivity losses by age, sex, and severity and type of injury, Thailand, 2005

	Self-directed violence								
	Incident events			Direct medical cost (million THB)			Productivity loss (million THB)		
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
Total	6,586	52,348	270,417	16.0	337.5	215.1	14,272.7	663.2	469.2
Men	4,991	19,547	69,103	10.9	157.2	55.0	11,142.7	231.7	128.6
Women	1,595	32,801	201,314	5.0	180.2	160.1	3,130.0	431.5	340.7
Men									
0-4	-	188	633	-	0.6	0.5	-	-	-
5-14	40	240	808	0.0	1.1	0.6	-	-	-
15-29	1,477	10,641	40,030	2.4	76.8	31.8	3,728.7	135.2	60.8
30-44	1,799	5,247	17,766	3.1	43.6	14.1	5,455.8	66.2	42.1
45+	1,675	3,231	9,866	5.5	35.2	7.8	1,958.2	30.4	25.7
Women									
0-4	-	145	643	0.0	0.3	0.5	-	-	-
5-14	19	767	3,401	0.0	3.6	2.7	-	-	-
15-29	375	20,812	141,782	1.8	108.4	112.8	1,020.8	354.4	230.3
30-44	522	7,868	44,585	1.7	45.5	35.5	1,432.8	65.5	93.2
45+	679	3,209	10,903	1.5	22.4	8.7	676.4	11.6	17.2
	Interpersonal violence								
	Incident events			Direct medical cost (million THB)			Productivity loss (million THB)		
	Fatal	Serious	Slight	Fatal	Serious	Slight	Fatal	Serious	Slight
Total	5,645	86,032	332,133	25.9	1,090.5	264.2	13,395.3	2,495.4	603.1
Men	4,887	72,843	259,866	24.3	962.3	206.7	11,835.0	2,142.2	500.0
Women	758	13,189	72,267	1.6	128.1	57.5	1,560.3	353.3	103.1
Men									
0-4	8.0	151.0	508.0	0.2	2.5	0.4	-	-	-
5-14	59.0	1,271.0	4,279.0	0.3	11.9	3.4	-	-	-
15-29	1,916.0	44,030.0	165,637.0	10.2	579.5	131.7	4,925.1	1,132.9	265.8
30-44	1,646.0	19,602.0	66,372.0	7.4	258.4	52.8	4,913.3	666.5	163.1
45+	1,258.0	7,789.0	23,070.0	6.3	110.0	18.3	1,996.6	342.7	71.1
Women									
0-4	13.0	119.0	528.0	0.1	1.5	0.4	-	-	-
5-14	23.0	335.0	1,486.0	0.0	2.1	1.2	-	-	-
15-29	200.0	4,611.0	31,412.0	0.4	41.8	25.0	544.1	115.6	36.7
30-44	267.0	5,051.0	28,622.0	0.4	53.5	22.8	722.7	158.6	49.9
45+	255.0	3,073.0	10,219.0	0.7	29.2	8.1	293.5	79.1	16.5

Note: Amounts may not sum exactly due to rounding

on causes of death from vital registry suffered from a large proportion of undetermined intent causes which we assumed proportional redistribution back to the known causes. Although ICD-10-TM is able to classify violence by its mechanism, cause of death data presents incomplete information for this. Ambulance services are not fully included in the patient database and the estimates should be improved with availability of their incident and cost data.

Estimates regarding direct medical cost due to serious injuries should be improved for fatal injuries using health services prior to deaths provided that the

proportion of deaths at sites of deaths after being rescued is known.

In terms of family and intimate partner violence, incomplete information can be found from health services. In 2005, there were about 11,791 violent cases going to 109 sentinel public hospitals in the OSCC (One Stop Crisis Center) which covers only violence in children and women according to the 2003 Child Protection Act and the 1999 government's measure against violence to children and women. The figures, although reflecting only uncovered cases, provide information on ER and OPD visits in more detail than other reports.

The economic cost from our study is close to out-of pocket medical cost estimates of smoking-attributable diseases, which amounted to 9,857.02 million baht, 0.48% of GDP in 2006[11]. Compared with medical cost attributable to alcohol consumption[12], our direct medical cost yields one-third of that and approximately 87 times of the medical cost of alcohol-related self-directed and interpersonal injuries. Without a standard protocol of direct medical cost, results from different studies can hardly be compared and are even more difficult for further decision-making among cost-effectiveness studies.

What this study contributes to our knowledge gap is that it provides cost and incident data of self-directed and interpersonal violence in great detail of the both nature and mechanism of injuries. This is useful for policy in priority setting and directing appropriate measures relevant to where problems exist.

The availability of accurate and reliable data of the highest quality from information systems, particularly health-related information systems, is critical in providing useful information on the burden of violence and injury to decision makers at local, regional, and national levels. As ministries of health take a leading role in violence and injury prevention[13], data collection and information systems must play a central role.

In conclusion, this study uncovers and confirms the existing problems concerning the accuracy of the cause of death in vital registration and inadequate information on epidemiology profiles of non-fatal, non-severe outcomes of violence which do not followed by hospital admission. Discrepancies of figures across different data sources prompt policy attention to improve the foundation for better estimates in the future.

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ความสูญเสียทางเศรษฐกิจของการบาดเจ็บจากการทำร้ายกันและทำร้ายตนเองในประเทศไทยในปี พ.ศ. 2548

กนิษฐา บุญธรรมเจริญ, ภัทรพรรณ อดทน, สุวรรณา มูเก็ม, สิรินทร์ยา พูลเกิด, กัญจนา ติษยาธิคม, เดวิด ว. บราวน์, วิโรจน์ ตั้งเจริญเสถียร

ความรุนแรงเป็นปัญหาทางสาธารณสุขที่สำคัญปัญหาหนึ่งในประเทศไทย อย่างไรก็ตาม การศึกษาภาระทางเศรษฐกิจของการบาดเจ็บจากความรุนแรงในระดับประเทศยังคงมีจำกัด การคาดประมาณความสูญเสียทางเศรษฐศาสตร์จากการกระทำความรุนแรงทั้งการทำร้ายผู้อื่นและการทำร้ายตนเองในประเทศไทย ปี พ.ศ. 2548 ครั้งนี้ใช้ระเบียบวิธีศึกษาจากคู่มือขององค์การอนามัยโลกและศูนย์ควบคุมและป้องกันโรคของสหรัฐอเมริกาเป็นแนวทาง ผลการศึกษา พบว่า ค่าใช้จ่ายตรงทางการแพทย์เพื่อการรักษาการบาดเจ็บจากการเจตนาทำร้ายตนเองคิดเป็นมูลค่าประมาณ 569 ล้านบาท และค่าใช้จ่ายจากการบาดเจ็บจากการทำร้ายกันคิดเป็นมูลค่าประมาณ 1.3 พันล้านบาท ความสูญเสียกำลังผลิตจากการทำร้ายตนเองมีมูลค่าประมาณ 12.2 พันล้านบาท และ 14.4 พันล้านบาทจากการทำร้ายกัน ซึ่งมูลค่ารวมที่เกิดจากความรุนแรงคิดเป็นร้อยละ 4 ของงบประมาณด้านสาธารณสุขของประเทศไทยในปี พ.ศ.2548 หรือคิดเป็นร้อยละ 0.4 ของมูลค่าผลิตภัณฑ์มวลรวมภายในประเทศ โดยสรุป ในปี พ.ศ. 2548 ประเทศไทยมีภาระค่าใช้จ่ายที่เกิดจากการกระทำความรุนแรงทั้งจากการทำร้ายกันและการทำร้ายตนเองคิดเป็นมูลค่ารวมทั้งสิ้น 33.8 พันล้านบาท ซึ่งมากกว่าร้อยละ 90 ของค่าใช้จ่ายดังกล่าว มาจากการสูญเสียกำลังผลิตและประมาณ 4 ใน 5 เป็นความสูญเสียที่เกิดในผู้ชาย