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Original Article

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## Years of Life Lost because of Premature Death due to Intentional and Unintentional Accidents in Ghazvin Province from 2004 till 2008

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**Accepted for publication:** 2 October 2014

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### Abstract

**Background:** Accidents are the second cause of death in Iran and one of the significant challenges in public health. They can affect people in all ages. In this study, we try to calculate years of life lost due to intentional and unintentional injuries, which is considered as one of the main indicators for prioritizing public health problems.

**Methods:** This study is a practical cross sectional survey research HSR (health system research) that uses secondary analysis on the death data of Ghazvin province. The calculations also take into account the WHO standards in age group, sex and years of life lost (YLL) due to death.

**Results:** This study showed that the unintentional accidents were the leading cause of death based on YLL from 2004 until 2008 in Ghazvin province. The number of deaths due to intentional and unintentional accidents was 3796 deaths as of which 2954 (77.8%) was male and 842 (22.2%) female. In general three quarter of the YLL due to early death relates to accidents for males and less than a quarter relates to accidents for females. Between 2004 until 2008, the maximum number of years of life lost (YLL) in both sexes is for the age group of 15 to 49.

**Conclusion:** Considering the high level of years of life lost (YLL) due to accident in this province, especially in men, more appropriate interventions for the more risk prone age groups and male in general need to be taken into account.

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**Keywords:** Years of Life Lost, Accidents, Mortality, Ghazvin Province

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**Cite this article as:** Jafari N, Akbarisari A, Omodvar T, Faghihi F, Nedjat S, Rahmatian K, Hosainzaheh M. Years of life lost because of premature death due to intentional and unintentional accidents in Ghazvin province from 2004 till 2008. SDH. 2015;1(1): 9-17.

### Introduction

Nowadays, one of the basic components for sustaining development is enhancing

public health. Healthy human is the core of continuous development; on the other hand everyone's life in today's world is faced with various dangers. The most important and

considerable factors that endangers people in different countries of the world is increasing rate of intentional and unintentional injuries and accidents (1). Accident is one of the significant challenges of public health that happens frequently (2) and affects people of all ages. Accidents and injuries are considered as one of the most preventable cause of death in the world and impose a large socioeconomic burden on society especially in the developing countries (3). According to current data accidents cause more than five million deaths in a year (4) and it has been predicted that until 2020 this number will reach 8.4 million (5) and if this process continues until 2020 mortality rate will reach 83% in countries with middle and low income and 27% in countries with high income will get to 27% (3). Traffic accident is a colossal problem for public health that continuous and effective prevention of this problem requires coordinated efforts. Transportation is one of the most complex and dangerous systems that people deal with every day (6). Traffic injuries are the first cause of burden of diseases. In 2011, traffic injuries caused 20068 deaths in Iran; it means 55 deaths and 2100 injured per day, that is 2 deaths and 87 injured in an hour (7). In addition to loss of human health or life, accidents result in increased health care and rehabilitation expenses, loss of income and productivity, and psychological effects. Based on studies done by the Research Center of Ministry of Transportation, in 2007 the direct cost of treating injuries from traffic accidents were 11% of total costs and the costs of decreasing quality of life, disabilities and the consequences of socioeconomic problems are 50% of total costs.

Surveys on the causes of death show us that non-contagious diseases especially injuries and accidents had an ascending path. Although injuries and accidents are ranked second for causes of death, but considering the fact that the mean age of the death was 35 years, it can be concluded that accidents and injuries by themselves, cause more than half of years of life lost. The first step in planning

of health programs is to obtain the priorities (8), on the other hand in order to prioritize health problems necessary indicators are needed to clearly show the actual requirements for health in society (9). In order to recognize and prioritize causes of premature deaths we can use years of life lost (YLL) indicator that has been introduced by WHO in study of Global Burden of Diseases (11, 10). Years of life lost (YLL) means that a person who could have an effective life, but due to a premature death the rest of his/her life is gone. In other words, YLL shows the negative effect that losing human capital due to premature death has on the society. Years of life lost as the result of premature deaths is a valuable analytical indicator for prioritizing health problems because it can take time as its quantifying unit, it can be compared with statistics on standard life expectancy. Also, it can be applied in different geographical locations (12, 13). Not only this indicator depends on the number of deaths but also on the age of the deceased, and as the age of deceased goes down, the years of life lost goes up.

Considering the fact that reducing burden of accidents is one of the primary challenges of public health and the Ghazvin province as well as other provinces in the country is struggling with the problem of accidents, it seems that, planning in order to decrease the burden of accidents in this province like the other places is one of the most significant demands. Hence, in this study in order to obtain the most objective observation which is required for policy-making process and designing and managing programs to reduce the burden of accidents, the years of life lost (YLL) due to intentional and unintentional injuries in aged groups and sexes between 2004-2008 is considered and compared with assessments of other places in Iran and internationally.

## Methods

This study is a practical cross sectional survey research HSR (health system research) that

uses secondary analysis on the death data of Ghazvin province. The persons who were passing by the province and have lost their lives due to accidents were omitted because of their irrelevance to the population sample. The indicator of years of life lost (YLL) has been calculated based on the standards given by World Health Organization as described below. To calculate the YLL according to the standard graphs on life expectancy, first age of deceased is reduced from the life expectancy based on that person's age and sex group and later using a weighting and discounting coefficient the years of life lost is calculated.

With accepting the life expectancy standards for years of life lost, in fact the Standard Expected Years of Life Lost (SEYLL) is being calculated.

Therefore, SEYLL is the difference between age at the time of death and standard life expectancy for that age and sex group:

$$SEYLL = \sum_{x=0^d, x^e}^L$$

The SEYLL of the population is the simple sum of all individual SEYLL of the deceased in that society (14).

Calculating SEYLL: for calculating the SEYLL the following statistical data is required: Standard life expectancy chart, discounting coefficient, weighting coefficient for age, cause of death based on age, sex and if necessary place of residency.

The following relationship is used for the discount rate in disconnected time range:

$$n_{present\ value} = (1+r)^{0/5} \times \frac{1}{r} \times \left[ 1 - \left( \frac{1}{1+r} \right)^n \right]$$

Furthermore, to calculate the weighting coefficient for age in continual time the following relationship is used:

$$n_{present\ value} = \frac{1}{r} - \left( \frac{1}{r} \times e^{-rxn} \right)$$

In this study  $r = 0.03$ .  $Cxe^{-\beta x}$  is used to calculate the weighting of age where C is a fixed value of 0.1658, x is the age of deceased and  $\beta = 0.04$ . The most important factor to consider in calculating SEYLL is the combination of age, sex and the different cause of death (14).

## Results

Between the years 2004 to 2008 the total number of deaths due to intentional and unintentional injuries were 3796, from which 2954 (77.8%) were related to men and 842 (22.2%) were related to women. The mean age of persons among unintentional injuries were 38.42 years and among intentional injuries were 33.26 years.

In 2004, there were in total 18,220 years equivalent to 1,662 years per 100,000 persons were lost due to injuries, of which 14480 of these years were related to men and 3,739 years were related to women of the province. In 2005, overall 2158 years equivalent to 1,885 years per 100,000 persons were lost due to injuries, from which 17,226 years were related to men and 3,932 years were related to women of the province. In 2006, overall 2,0595 years equivalent to 1,800 years per 100,000 persons were lost due to injuries, of which 15,800 years were related to men and 4,795 years were related to women of the province. In 2007, overall 26,582 years equivalent to 2,310 years per 100,000 were lost due to injuries, from which 19,974 years were related to men and 6,608 years were related to women of the province. In 2008, overall 17,859 years equivalent to 1,541 years per 100,000 persons were lost due to injuries, of which 13,774 years were related to men and 4,084 years were related to women of the province (figure 1).

The highest number of YLL in both sexes had been seen among aged group 15-49 years that has been in 2004, 13088 years (1986 per 100000), in 2005 16229 years (2365 per 100000), in 2006, 16026 years (2284 per 100000), in 2007, 20224 years (2807 per 100000) and in 2008, 13674 years (1868 per

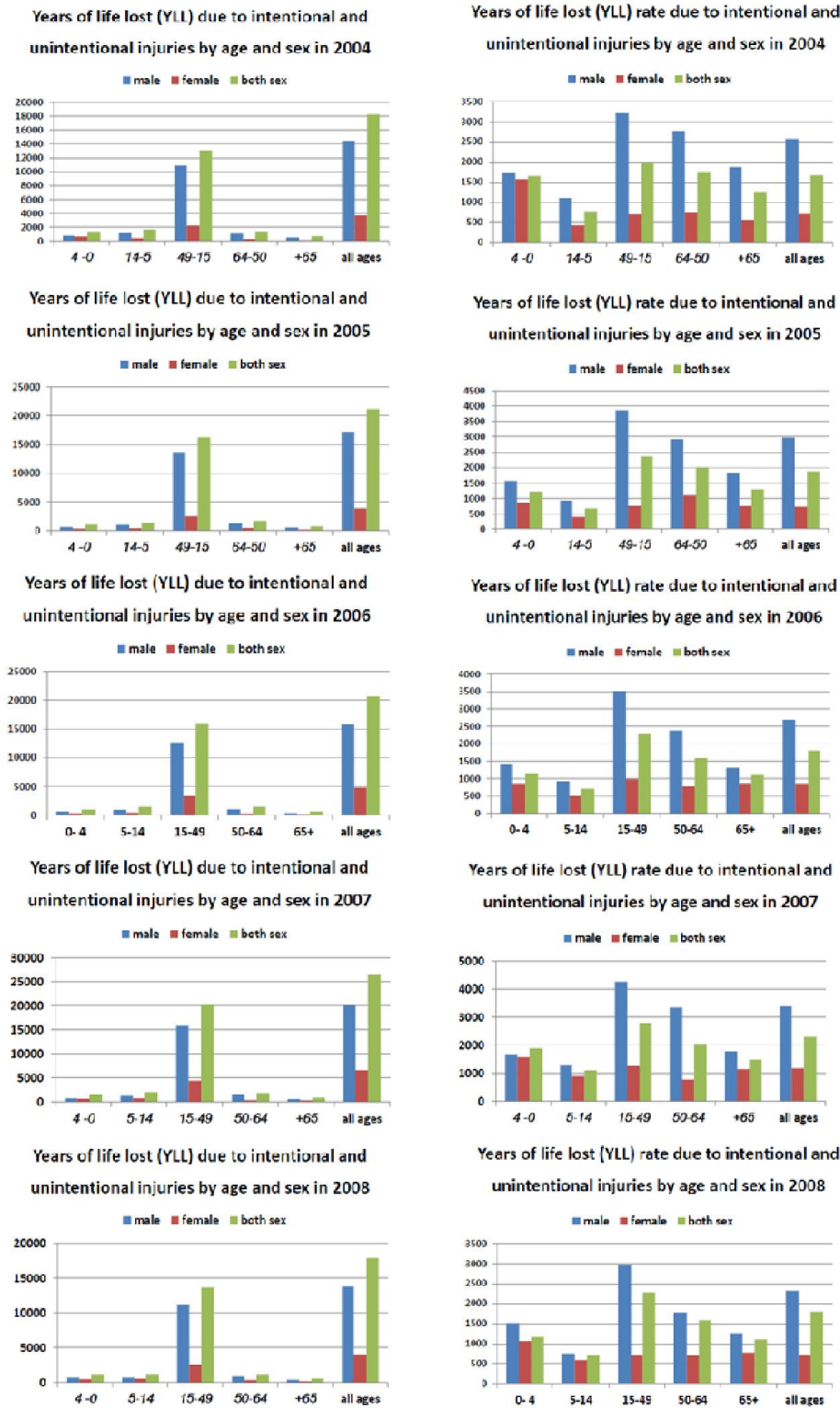
100000). (figure 1). From the total number of deaths that has been occurred in the province, 3,453 cases (91%) were related to unintentional accidents and 343 cases (9%)

were related to intentional accidents in the province. Among the unintentional accidents the greatest YLL belonged to traffic accidents (table 1).

**Table1. Years of life lost (YLL) due to intentional and unintentional injuries (2004 – 2008) in Ghazvin province**

1387			1386			1385			1384			1383			Injury Type	
YLL (%)	(per	YLL	YLL (%)	(per	YLL	YLL (%)	(per	YLL	YLL (%)	(per	YLL	YLL (%)	(per	YLL		
5.6.6	8.7.2	10.11.2	6.9.9	1.6.5	18.59.0	7.0.6	1.2.7	14.55.0	7.5.9	1.4.3	16.06.1	6.8.1	1.1.3	12.40.9	<b>Transport Accident</b>	Unintentional Injuries
1.5	2.4	28.3	0.6	1.4	16.9	0.4	8.8	10.0	0.1	33.3	4.4	7.4	81.4	<b>Poisoning</b>		
2.3	3.5	41.4	4.1	9.5	11.01	3.5	6.4	74.0	3.2	6.1	68.9	3.9	6.5	72.5	<b>Drowning</b>	
4.6	7.1	83.1	3.0	6.9	80.4	3.7	6.8	77.7	3.3	6.3	71.5	3.3	5.6	61.6	<b>Fall</b>	
4.5	6.9	81.0	2.1	4.9	56.9	3.3	5.9	68.4	2.3	4.5	50.4	1.6	2.7	29.8	<b>Burn</b>	
1.3	2.0	23.7	0.5	1.3	15.1	0.1	2.2	21.21	1.5	2.9	32.6	0.5	9.9	98.98	<b>Other accidental threats to breathing</b>	
8.5	1.3.2	15.29	1.4	2.6.3	30.34	1.7	2.1	24.18	6.3	1.8	13.33	9.8	1.3	17.88	<b>Other unintentional injuries</b>	
5.2	8.0	93.8	2.9	6.7	78.1	1.4	2.6	30.2	2.9	5.4	61.4	2.8	4.7	52.1	<b>Violence</b>	Intentional Injuries
1.5.1	2.3.3	27.01	5.1	1.1.9	13.79	4.8	8.7	99.8	4.1	7.8	87.9	5.2	8.7	95.5	<b>Suicide</b>	

**Figure 1: Years of life lost (YLL) due to intentional and unintentional injuries by age and sex from 2004 to 2008 in Ghazvin province**



## Discussion

There are numerous studies on traffic accidents and the trauma that results from such accidents currently being conducted in majority of the countries in the world and performed interventions based on these studies has resulted in a decrease in mortality rate of developed or developing countries (15, 16).

This study has showed that men who are living in this province are more than three times prone to accidents (77.8%) compared to the women (22.2%). Overall, more than three-fourth of YLL due to injuries was related to men and less than one-fourth of YLL were related to women. This result illustrates that men bear more burden from accidents in comparison to women. A study conducted in Shahrood shows that 72% of all clients accepted at trauma centers were men and 28% of them were women (17). One of the reasons for the greater mortality rate in men in Iran could be due to occupational, cultural and social characteristics that men have in Iran compared to women.

In a study done by Ferando et al. in Spain, 62% of injured from traffic accidents are men (18). In India (19) this number gets to 85.7% and in Turkey it is 64.7%. (20, 21) African and European countries with low and middle income have the most amounts of men losing their life due to accidents in the world (22).

A study done in Europe shows the younger men had the highest risk of premature death due to an accident (23). In Thailand, men are four to five times more prone to get injured from accidents than women (24). This could be because of the fact that men in comparison to women, are more involved in outdoor activities on the streets and roads due to do their job requirements and accidents are more likely to happen on these places. The most important cause of accident was high risk behavior of men while driving or a crossing the street. A study in America on the high risk behavior of teenagers between the ages of 16 and 19 shows that speeding more than 20 miles per hour, driving in the permissible

areas, endangering for the sake of entertainment and passing by multiple vehicles, were significantly more between men than women. A study done in Karachi, Pakistan shows that men are significantly more likely to jump out of an autobus while running than women (43% compared to 1.6%), hop into an autobus while running (49% compared to 12%) and run after an autobus (45% compared to 8%) (25).

The mean age of the persons in this study in Ghazvin province who had an unintentional injury was 38.42 years and 33.26 who had an intentional injury. The greatest number of YLL in both sexes between years 2004 to 2008 was related to aged group 15-49 years. This result has a high level of significance because injuries that were resulted from traffic accidents were more common in the youth who compose most of the workforce and are important to the economic production. Therefore, loss of this group of people has a great negative impact on the society and results in the loss of national assets. A study done in the Bushehr province shows that the leading cause of YLL in both sexes was related to traffic accidents. (26)

One of the findings of this study was great expected burden of unintentional injuries since it was the leading cause of death due to accidents, from total death that has been occurred in the Ghazvin province, 3,453 cases (91%) were related to unintentional accidents and 343 cases (9%) were related to intentional accidents. Among unintentional accidents, traffic accidents were responsible for greatest burden of death due to accidents (22). In both developed and developing countries, main cause of death due to accidents was unintentional accidents (27). In Europe 6% of all deaths were due to unintentional accidents responsible for 12% of YLL (4). Based on survey of burden of diseases responsibility of unintentional accidents was four times more than intentional one (13). A probable reason for this could be the existence of variety in the group of unintentional accidents and specially the categorization of traffic accidents and household accidents in this

group. Another study about death of traffic accident in developed countries illustrated that 90% of deaths belonged to passengers, motor cycles and pedestrians (15). Findings of studies in Thailand (28) and France (29) verify the same reality. Based on the WHO reports, traffic accident is the main cause of death from accidents in all of WHO's 6 different zones and yearly more than 1.3 million people die in traffic accidents. Eastern Mediterranean zone is ranked as number one in this statistics compared to the other five zones of WHO (4). Injuries and deaths due to traffic accidents are one of the main problems facing public health in developing countries. More than 85% of deaths and 90% of injuries due to traffic accidents occurred in developing countries. While among children aging 0-4 and 5-14 years the number of deaths per 100,000 persons were six times higher in countries with lower average of income than countries with higher average of income (30).

Considering the fact that traffic accident is the leading cause of death in the age group 12-59 month and 5-14 years, urgent interventions can result in substantial reduction of such deaths. It may be considered that one of the most important causes of high mortality rate due to accidents in these years is the increase of transportation vehicles and the move towards industrialization to increase the standards of living. Effective interventions that could prevent injuries and deaths are reducing substance abuse, teaching essentials for safety, improving safeguards in workplace, urgent and primary care at scene, eliminating casual factors (reducing speed, improving traffic signs, etc.), reinforcing traffic laws and improving rehabilitation services.

In this study, after traffic accidents, suicide was the second cause of premature death in this province, which compared to the situation in 2003 in South Africa (22) and in Thailand (28); it illustrates an ascending process between years 2004 to 2008 in both sexes. In 2004 suicide was the fourteenth cause of death based on YLL, number of years that

had been lost was 87 years. In men, 118 years per 100000 persons, and in women, 53 years per 100000 persons. In 2007 suicide was one of the ten causes of death and in 2008 was fifth cause of death based on YLL. The number of YLL was 233 years, which 151 years was related to women and 210 years was related to men. The most common way of suicide in men was hanging and in women was self-burning. 50% of all cases consisted of hanging and self-burning. Taking into account the fact that Iranian population is young and the increase in the number of suicides also the fact that these deaths are not reported properly and considering that only successful suicides are taken into account, the importance of this matter is magnified. Hence, contemplating for an appropriate contraption in this regard is needed (the average age of death at time of suicide is 29 years).

Although suicide is not considered as the most important problem in the world, but statistics that WHO and other health organizations published, has shown an increase in global concern regarding youth suicide. There are about one million suicides every year, in every 40 seconds one person commits suicide. This report predicts that in 2020 the number of suicides will reach 1.5 million persons. Since 50 years ago the rate of suicide has increased about 60% worldwide.

Nowadays, suicide is one of the main causes of death in age group of 15 to 44 years and unsuccessful suicide is 20 times more than successful suicide. The highest number of suicide is at Japan, USA, and Eastern European countries and the lowest number is at Latin America, Spain, Ireland and some of the Asian countries. WHO estimated that suicide results to the death of 685 people every day in China. Also, 45 young persons from 100,000 persons in Finland try to suicide in a day (31, 32).

In this study death as the result of murder is the highest reason in the group of violence, which is amounted from 1.7 to 2.2.

Although intoxication in Eastern Mediterranean countries is ranked as the fifth

cause of death and accounts for 5% of the death due to unintentional accidents (4), but in Iran it is not considered as one of the main causes of death due to accidents. Intoxication is the fourth cause of death due to accidents in high income countries. It has the greatest burden in Europe but plays a relatively small role in the causes of death in low income countries (12). In this study, the number of YLL due to intoxication was 814 years and this number reached 283 years in 2008.

This study shows that, YLL due to drowning in 2004 was 720 years and in 2008 was equal to 414 years. We have to consider that drowning is one of the main causes of death in middle and low income countries. According to WHO reports, drowning is the third cause of death due to unintentional injuries and is the greatest burden on pacific ocean countries.

Another finding of this study shows that YLL due to falling in 2004 was 615 years, in 2005 was equal to 715 years, in 2006 it was 777 years, in 2007 it was 804 years and in 2008 was equal to 831 years. Based on epidemiologic studies, falling greatly occurs in Iran, resulting to femur fracture in elder people and can cause disabilities rather than death. Therefore, falling is not one of the first ten causes of death in Iran (6). A study in Toiserkan shows that 86% of fallings merely resulted in fractures (33), while on a global scale falling is the second cause of death due to unintentional accidents (4).

One of the main restrictions of this study is the paucity, which has not been taken into consideration. However, this is one of the only studies of its kind that announces the quantity of deaths due to accidents in Ghazvin province and has conducted a comparison between the conditions in Iran with other countries of WHO. Considering the fact that on the one hand most of accidents that create burden to sudden death especially in youths can be intervened, controlled and prevented, on the other hand the fact that the increase in the wellbeing of the society is directly related to the increase of the well-being of youth, investigation and improving the youth's

health is compulsory. It is important to note that reducing the number of death and accidents require through cooperation between different organizations and having strong social health care policies is the most pivotal key in this matter that needs designing and valuating solutions proportionate to the economic, social and cultural situation of the country.

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