

Injury Mortality among Youth in Taiwan: Pattern of Changes and International Comparisons

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Objectives: To identify priorities for establishing various injury prevention programs for youth aged 15-24 years in Taiwan.

Methods: Mortality statistics were used to examine the pattern of changes between years 1964-66 and 1994-96. The rankings of injury mortality in Taiwan were compared to those of other countries.

Results: Between the two time periods the unintentional mortality rate among youth in Taiwan increased by 32.2%, and the intentional injury rate (i.e., suicide, homicide) decreased by 89%. Motor vehicle injuries showed a drastic increase, 334% for males and 387% for females. Comparing similar statistics from 39 other countries, Taiwan was found to rank 4th for males and 2nd for females in death caused by unintentional injury. Taiwan ranked 33rd for males and 29th for females in death due to intentional injury. Taiwan ranked the highest in terms of youth death by fire and flames.

Conclusion: Based on our findings, injury research and injury prevention programs for youth in Taiwan should focus on reducing the number of death by motor vehicle injuries and fire and flames.

Key words: accidents, mortality, international health, Taiwan

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Introduction

People between the ages of 15 and 24 years old seem to enjoy the healthiest lives, with the average number of visits to the physicians is the lowest of any age group ^[1]. Injury mortality rate of youth is also the lowest when comparing with other age groups. However, people between the ages of 15 and 24 had the highest proportional mortality from injuries compared to that of other age groups in Taiwan ^[2]. Unfortunately, the health of youth has been overlooked in Taiwan, and it was not until 1993 that health goals for this sizable demographic group were established ^[3].

Injury prevention and control programs, especially for youth have been rapidly established in developed countries over the past three decades ^[4-7]. To avoid wasting scarce human resources, developing and newly industrialized countries can learn from the lessons and experience of developed countries ^[8-11]. A necessary first step in injury prevention and control is to make valid comparisons among countries, which may not only lead to a recognition of important differences but also to the identification of successful preventive measures ^[12]. The purpose of this study was to use mortality statistics to examine the nature and severity of the problem posed by injury among youth in Taiwan and to compare these figures with those of other countries so that priorities for the development of injury prevention programs can be established.

Materials and Methods

The injury mortality data for Taiwan were derived from official publications of vital statistics ^[2]. Causes of death were classified according to ICD-7 (International Classification of Disease, Seventh Revision) for the year 1964-66 and ICD-9 (International Classification of Disease, Ninth

Revision) for the year 1994-96 ^[13,14]. Unintentional injuries included motor vehicle injury, poisoning, falls, fire and flames, drowning. Intentional injury included suicide and homicide. International mortality data were taken from World Health Statistics Annual 1993 ^[15]. Age-sex-cause-specific mortality rates (MR, per 100,000) and proportional mortality rates (PM, %) were compared. Youth is defined as referring to people aged 15-24 years ^[16].

Only countries with a population greater than 2 million were compared in this study. These countries were categorized as high-income countries (HICs) or middle-income countries (MICs) according to the classification scheme of the World Bank ^[17]. Twenty HICs were included, the lowest being Ireland with an annual gross national product (GNP) per capita of US\$ 12,200 and the highest being Japan with a GNP of US \$ 28,190. Eighteen MICs were included, the lowest being Armenia with a GNP of US\$ 780 per capita and the highest one being Puerto Rico with a GNP of US\$ 7,450. The annual GNP per capita in Taiwan was US\$ 11,597 in 1994 ^[18]. The names of countries classified into HICs or MICs are listed in Appendix.

Results

The mortality rate from natural causes of death among youth in Taiwan decreased from 105.4 per 100,000 in 1964-66 to 29.4 in 1994-96 for males and from 91.2 to 21.3 for females. The unintentional injury mortality rate, however, increased by 32.2%, from 47.8 in 1964-66 to 63.2 in 1994-96. In contrast, the mortality rate from intentional injury decreased by 89%, from 52.1 to 5.8 (Figure 1 and 2).

Figure 3 reveals the percentage of change in death rates according to specific injuries that took place from 1964-66 to 1994-96 by sex. Motor vehicle injury (MVI) showed a drastic increase

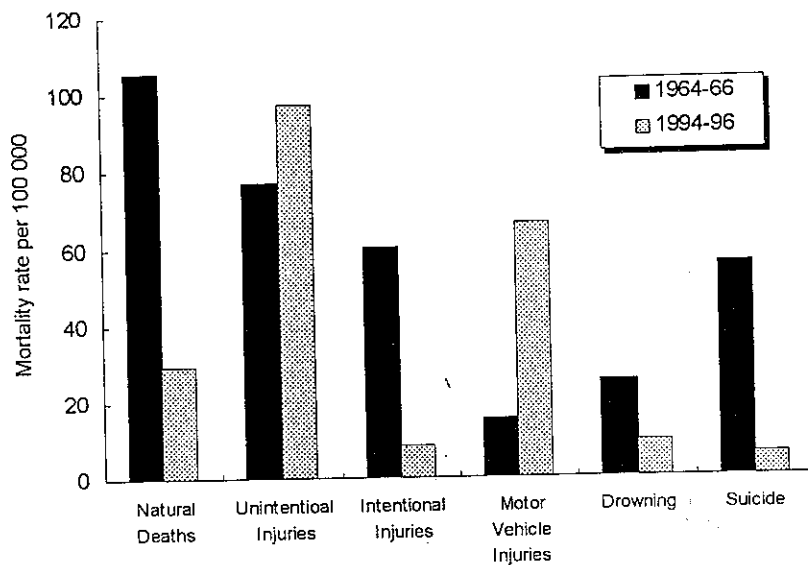


Fig. 1 Mortality rates from selective causes of death among male youth (aged 15-24) in Taiwan, 1964-66 and 1994-96.

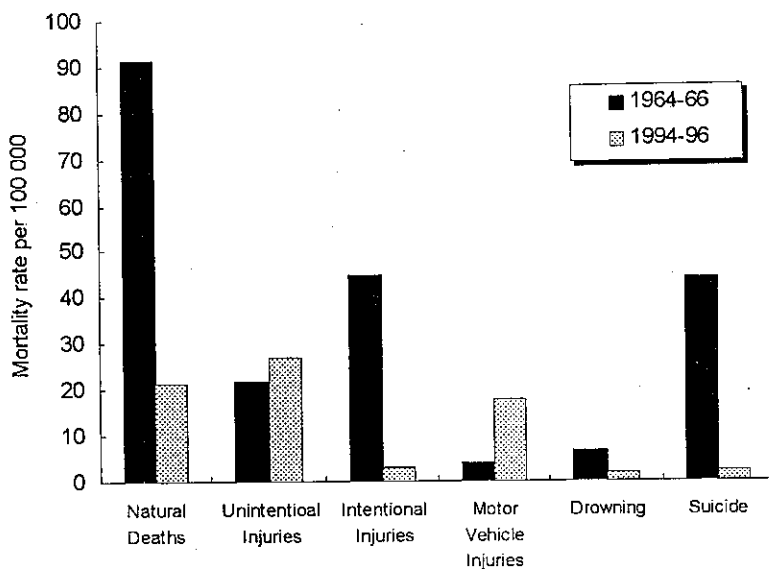


Fig. 2 Mortality rates from selective causes of death among female youth (aged 15-24) in Taiwan, 1964-66 and 1994-96.

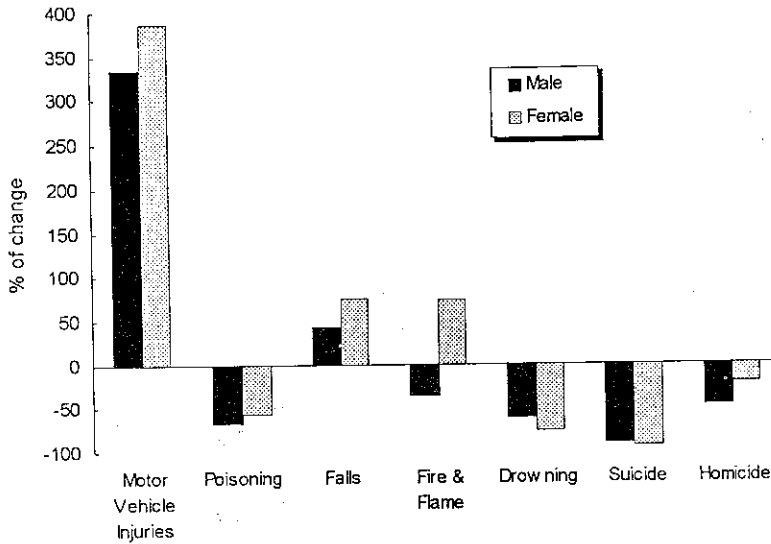


Fig. 3 Percentage change in death rates for various injuries among youth in Taiwan by sex, 1964-66 compared with 1994-96.

(334% for males and 387% for female) over the past three decades. Except for deaths from falls and fire and flames among females, all other injury rates had decreased.

According to Table 1 and 2, the MR and PM ranks from unintentional injuries among Taiwanese youth were high when compared to these of 39 countries, while deaths from intentional injuries were comparatively low. The unintentional injury MR for both males and females in Taiwan were higher than these found in all HICs considered here. For males, three MICs had higher rates than Taiwan: Latvia, Russian, Lithuania. For females, only one MIC, Latvia, had higher rates than Taiwan. However, the PM for unintentional injury for males in Taiwan ranked highest among the 39 countries and second for females. Specially, the MR and PM from fire and flames ranked first among youth in Taiwan when compared to these of all countries, and the MR and PM from drowning, both males and females, were higher than all other HICs. Taiwanese males and females ranked third in terms of MVI, though the PM for this specific

injury were 4th for males and 7th for females. Youth in Taiwan were found to have a smaller chance of dying from suicide or homicide than young people in other countries. The MR and PM from suicide were lower among Taiwanese males than all the other HICs, which, generally speaking, had higher suicide rates (MR and PM) than MICs.

Discussion

The data presented in this study shows that the ranking of deaths due to various injuries among youth in Taiwan are different from other countries and have undergone a different pattern of changes. There have been increases in some injury rates (e.g., MVI and falls), and decreases in others (e.g., poisoning, drowning, intentional injury). Some injury rates are higher than those of other countries (e.g., fire and females, MVI); others are lower (e.g., suicide and homicide). Such information is essential if we are to design effective injury preventive programs.

Over the past three decades, though Taiwan

Table 1 Injury mortality rate (MR, per 100,000) among youth in Taiwan as compared to high-income countries and middle-income countries by sex and cause-of-death.

Cause of death	Taiwan	Rank*	Middle-income countries		High-income countries		
			Medium	Range	Medium	Range	
			Male				
Unintentional Injuries	100.4	4	63.2	10.5 - 126.7	47.1	15.0 - 84.1	
Motor Vehicle Injuries	66.7	3	39.8	13.6 - 84.8	34.5	6.4 - 62.4	
Poisoning	3.3	10	2.5	0.2 - 8.5	1.2	0.2 - 5.4	
Falls	3.7	8	2.5	0.0 - 7.4	1.4	0.0 - 3.9	
Fire and Flames	2.3	1	0.7	0.0 - 2.1	0.6	0.0 - 1.3	
Drowning	10.3	10	10.5	1.7 - 20.0	2.6	0.5 - 4.0	
Suicide	5.9	33	13.5	3.7 - 29.5	15.0	5.9 - 38.7	
Homicide	2.4	25	11.1	1.8 - 82.8	2.0	0.4 - 32.5	
			Female				
Unintentional Injuries	27.5	2	15.0	5.6 - 28.1	12.4	3.7 - 23.9	
Motor Vehicle Injuries	17.6	3	8.7	4.2 - 18.6	9.6	1.4 - 21.4	
Poisoning	2.2	5	0.8	0.0 - 4.6	0.4	0.0 - 1.3	
Falls	1.7	4	0.8	0.0 - 2.8	0.3	0.0 - 0.7	
Fire and Flames	1.8	1	0.4	0.0 - 1.0	0.3	0.0 - 0.6	
Drowning	1.8	5	1.3	0.0 - 3.3	0.3	0.0 - 0.7	
Suicide	2.5	29	3.5	0.6 - 12.7	4.1	1.3 - 8.3	
Homicide	1.0	22	2.2	0.4 - 9.2	1.2	0.3 - 6.2	

* Rank of Taiwan among 39 countries.

Data source: Health Statistics: Vital Statistics (II), R.O.C. 1992-1994 [2]; World Health Statistics Annual, 1993 [5]

Table 2 Injury mortality rate (PR, %) among youth in Taiwan as compared to high-income countries and middle-income countries by sex and cause-of-death.

Cause of death	Taiwan	Rank*	Middle-income countries		High-income countries		
			Medium	Range	Medium	Range	
			Male				
Unintentional Injuries	72.6	1	48.9	28.1 - 70.4	49.9	31.2 - 65.1	
Motor Vehicle Injuries	48.2	4	22.1	12.8 - 52.3	37.1	13.3 - 60.9	
Poisoning	2.4	11	1.5	0.1 - 3.9	1.6	0.3 - 7.3	
Falls	2.7	8	2.1	0.0 - 6.2	1.4	0.0 - 4.3	
Fire and Flames	1.7	1	0.6	0.0 - 1.0	0.6	0.0 - 1.4	
Drowning	7.5	5	6.1	1.0 - 14.3	2.3	0.8 - 4.7	
Suicide	4.3	35	9.9	2.4 - 21.2	15.7	5.7 - 33.2	
Homicide	1.7	29	6.9	1.5 - 42.9	2.2	0.6 - 22.0	
			Female				
Unintentional Injuries	52.5	2	28.7	8.3 - 54.1	37.6	13.2 - 47.0	
Motor Vehicle Injuries	33.6	7	16.4	3.0 - 44.6	29.8	5.0 - 44.7	
Poisoning	4.1	2	1.6	0.0 - 5.4	1.0	0.0 - 3.5	
Falls	3.2	4	1.2	0.0 - 5.3	0.9	0.0 - 2.5	
Fire and Flames	3.4	1	0.7	0.0 - 2.8	0.7	0.0 - 2.3	
Drowning	3.5	5	2.5	0.0 - 4.3	0.7	0.0 - 2.2	
Suicide	4.8	31	8.4	1.3 - 14.8	11.9	4.2 - 22.6	
Homicide	1.8	28	4.1	0.6 - 19.3	2.8	1.1 - 12.8	

* Rank of Taiwan among 39 countries.

Data source: Health Statistics: Vital Statistics (II), R.O.C. 1992-1994 [2]; World Health Statistics Annual, 1993 [15]

has experienced rapid economic development, death due to unintentional injury, particularly MVI, among young people has also increased dramatically. Like in many newly industrialized countries, the major factors leading to increased mortality from injury in Taiwan are urbanization, industrialization, and motorization^[11,19]. While these developments slowly occurred in many HICs for more than half a century, they have occurred more drastically in many newly industrialized countries in less than a decade^[11,20]. Along with such drastic developments have come drastic changes in the kind of injuries that cause death. The data presented here suggests that the government of Taiwan should take the problem of youth injury seriously.

The main causes of death from injuries among youth are similar in most countries (i.e., MVI, suicide, and drowning), but the nature and extent of injuries vary greatly according to geographic, cultural, urban/rural and other factors^[8,11]. For example, while most youth death from MVI in Taiwan involves motorcycles^[22], automobile deaths are more common in United States^[23]. Understanding these differences will have great influence on the choice of countermeasures. For example, since the Motorcyclist Helmet Law in Taiwan was implemented in June 1997, head injuries from motorcycle accidents have decreased^[24,25].

Though the MR and PM ranks from fire and flames in Taiwan were the highest of all the countries studied, number of deaths due to fire and flames among youth was on average about 70 annually for 1994-96. We speculate that most of these injuries were related to public fire incidents (e.g., factories, restaurants, or singing clubs). The development of effective programs to prevent of fire and flames and other similar injuries alike should not be confined to the health sector alone. The cooperation of the police, transportation, construction, and legislative sectors are also

very important^[6].

The limitations of this study were: 1) the mortality data is only the tip of the 'injury pyramid' and does not necessary reflect the extent or severity of a particular injury problem^[26], 2) caution should be used when interpreting the results of international comparisons as many of the noted differences may be attributed to variations among the countries in the criteria used to certify death due to injuries and the quality of mortality data, 3) due to the limitation of data sources the mortality rate within the 15-24 age group could not be adjusted, 4) only two time periods were used to illustrate the pattern of changes, which might obscure the curve of trends, and 5) to design an effective injury prevention program, we need to know more about the circumstances of the injuries.

In conclusion, according to the pattern of changes and international comparisons found in this study programs for injury research and the prevention of death by injury among youth in Taiwan should focus on injuries due to MVI and fire and flames.

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Appendix: Names of countries classified to high income countries or middle income countries.

High income countries	Middle income countries
Hong Kong 1991	Argentina 1990
Australia 1992	Armenia 1990
Austria 1992	Brazil, S, SE & CW 1989
Belgium 1989	Bulgaria 1992
Canada 1991	Costa Rica 1991
Finland 1992	Czech Republic 1992
France 1991	Greece 1991
Germany 1991	Hungary 1992
Hong Kong 1991	Kazakhstan 1990
Ireland 1991	Kyrgyzstan 1990
Israel 1990	Latvia 1990
Italy 1990	Lithuania 1990
Japan 1992	Mexico 1991
Netherlands 1991	Poland 1992
New Zealand 1991	Portugal 1992
Norway 1991	Puerto Rico 1991
Singapore 1991	Romania 1992
Spain 1990	Russian Federation 1991
Sweden 1990	
UK: England & Wales 1992	
UK: Northern Ireland 1992	
UK: Scotland 1992	
United Kingdom 1992	
USA 1990	

Source: World Bank: Social Indicators of Development ⁽¹⁷⁾

台灣年輕人之傷害死亡率： 變化型態與國際比較

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目標：為了解台灣年輕人（15-24歲）事故傷害防制的優先順序。

方法：本研究利用死因統計資料檢視1964-66與1994-96年死亡率變化型態與國際比較。

結果：非故意性事故傷害死亡率在研究期間增加了32.2%；反之，故意性事故傷害死亡率減少了89%。機動車事故傷害是增加率最高的死因，男性增加了334%，女性增加了387%。與其他39個國家比較，非故意性事故傷害死亡率排序：男性第四，女性第二；故意性事故傷害死亡率排序：男性第三十九，女性第二十九。台灣年輕人火災死亡率排行世界第一。

結論：根據上述結果，作者認為台灣年輕人事故傷害防制的優先重點為機動車及火災。

關鍵詞：事故傷害，死亡率，國際比較，台灣

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