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ORIGINAL PAPER

Trends in road traffic crashes and associated injury and fatality in the People's Republic of China, 1951–1999

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Abstract

The burden of road traffic injuries in the People's Republic of China is increasing as evidenced by trends since 1951. Data from the National Statistical Office, Ministry of Communications and the Traffic Administration Bureau were analyzed. Absolute numbers of crashes, fatalities, and injuries, as well as fatalities per 100,000 population and motorization (number of vehicles per 1000 population) were used as indices to measure trends. Regional variations in trends and the characteristics of people injured or killed were also analyzed. Road traffic crashes increased 68-fold, from around 6000 in 1951 to 413,000 in 1999. Excessive speed was the main reported cause of the crashes. The injuries increased 56-fold – from around 5000 to 286,000 – and fatalities 97-fold – from 852 to around 84,000 – over the same period. The crash, fatality and injury rates also increased after 1985, due to increased motorization spurred by rapid economic growth. The number of four-wheel motor vehicles increased from 60,000 in 1951 to just under a million four-wheel motor vehicles in 1975 and to 10 million in 1987. The number of four-wheel motor vehicles then rose to 50 million in 1999, with an additional 30 million motorcycles. The increase in motorization and fatalities affected all the provinces. Road traffic injuries are the leading cause of death for populations up to the age of 45 years and the leading cause of working-life years lost in China.

Keywords: China; rapid motorization; traffic injuries; fatalities.

Introduction

Road traffic crashes have become a major public health problem in China. Road traffic injuries and fatalities increased rapidly following rapid motorization that started in the late 1980s^{1,2}. Rapid motorization was fueled by China's economic growth, especially over the last two decades³. However, the changes were not uniform in all of China's 31 provinces.

In 1999, the total length of highway in China was 1.35 million kilometers. The majority of these roads were arterial highways – 1,145,131 kilometers or 84.4%. Arterial highways have four grades or classifications. Ordinary roads, defined as substandard highways, accounted for 194,955 kilometers or 14.4% of the highways. Less than 1% of highways in China were expressways at 11,605 kilometers. The fulfilled volume of highway freight was 9.90 billion tons, and the goods transport turnover was 572.43 billion tons per kilometer in 1999. (The goods transport turnover index combines the amount of freight with the number of kilometer traveled by motor vehicle.) 12.69 billion passengers traveled on Chinese highways by motor vehicle, with a 1999 passenger turnover rate of 619.92 billion persons per kilometer (the number of passengers and kilometers traveled by motor vehicle).

Motorization promotes the development of the economy, but it also brings about road injuries and a threat to safety. Road injuries have become a grave problem of social safety and public health as both the population and motorization increases.

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This study reviews the trends in traffic crashes and associated injuries and deaths based on data from various sources. The study analyzes the trends in different provinces and the characteristics of people injured or killed in road traffic crashes in China, together with the risk factors for crashes.

Materials and methods

Data were collected from records of the National Statistical Office, Ministry of Communications and the Traffic Administration Bureau. The fatality rate (deaths per 100,000 population), and the motorization index (vehicles per 1000 population) were used as evaluation indices for measuring trends at national and provincial levels.

Results

Time trends

Over the past 50 years, road traffic crashes have increased 68-fold, from around 6000 to around 413,000; injuries increased 56-fold from around 5000 to 286,000; and fatalities increased 97-fold from 852 to around 84,000. Figure 1 shows that most changes occurred after 1970, following the onset of a rapid increase in motorization (Fig. 2). A rapid rise in crashes and associated injuries and deaths then followed, and especially after 1985. Currently, an average of 229 people is killed every day as the result of road traffic crashes.

There were only 60,000 motor vehicles in China in 1951 and just under a million in 1975. The number of four-wheel vehicles sharply increased to 10 million in 1987 and went up 50 million in 1999, with an additional 30 million motorcy-

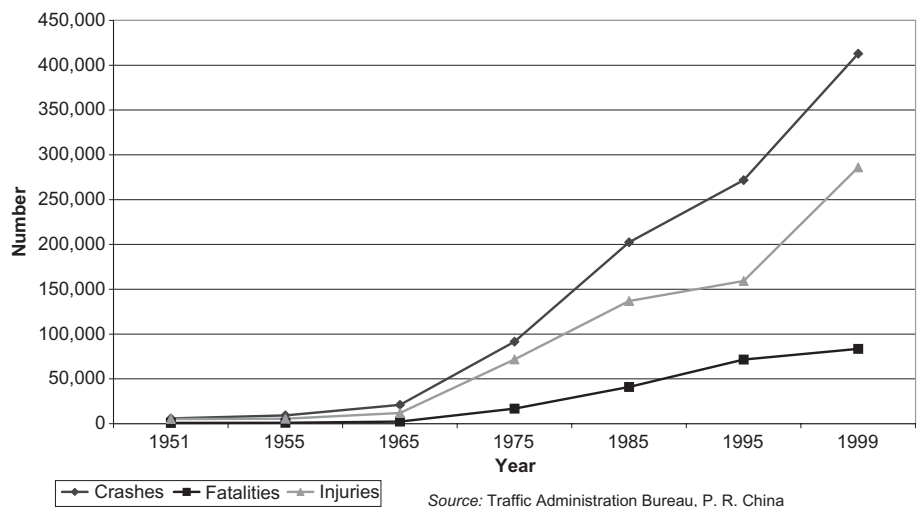


Figure 1. Trends in road traffic crashes, injuries and fatalities, People's Republic of China, 1951–1999.

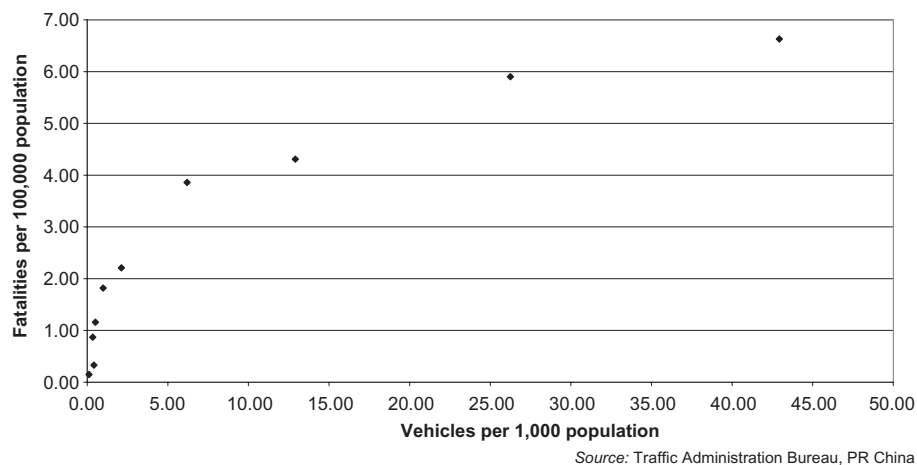


Figure 2. Trends in motorization and associated fatality rates in the People's Republic of China, 1951–1999.

cles. Over the last decade alone, the number of four-wheel vehicles increased 9-fold. Figure 2 shows the trend in motorization, expressed as motorization indices (number of vehicles per 1000 population), in relationship to the fatality per capita indices (fatalities per 100,000 population). The data in Figure 2 show that motorization increased 43-fold between 1975 and 1999, while the fatality per capita index increased 4-fold over the same time period. The data show clearly that the trend in fatalities was closely linked to changes in the motorization index.

Table 1 compares the motorization index and associated motor vehicle fatality rates per 100,000 population for 1990 and 1999 for all the provinces. The results show that for all the provinces, motorization increased between 2-fold and –5-fold over the 10-year period between 1990 and 1999. The provinces having the highest motorization indices in 1999 – Beijing, Tianjin, Guangdong, Jiangsu, Inner Mongolia, Qinghai, Ningxia, Xinjiang and Fujian – also tended to record the highest motor vehicle fatality per capita indices. However, the data in Table 1 show that a few provinces that had high motorization indices, such as Hainan, Inner Mongolia and Qinghai, had lower fatality indices than the other highly motorized provinces.

Characteristics of people killed or injured

Age and gender

Table 2 shows the age distribution of the victims of road traffic injuries. Young people (age 21–40) made up 46% of deaths and 60% of people injured in road traffic crashes in 1999. With regard to gender, the data in Table 3 show that men accounted for approximately three-quarters of all those injured or killed in road traffic crashes in 1999.

Variation by province

Table 4 summarizes the distribution of crashes, deaths, and injuries in the country according to province. Shandong, Guangdong, Jiangsu, and Zhejiang provinces accounted for the highest number of deaths and injuries.

Road user category

Figure 3 shows the distribution of fatalities in 1999 by road user category. Pedestrians (26%), passengers (23%), bicyclists (16%) and motorcyclists (17%) together accounted for 82% of all road users killed in road traffic crashes. Automobile drivers accounted for 10% of the fatalities.

Risk factors

According to the data, human error, mostly driver error, accounted for more than 90% of the reported causes of road traffic crashes. Driving at excessive speed was the main error cited. The majority of crashes involved four-wheel-vehicles

Table 1. Changes in motorization index and fatality in 31 provinces, P. R. China, 1990–1999.

Province	Motorization index (vehicles per 1,000 population)		Motor vehicle fatality rates (per 100,000 population)	
	1990	1999	1990	1999
Beijing*	42.43	111.28	4.32	11.95
Tianjin*	32.25	99.68	4.85	10.87
Hebei	13.71	51.82	3.54	5.14
Shanxi	20.52	43.84	6.32	5.79
Inner Mongolia [▲]	24.72	64.89	3.08	6.98
Liaoning	19.80	37.90	5.49	6.89
Jilin	19.29	36.40	5.23	7.97
Heilongjiang	13.03	22.42	3.56	3.63
Shanghai*	16.51	45.89	4.75	4.93
Jiangsu	13.07	70.64	4.45	8.49
Zhejiang	13.54	49.85	7.12	12.81
Anhui	4.64	15.94	3.28	4.73
Fujian	17.08	53.07	5.34	10.25
Jiangxi	7.66	24.30	3.69	6.62
Shandong	14.38	77.47	4.11	9.76
Henan	9.62	26.49	3.60	3.98
Hubei	8.61	28.29	4.22	6.64
Hunan	7.75	21.73	3.53	5.59
Guangdong	24.92	107.41	5.83	10.30
Guangxi [▲]	9.68	37.95	3.91	5.65
Hainan	11.59	63.77	4.96	5.35
Chongqing*		11.84		4.36
Sichuan	5.94	21.39	3.65	4.36
Guizhou	5.79	12.10	3.44	3.05
Yunnan	10.12	34.10	4.00	8.20
Tibet [▲]	16.34	28.90	11.10	8.20
Shaanxi	15.59	28.66	4.52	6.03
Gansu	16.27	27.52	3.70	5.09
Qinghai	30.00	60.09	10.07	8.65
Ningxia [▲]	30.01	60.89	7.30	15.38
Xinjiang [▲]	22.08	60.60	7.96	14.46

* Municipality directly under the Central Government.

[▲] Autonomous region.

Source: Traffic Administration Bureau, P. R. China.

(92.8%). Most of the crashes (62.8%) occurred on the highways, while 34.2% occurred in city traffic. Two-thirds of the crashes occurred on sunny days as opposed to snowy, rainy, cloudy/foggy or windy days.

DISCUSSION

Each year, more than 80,000 people in China die from road traffic injuries, and approximately 300,000 persons suffer non-fatal injuries. The number of traffic injury victims has increased 10-fold, and fatalities 4-fold, since 1951. Road

Table 2. Distribution by age of persons injured or killed in road traffic crashes, P. R. China, 1999.

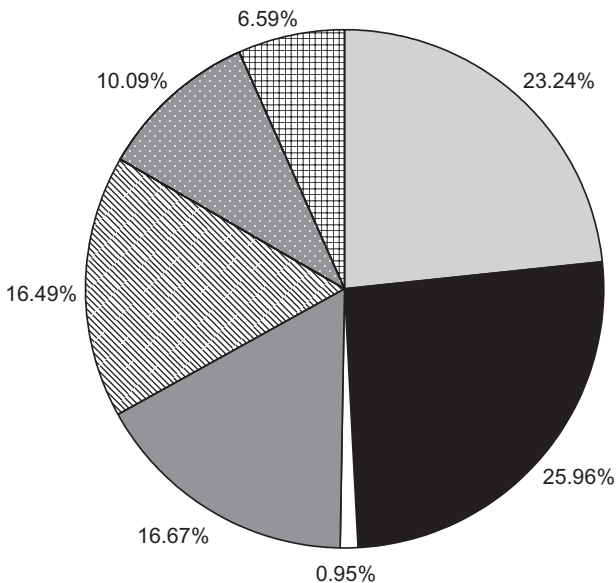
Age	Killed		Injured	
1–6	2,898	3.47%	5,216	1.82%
7–9	1,867	2.24%	3,879	1.36%
10–12	1,329	1.59%	3,779	1.32%
13–15	1,275	1.53%	4,349	1.52%
16–20	4,763	5.70%	21,388	7.48%
21–25	8,372	10.02%	41,737	14.59%
26–30	10,916	13.07%	50,565	17.68%
31–35	10,287	12.32%	42,030	14.69%
36–40	8,552	10.24%	34,849	12.18%
41–45	7,868	9.42%	25,843	9.03%
46–50	6,867	8.22%	19,074	6.67%
51–55	4,415	5.29%	10,506	3.67%
56–60	4,020	4.81%	7,807	2.73%
61–65	3,351	4.01%	5,656	1.98%
>65	6,749	8.08%	9,403	3.29%
Total	83,529	100%	286,081	100%

Source: Traffic Administration Bureau.

Table 3. People injured or killed in road traffic crashes by sex, P. R. China, 1999.

	Deaths		Injuries	
Male	64,495	77.21%	224,491	78.47%
Female	19,034	22.79%	61,589	21.53%
Total	83,529	100%	286,080	100%

Source: Traffic Administration Bureau.



Source: Traffic Administration Bureau, PR China

Figure 3. Distribution of road traffic deaths by category of road user.

Table 4. Distribution of crashes, fatalities and injuries by province, P. R. China, 1999.

District	Crashes	Fatalities	Injuries
Beijing*	32,292	1,502	10,607
Tianjin*	6,870	1,042	4,681
Hebei	9,102	3,400	7,399
Shanxi	6,572	1,854	5,204
Inner Mongolia▲	6,744	1,649	4,395
Liaoning	14,606	2,872	7,667
Jilin	6,884	2,118	3,729
Heilongjiang	3,092	1,377	2,301
Shanghai*	26,108	726	7,774
Jiangsu	29,872	6,123	15,448
Zhejiang	46,217	5,731	26,684
Anhui	8,233	2,952	6,729
Fujian	19,191	3,399	16,184
Jiangxi	7,990	2,803	5,645
Shandong	41,164	8,674	27,878
Henan	13,762	3,738	12,025
Hubei	12,902	3,941	11,017
Hunan	14,981	3,650	14,548
Guangdong	38,339	7,487	43,834
Guangxi▲	7,265	2,665	6,856
Hanan	2,093	408	2,028
Chongqing*	8,030	1,032	5,268
Sichuan	16,421	3,725	14,077
Guizhou	1,885	1,133	1,370
Yunnan	6,006	2,003	3,517
Tibet▲	744	210	451
Shaanxi	10,112	2,180	7,258
Gansu	2,002	1,294	1,462
Qinghai	1,305	441	1,161
Ningxia▲	2,768	835	1,961
Xinjiang▲	9,308	2,565	6,922

* Municipality directly under the Central Government.

▲ Autonomous region.

Source: Traffic Administration Bureau.

traffic injuries kill more people aged 1 to 34 years than all other causes combined. They are the leading cause of death for Chinese up to the age of 45 years and account for more working years of life lost than all forms of heart disease and cancer combined^{1,3}. The average age of people killed in motor vehicle crashes was 21–40 years.

Road traffic fatalities and injuries in China rose hand in hand with rapid motorization. Motor vehicle ownership increased 390-fold between 1951 and 1999, spurred by China's rapid economic growth, especially over the last 30 years^{1,3}. From 1990 to 1999 alone, there was a 266-fold increase in the number of motor vehicles. During the same period, there was a 37-fold increase in the volume of goods transported by road and a 96% increase in the passenger volume. Part of the problem is that road infrastructure expansion has been out of phase with demand for road space. While the number of vehicles skyrocketed, between 1990 and

1999, the road space was expanded by only 31.5%, thus increasing the crash risk⁶.

Although road traffic injuries are a major public health problem in China, they have not been accorded the level of importance they deserve. So, as in other low- and middle-income countries, road traffic crashes remain largely neglected by those who set the country's public health policies and priorities^{4,5}.

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