RAPID MOTORIZATION AND ROAD TRAFFIC ACCIDENTS IN CHINA

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ABSTRACT

This paper examines the characteristics of road traffic fatalities, by using the official China Road Traffic Accidents Statistics 2000-2005. It is found that less experienced drivers are causing more fatalities, the number of deaths on expressway is continuously increasing, and rural areas with less high-grade roads are likely to cause more fatalities. The paper then identified the possible causes for traffic accidents at institutional, cultural, and technical levels. The paper concludes with some suggestions to reduce traffic accidents.

1. BACKGROUND

China has been experiencing dynamic urbanization and motorization process, under a rapid economic growth. During 1980-2005, the overall GDP increased by approximately 40 times, averaging around 10% growth per annum; the urban population tripled while the total population increased by 30%; the numbers of motor vehicles and motor vehicle drivers increased approximately 18 times and 33 times respectively (Table 1).

Table 1: Changes in economics, population, urbanization and motorization, 1980-2005

year	GDP (billion US Dollar)	Population (10000 persons)			per Capita GDP (US dollar/person)	Motor vehicle ownership (10000 units)	Motor vehicle drivers (10000 persons)
		Total	Urban	%			
1980	58	98,705	19,140	19	59	178	245
1985	115	105,851	25,094	24	108	321	462
1990	237	114,333	30,195	26	207	551	791
1995	773	121,121	35,174	29	638	1,040	1,673
2000	1,261	126,743	45,906	36	995	1,609	3,747
2005	2,326	130,756	56,212	43	1,779	3,160	8,018
2005/1980	40.3	1.3	2.9	2.2	30.4	17.7	32.7

Source:China Statistical Yearbook 2006

During the last 20 years the central government had made transportation policy reform and implementation one of the priorities in the national economic

development strategy, aiming at an integrated transport infrastructure construction. This has been particularly important since 1997. When the Asian economic crisis broke out, the Chinese government introduced proactive fiscal policies and strengthened the investment in infrastructure development (for example, the highway investments to GDP reached to around 3%). The investment in transportation infrastructure has contributed to national economic growth as well as greatly improving the transport systems. Owing to its inherent characteristics of widespread accessibility, adaptability and flexibility, road transport has been developing rapidly in China. A road network has preliminarily been formed, with the capital of Beijing, the municipalities directly under the central government and capital cities of the provinces as hubs, with radiated routes from each of the economic zones, and from the east coastal area to the hinterland and the vast rural areas.

As can be found from Table 2, by the end of 2005, the total mileage of highways in China reached 1.931 million kilometers (excluding HK, Macao and Taiwan); the density of the road network reached close to 20.1km/100 km^2. Expressways have been rapidly developed since 1988. In 1988 the first 18.5 kilometer-long Shanghai-Jiading Expressway was completed and opened to traffic. In less than 20 years the total length of expressways reached 41,005 kilometers in 2005. The central government approved in January 2005 the National Expressway Network Masterplan comprising 85,000 kilometers (so called “7918” plan), which will be completed in 20-30 years.

Table 3 demonstrates the changes of share by each transport mode since 1980. Due to the improvement of road infrastructure and rapid motorization, the amount of road transport has kept increasing since 1980. The share of passenger-kilometer by highway has increased from 32.0% in 1980 to 53.2% in 2005, while the share of freight ton-kilometer by highway has increased from 6.4% in 1980 to 10.8% in 2005. Railway and waterway are still major modes for transporting long-distance heavy cargo (Table 3).

As a result of these dynamic changes in economics, road transport infrastructure development and motorization, road traffic accidents have become a more severe problem in China. According to the annual report of China Road Traffic Accidents Statistics, the number of people who died from road traffic accidents in 2005 was 98,738, with the number of injured five times higher, believed to be underestimated in rural areas in China. This fatality number is about 20% of the

total traffic fatalities in the whole world each year, and the number of fatalities is expected to be even worse due to the rapidly increasing number of vehicles and novice drivers.

Table 2: Highway investments and developments, 1986-2005

Year	GDP (billion US Dollar)	Highway investment (billion US Dollar)	Highway investment/GDP (%)	Highway mileage (10000 kilometer)	Expressway mileage (kilometer)
1986	131	0.4	0.3	96.3	-
1987	153	0.5	0.3	98.2	-
1988	191	0.7	0.4	100.0	147
1989	216	0.8	0.4	101.4	271
1990	237	1.0	0.4	102.8	522
1991	277	1.2	0.4	104.1	574
1992	342	2.3	0.7	105.7	652
1993	449	4.3	1.0	108.4	1,145
1994	612	6.0	1.0	111.8	1,603
1995	773	7.6	1.0	115.7	2,141
1996	904	8.5	0.9	118.6	3,422
1997	1,004	11.6	1.2	122.6	4,771
1998	1,072	27.6	2.6	127.9	8,733
1999	1,140	27.8	2.4	135.2	11,605
2000	1,261	29.4	2.3	140.3	16,314
2001	1,393	33.9	2.4	169.8	19,437
2002	1,529	40.8	2.7	176.5	25,130
2003	1,726	47.2	2.7	181.0	29,745
2004	2,032	59.8	2.9	187.1	34,288
2005	2,326	69.7	3.0	193.1	41,005

Source: China Statistical Yearbook 2006
China Statistical Yearbook of Communication & Transportation 2006

Table 3: Modal shares (%), 1980-2005

Year	Passenger-Kilometers				Freight Ton-Kilometers				
	Railway	Highway	Waterway	Civil Aviation	Railway	Highway	Waterway	Civil Aviation	Pipeline
1980	60.6	32.0	5.7	1.7	47.5	6.4	42.0	0.0	4.1
1985	54.5	38.9	4.0	2.6	44.2	10.4	42.1	0.0	3.3
1990	46.4	46.6	2.9	4.1	40.5	12.8	44.2	0.0	2.4
1995	39.4	51.1	1.9	7.6	36.3	13.1	48.9	0.1	1.6
2000	37.0	54.3	0.8	7.9	31.1	13.8	53.6	0.1	1.4
2005	34.7	53.2	0.4	11.7	25.8	10.8	61.9	0.1	1.4

Source: China Statistical Yearbook 2006

The rest of this paper examines traffic accident trends and their characteristics in China, using official annual reports of China Road Traffic Accidents Statistics during 2000 to 2005. Several causal factors are identified, at the institutional, technical and cultural levels. Practical measures to address traffic accidents are finally suggested.

2. THE CHARACTERISTICS OF TRAFFIC ACCIDENTS IN CHINA

The Ministry of Public Security (MPS) is the sole administration in charge of road traffic accidents in China. All road traffic accident data is collected by the public security administrations in each district or county, and then the data is aggregated and reported in turn to the upper public security administration. The Traffic Administration Bureau of MPS finally analyzes the data and publishes the annual Road Traffic Accidents Statistics.

2.1 Trends of traffic accidents

As can be seen from Table 4, there is a jump point between 1984-1985 in the numbers of accidents, deaths and injuries, possibly because of the rapid increase in the number of automobile drivers since 1984. Since 2001 the number of deaths has been exceeding a high level of 100,000, though there is a slight decrease in 2005. Considering 1.3 billion population in China, this number might not be surprising, however, as Figure 1 indicates, the number of deaths per VKT in China is 5-10 times higher than that of other developed countries.

2.2 Characteristics of fatalities

Figures 2-6 demonstrate the characteristic of road traffic fatalities during 2000-2005. These characteristics can be summarized as follows:

1. Novice drivers (driving years are less than one year) and less experienced drivers (driving years are 2-3 years) are causing more fatalities since 2003. This is partly because SARS broke out in 2003 which facilitated the transfer of travelers from public transportation to automobiles, and accounted for a huge number of novice and less experienced drivers, who might have caused traffic fatalities. On the other hand, experienced drivers (driving years are more than 11 years) are causing fewer fatalities. It is evident that driving experiences, accumulated by either practical driving or reeducation at driving school, are contributing to road traffic safety. It is worthy of note that about 80% of the victims are between 21-45 years old.

2. The number of deaths on expressway is continuously increasing, corresponding to the rapid development of expressways. The top three causes for fatalities on expressways are: unsafe distance between vehicles, fatigue and

speeding.

3. Nighttime driving is causing more fatalities, especially in the case of no lighting. Minimum necessary safety facilities could avoid traffic accidents.

4. The number of deaths per vehicle is negatively correlated with the density of classified roads. More fatalities are happening in rural areas, where classified roads or high-grade roads are poorly developed and traffic rules are not well followed by drivers from rural areas.

Table 4: Traffic accident data, 1980-2005

Year	Number of accidents	Number of deaths	Number of injuries	Number of deaths per 10000 vehicle[1)]	Number of deaths per 100000 population
1980	116,692	21,818	80,824	104.47	2.21
1981	114,679	22,499	79,546	95.85	2.25
1982	103,777	22,164	71,385	85.32	2.81
1983	107,758	23,944	73,957	84.35	2.33
1984	118,886	25,251	79,685	42.99	2.43
1985	202,394	40,906	136,829	62.39	3.89
1986	295,136	50,063	185,785	61.12	4.70
1987	298,147	53,439	187,399	50.37	4.94
1988	276,071	54,814	170,598	46.05	5.00
1989	258,030	50,441	159,002	38.26	4.54
1990	250,297	49,271	155,072	33.38	4.31
1991	264,817	53,292	162,019	32.15	4.60
1992	228,278	58,729	144,264	30.19	5.00
1993	242,343	63,508	142,251	27.24	5.36
1994	253,537	66,362	148,817	24.26	5.54
1995	271,843	71,494	159,308	22.48	5.90
1996	287,685	73,655	174,447	20.41	6.02
1997	304,217	73,861	190,128	17.50	5.97
1998	346,129	78,067	222,721	17.30	6.25
1999	412,860	83,529	286,080	15.45	6.82
2000	616,971	93,853	418,721	15.60	7.27
2001	754,919	105,930	546,485	15.46	8.51
2002	773,137	109,381	562,074	13.71	8.79
2003	667,507	104,372	494,174	10.81	8.08
2004	517,889	107,077	480,864	9.93	8.24
2005	450,254	98,738	469,911	7.57	7.60

Note 1:Two-wheel motorcycles & some tractors are included
Source: China Road Traffic Accidents Statistics 2005

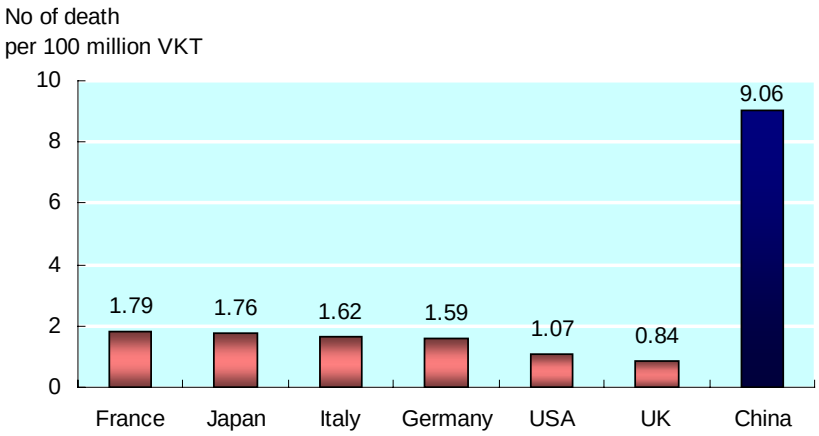

Figure 1: Number of deaths per 100 million VKT in 1995

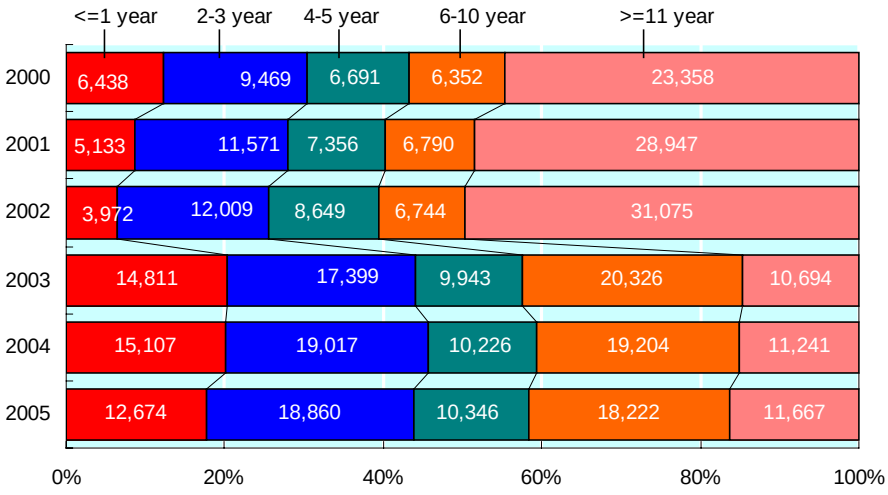

Figure 2: Number of deaths by driving experiences

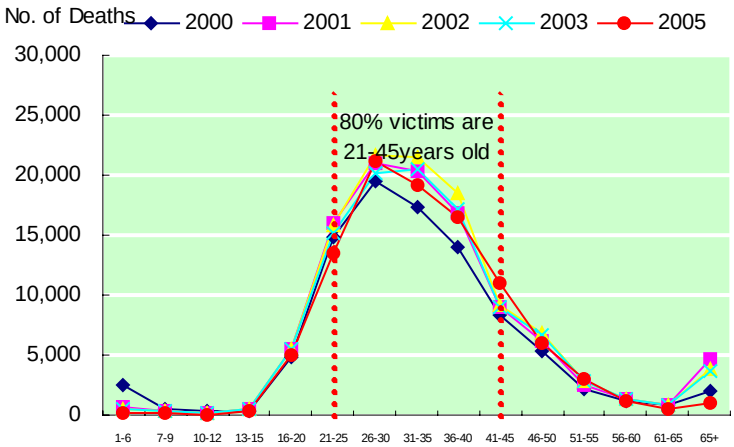

Figure 3: Number of deaths by age group

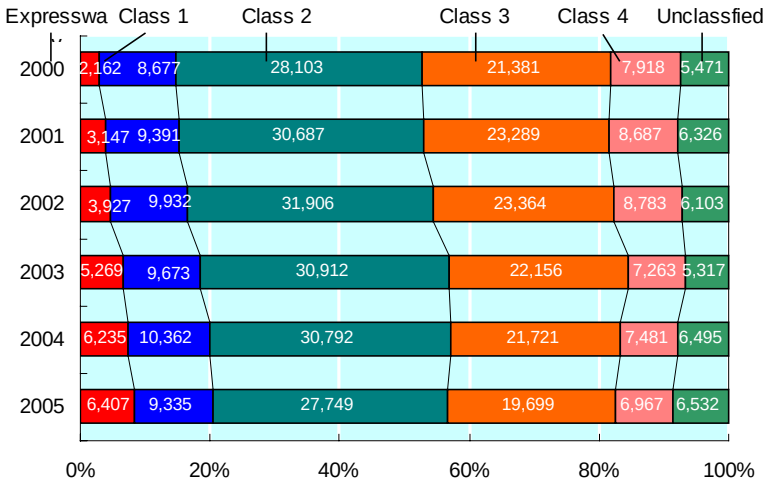

Figure 4: Number of deaths by road type

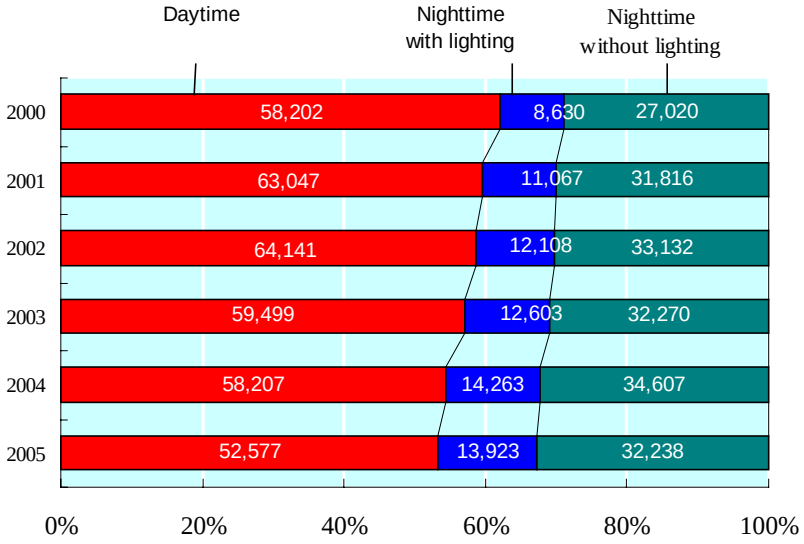

Figure 5: Number of deaths by daytime and nighttime

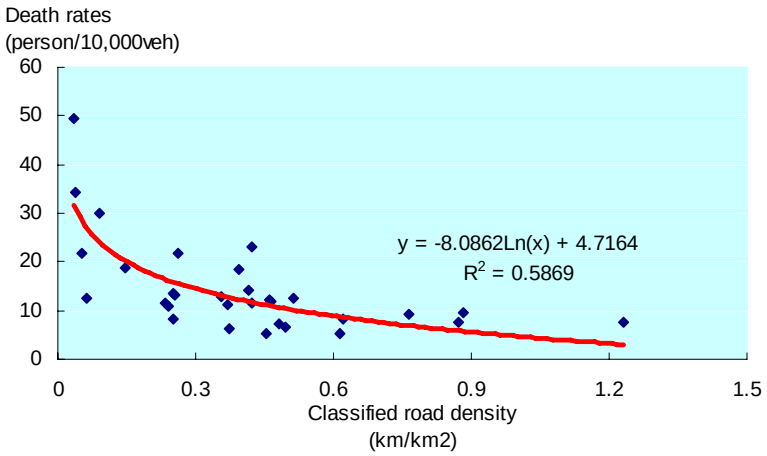

Figure 6: Relationship between death rates and road density (regional data)

3. POSSIBLE CAUSES FOR ROAD TRAFFIC ACCIDENTS

It is true that traffic accidents are directly related with man-vehicle-road combinations; however, many substantial factors are likely to affect the traffic accidents. The following discussions try to point out some institutional, technical and cultural causes for road traffic accidents in China.

3.1 Institutional issues

Road traffic safety directly involves at least three ministries and agencies at central government level. The Ministry of Public Security is in charge of road traffic accidents; the Ministry of Communications is in charge of planning, construction, operation and maintenance of highway (intercity); the Ministry of Construction is in charge of urban roads. The coordination among these ministries is very important in effectively addressing road traffic accidents. The interagency coordination conference on road traffic safety, which is called by the State Council, started in 2004, but the key point is the discussions of the conference can be reached as an agreement, which is legally binding to address road traffic safety issues.

3.2 Cultural issues

Compared with developed countries, traffic safety awareness has not spread among the whole population. Jaywalking, speeding and drunk driving are all in the day's work. Chinese drivers are raised riding bicycles. Their driving behaviors are deeply affected by the bicycle; for example, there are often scenes of cutting into the vehicle queue. Some drivers in southern China even complain that seat belts make them hotter in summer. To reach a common awareness towards traffic safety is the first step to reduce traffic accidents.

3.3 Poor road performance and lack of traffic safety facility

Due to the serious deficiency in road infrastructure and limited funding, quantity but not quality has been given to the top priority in road construction. In 2004, the high and sub-high grade road pavement only accounts for 48% of the total, while the mileage of class II and above only accounts for 16% of the total. The mixed traffic on most of the national highways causes traffic congestion, as well severe traffic accidents. The traffic safety features were neglected. It is hard to

imagine that 7 people died from traffic accidents in Guangdong Province in 2000 due to the lack of speed bumps at the crossroads!

3.4 Overloaded and oversized trucks and unsafe vehicles

Due to the unfair competition and relatively expensive toll, many truckload carriers run overloaded and oversized trucks. Those trucks not only cause heavy damage to roads (it is estimated that road maintenance cycle could be reduced from 15 years to 6-8 years) but also cause many traffic fatalities. It is estimated that 70% of traffic accidents are related to overloaded and oversized trucks. Since April 30, 2004, 7 Ministries including the Ministry of Communication and the Ministry of Public Security had jointly implemented nation-wide strict enforcements on overloaded and oversized trucks. As a result, substantial reduction of road traffic accidents is expected.

Automobiles failing inspection are prohibited from running on roads, however, some unprincipled automobile salesmen sell these automobiles to rural areas, causing many traffic accidents as well as emission problems.

3.5 Traffic accidents analyzing expertise

In China, transport agencies have road departments but few have traffic safety departments. While the technical expertise for design and construction of roads has rapidly increased, the expertise to analyze and deal with traffic accidents has not yet developed. Moreover, very few public agencies have reliable statistics and database on traffic accidents. None of them has accumulated information connected with data from hospitals and insurance companies. The work of collecting accident data by the public security bureau is full of deficiencies. There are no sufficient human and technical resources, policemen are not well trained to collect proper information, and there is often a disregard for collecting correct information. Coverage outside urban areas is highly defective, with a presumably large number of unreported accidents in rural areas.

4. PRACTICAL MEASURES

Considering the road traffic accidents and their possible causes mentioned before, a number of possible measures are proposed to improve the overall road traffic safety. Some of these suggestions are based on the experiences of developed

countries, which had successful experiences in fighting against road traffic accidents during their rapid motorization process.

4.1 Enhancement of road traffic safety administration system

It is important to formulate a national road safety strategy, to enhance the interagency coordination conferences on road traffic safety at both national and provincial levels, and to establish a road safety countermeasure committee and a separate department in charge of road traffic accidents at the municipal level. The national safety strategy should include the targets, policies, and countermeasures as well as investment plans. The strategy should have biding force. The road safety countermeasure committee at the municipal level should be comprised of public security department, traffic department, school, kindergarten, driving school, automobile manufacturer, hospital, insurance company and media.

4.2 Dissemination of road traffic safety awareness through home education, school education and social education

As mentioned before, most Chinese drivers are raised riding a bicycle; they are greatly different from those drivers from developed countries, who are raised riding in a vehicle. Chinese drivers may be good at driving skills but lack a sense of consciousness of traffic safety. In addition, pedestrians and other travelers also have limited traffic safety knowledge. It is thus essential that traffic safety education should be conducted at home, school and society, from kids to adults, in order to formulate strong awareness among all the citizens. Road traffic safety education will be an endless campaign, especially for adults, rural immigrants and rural residents.

4.3 Allocation of limited funding based on cost-benefit analysis

The funding for road traffic safety features was 2 billion RMB in 2004, equivalent of 0.5% of total highway investment, which is much lower than that of developed countries such as Japan (During 1975-1986, the percentage of investment for road safety measures to all road investments was approximately 13-18% while the percentage of investment for road safety measures to GDP was approximately 0.2-0.4%). The first priority for China is to increase the investment to road safety facilities such as guardrails, speed bumps, median barriers, overpasses, etc. Meanwhile it is important to introduce a cost-benefit

approach to allocate the limited funding to the most effective policies. There is a fashion to choose high-tech countermeasures to address road traffic accidents in China, however, some low-tech measures such as mandatory seat belt usage or speed limit might be the most effective choices.

4.4 Improvement and share of traffic accidents database

It is important to establish a road accident investigation system with participants including policeman, doctor, psychologist, traffic engineer, automobile designer, and insurance salesperson. The process of gathering information on traffic accidents has to be systematized for accuracy. The first step is to remove the responsibility for the number of traffic fatalities from the evaluation indices for local officials, in order to avoid underreporting the number of traffic fatalities. The second step is to provide adequate training to policemen, especially to those in rural areas (In rural areas, some of policemen do not know how to use the traffic accidents reporting system properly, or could not even tell the difference between expressway and other roads!). The third step is to have information from hospitals and insurance companies to double-check the data from the public security administration. This database should be open to traffic safety researchers who need these “medical records” to diagnose traffic accidents.

5. CONCLUSION

China has started to experience high traffic accidents rates since 1985, especially after 2000, when road infrastructures were rapidly developed and automobiles began to enter family life. Since 2001, the number of fatalities has kept at a high level of about 100,000, with the number of injured five times higher, which is believed to be unreported in rural areas in China. This fatality number is about 20% of the total traffic fatalities in the whole world each year, and the number of fatalities is expected to be even worse due to the rapidly increasing numbers of vehicles and novice drivers. The problems are extremely severe. The central government and local governments are making efforts in fighting against traffic accidents, for example, new traffic safety law was implemented on May 1st, 2004 and strict regulations on overloaded and oversized trucks were also introduced in May 2004. However, traffic accidents rates are still very high, compared with developed countries. It is necessary to analyze the causes behind the high traffic accidents rates, and to learn from developed countries in order to find some practical measures to change the current situation.

This paper examined the characteristics of road traffic fatalities, by using the official China Road Traffic Accidents Statistics 2000-2005. It is found that less experienced drivers are causing more fatalities, the number of deaths on expressway is continuously increasing, and rural areas with less high-grade roads are likely to cause more fatalities. The paper then identified the possible causes for traffic accidents at institutional, cultural, and technical levels. The paper finally suggested, (1) to enhance the road traffic safety administration system, (2) to cultivate road traffic safety awareness through home education, school education and social education, (3) to allocate limited funding based on cost-benefit analysis, and (4) to Improve the traffic accident database and share them among traffic researchers.

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