

**Sleep Patterns, School-Related Stress, and Road Traffic Injury among
Middle School Students in Rural China**

A Senior Honors Thesis

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ABSTRACT

Purpose. We studied pedestrian traffic injuries among middle school adolescents in rural China, focusing on the effects of sleep problems and school-related stress.

Methods. Using a modified Children's Sleep Habits Questionnaire, we surveyed 1,551 middle school students in Hunan Province to investigate their sleep patterns, school habits, and pedestrian traffic injuries during a three month recall period.

Results. There were 56 cases of pedestrian traffic injury reported among the surveyed students yielding a rate of 3.6% over the three month period. The greatest proportion of the incidents involved a motorcycle (80%), followed by tractors (12%) and cars or buses (8%). The activity of the student at the time of the injury was evenly split between walking and riding a bicycle. Nearly two fifths of injuries resulted in a period of activity restriction lasting one day or more (39%). The amount of time spent traveling to and from school was not significantly related to risk of pedestrian injury. School performance was also not a significant risk factor; however, academic stress from parents was associated with pedestrian injury ($P<.001$). Sleep disturbances measured in difficulty falling asleep on school days was also significantly higher in children who experienced pedestrian injury ($P<.05$). These trends were not observed in multivariate analysis after adjusting for possible confounding variables.

Conclusions. School-related stress and sleep patterns were identified as possible risk factors in this population for pedestrian injury. Further research is warranted in order to study these factors and develop prevention strategies to address these preventable injuries.

INTRODUCTION

Road traffic injury is a leading cause of mortality and morbidity among children and adolescents worldwide, and the burden of these injuries falls most heavily on low- and middle-income countries (Krug et al., 2000; Nantulya and Reich, 2003; Rivara, 2002; Zwi et al., 1996). Globally, 96% of all road traffic fatalities among children, and 85% of road traffic fatalities among all ages, occur in developing countries (Krug et al., 2000). Despite these staggering trends, it is in developed countries where road traffic fatalities have received the most attention. In these countries, road traffic fatalities are expected to decrease by 28% between 1999 and 2020 (Kopits and Cropper, 2005). However, this decrease is overshadowed by the increasing fatality rates in developing countries. The road traffic fatality rate in the People's Republic of China is projected to rise by 92% in this same period (Kopits and Cropper, 2005). This increase has coincided with and is related to the growth in motor vehicle use in China and other developing countries over the past 50 years. Between 1990 and 1999, the number of four-wheel motor vehicles in China has jumped 9-fold to 50 million (Wang et al., 2003). The ownership of motorcycles has experienced a similarly meteoric rise from 2.5 million units in 1987 to 43.3 million units in 2001 (Zhang et al., 2004). In China, road traffic injury has become the leading cause of death for age groups less than 45 years (Ma et al., 2008; Wang et al., 2003).

The populations in developing countries most at risk for road traffic injury are pedestrians, cyclists, and bus and taxi passengers. These correspond with the transportation modes most commonly utilized by those of the lowest socioeconomic status (Nantulya and Reich, 2003). In China, road traffic fatalities are predominantly among these vulnerable road user categories with 65% of traffic deaths occurring among pedestrians, passengers, and bicyclists (Wang et al., 2003). In Wuhan, China, hospitalization from pedestrian and bicyclist

injury as a proportion of all injury hospitalizations increased from 1.3% to 3.1% from 1993 to 2004 (Sun et al., 2006).

To address this increasing burden, the risk factors for pedestrian and bicyclist injuries must be understood in order to develop effective prevention strategies. In developed countries, an extensive body of literature has documented various sociodemographic, behavioral, and environmental factors for road traffic injury and has evaluated targeted education and prevention programs. In comparison, research on road traffic injury in developing countries has been limited. The risk factors examined in developed countries may not be transferable to social and cultural contexts in many developing countries. Past studies of road traffic injury in China and surrounding countries have found some regional trends in pedestrian and bicyclist injury. In Kathmandu, Nepal, and Wuhan, China, road pedestrian injury rates were observed to be higher for male adolescents than females (Poudel-Tandukar et al., 2007; Sun et al., 2006). Risky pedestrian behaviors including not looking both ways at a road crossing, disobeying traffic signals, and playing in the road among all ages were observed in Nepal and Karachi, Pakistan, and these behaviors were often compounded by poor road environmental conditions such as encroachments on sidewalks and lack of traffic signals (Khan et al., 1999; Poudel-Tandukar et al., 2007; Sun et al., 2006). There is a positive link between risk perception and safe road behaviors, however, the presence of risky behaviors did not significantly increase rates of pedestrian injury. Thus, social and environmental factors ought to be examined further to identify possible methods of injury prevention.

While studies have examined the environmental and behavioral factors associated with road traffic injury in adolescents, psychosocial factors including sleep patterns and school stress have not been well documented, especially in the context of a developing economy. Based on

parent and teacher surveys conducted in Montreal, Canada, children of up to 15 years of age who had suffered road traffic injuries were found to have higher levels of impulsive and hyperactive characteristics (Pless et al., 1995). Sleep disturbances have been identified as risk factors for unintentional injury among children and adults (Choi et al., 2006; Edmonds and Vinson, 2007; Stallones et al., 2006; Valent et al., 2001). Insufficient sleep induces deficiencies in both processing information and reliable behavior (Carskadon et al., 1981; Valent et al., 2001; Wolfson and Carskadon, 1998). Among adolescents whose sleep patterns are changing, sleep problems may have serious implications for injury risk (Carskadon and Acebo, 2002; Carskadon et al., 2004). A study by Stallones et al. found that adolescents living on farms in Colorado who slept less than 9.25 hours on school nights were more susceptible to injury by a factor of 3.71 (Stallones et al., 2006).

Stress from life events has also been shown to increase the risk of unintentional injury in adults and pedestrian injury in children. Among manufacturing workers in Japan, greater work-related stress was associated with increased occupational injury (Nakata et al., 2006). One study among Hispanic children in the United States found that family stress measured by household crowding and frequency of family moves were significantly associated with pedestrian injury (Agran et al., 1998). The effects of stress on injury among adolescents remain poorly documented and may have greater implications in economies undergoing industrialization than in developed countries.

China serves as an illuminating case study of the relationship between stress and injury among adolescents. Academic success and respect for a high level of education are very important to Chinese families and culture (Liu et al., 2000; Liu et al., 2005; Sue and Okazaki, 1990). Responsibilities to school and household work may contribute to the fact that Chinese

children and adolescents have a high prevalence of sleep problems (Gau and Soong, 1995; Liu et al., 2000; Yang et al., 1987). School-related stress has been found to increase the risk of unintentional injury at school among children and adolescents in China (Sun et al., 2006). This study seeks to examine the characteristics of road pedestrian and bicyclist injury among middle school students in Hunan Province, China, and the effects of these two potential risk factors—sleep problems and school-related stress.

METHODS

Study Design

This study utilized a cross-sectional survey to assess farm work-related, sports-related, and road pedestrian and bicyclist injury among middle school students attending two middle schools in Hunan Province, located in the heavily agricultural region of south-central China. A map is provided in Figure 1. In 2005, the province's total population was 63.2 million with a rural population of 39.8 million (63.0%; National Bureau of Statistics of China). In the Chinese education system, middle schools consist of students grades 7-9. Middle schools used in this research survey were selected to be representative of a rural area. School principals reviewed the study design and signed a cooperative agreement approving participation in the study. Four classes in each grade at both schools were included in the survey. Consent to participate in the study was obtained from the parents of the selected students, and further consent was obtained from each individual student. A description of the study was provided to the students in a cover letter to the survey. Students were informed that they could choose not to participate in the study and that they could withdraw from the study at any time.

This study underwent a full review by Nationwide Children's Hospital Institutional Review Board, and the study protocol was also reviewed by the Scientific Research Committee of the Wuhan University School of Public Health. Approval was obtained from both institutions before the study was officially launched in the study field.

Data Collection

The survey was conducted in September 2006 using individual paper questionnaires. The student questionnaire collected demographic information (e.g. age, school year, gender, parents'

ages and education levels, and household income). In order to identify students that had experienced a pedestrian and bicyclist injury, students were asked if they had been struck by a motorized vehicle while walking or riding a bicycle during the three month recall period spanning from June to September 2006. Students further reported the characteristics (e.g. vehicle type that caused the injury, activity at time of incident, and activity restriction resulting from the injury) of the most recent pedestrian traffic injury that each student had sustained during the recall period.

To assess the students' sleep patterns, questions were developed by modifying the Children's Sleep Habits Questionnaire used previously (Liu et al., 2005; Owens et al., 2000; Stallones et al., 2006). Students were asked to describe their sleep patterns and report sleep problems such as difficulty falling or staying asleep, having nightmares, and using sleep medications. School-related stress was examined with questions based on previous studies (Sun et al., 2006; Torsheim et al., 2001). Students reported the amount and difficulty of homework, whether extra homework was assigned by their parents, how their parents reacted to poor grades, what grades they received in school, and the highest education level they intended to complete. Survey questions were finalized through feedback from a pilot study that was conducted among 50 students.

School teachers trained by researchers from Wuhan University administered and collected the questionnaires in the classroom. Researchers were available during the collection period to address any questions regarding the surveys. The questionnaires were submitted to the researchers, and they entered the data into a statistical database on a secured computer at Wuhan University. Data quality was controlled by cross-checking values with related research questions

in the questionnaire. De-identified data were then transferred to researchers at The Ohio State University for further statistical analysis and manuscript preparation.

Statistical Analysis

The SAS statistical package version 9.1 was utilized for data analyses (2004). *P* values associated with Pearson χ^2 tests were used as the significance test, and differences with a $P < .05$ were considered statistically significant. Missing or nonresponses were tabulated but not included in Pearson χ^2 tests. Study variables included sociodemographic characteristics, school activities, and sleep habits. Each injury incident was analyzed according to vehicle type that caused the injury, activity at time of injury, and activity restriction resulting from the injury.

Multivariate analysis was performed using Poisson regression models to calculate relative risks of injury and associated 95% confidence intervals. Three models were used to control for potential confounding variables among the study population. Each model assessed one variable examining sleep disturbances after adjustment for confounding effects of sociodemographic and school stress-related factors. Reference groups were generally those with the lowest rate of injury in the univariate analysis.

RESULTS

Proportion of Students Reporting Injuries

The survey was administered to 1564 students. Of these surveys, 1551 were completed (response rate 99.2%). A total of 56 students reported at least one pedestrian traffic injury yielding an injury rate of 3.6% over the three month period. Injury frequency and percentage according to the sociodemographic characteristics of gender, age, grade in school, mother's age and education, household composition and estimated household income are presented in Table 2. Males experienced a higher injury rate (4.5%) than females (2.8%). There was no observed trend between age and injury rates; however, when injury rates were compared based on student grade level, seventh graders had significantly higher risk of pedestrian traffic injury (5.3%, $P < .05$). No consistent relationship was observed with the mother's age, but injury rates did increase with the mother's education level. The presence of an older sister living in the same household as the student significantly raised the risk of injury while no increase was found in students who had older brothers living with them. Household income did not exhibit a significant injury pattern except that students who reported a household income of more than 5000 yuan or higher had over twice the injury rate of lower income groups.

Table 3 presents injury rates according to characteristics describing the students' school activities and sleep patterns. School activities and school-related stress were analyzed according to variables including time spent traveling to and from school, homework difficulty, academic performance, assignment of extra homework by parents, parents' treatment for poor academic performance, and the highest level of schooling that the student wanted to complete. The two indicators examining parents' behavior regarding school work were both statistically significant indicators of pedestrian and bicyclist injury. Students who reported that they were often given

extra homework had the highest injury rate of 9.6% compared to 2.4% among those whose parents never or rarely did ($P<.001$). Similarly, students with parents who were apathetic or would scold or chastise them for poor academic performance had a higher injury rate (6.7%) than those who were encouraged by their parents (2.6%; $P<.001$).

Sleep pattern disturbances were not significantly tied to road pedestrian and bicyclist injuries. The average length of sleep on a school night for all students surveyed was 7.87 hours. Of students surveyed, 10.8% reported having difficulty falling asleep often, 3.5% awakened at night and had trouble falling back asleep often, and 4.6% had nightmares often. Of these three variables, difficulty falling asleep and having nightmares both showed a trend of increasing injury rates among students who experienced these sleep problems sometimes or often; however, only the indicator of difficulty falling asleep was statistically significant ($P<.05$). The incidence of falling asleep later than 12 AM and difficulty falling back asleep after awakening during the night were not significantly correlated with road pedestrian injury. Use of sleep medications was reported by less than 1.0% of respondents and was not found to be associated with injury risk (Data not shown).

Injury Characteristics and Outcomes

The characteristics of the road pedestrian and bicyclist injuries among the 56 students who reported injury are presented in Table 4. The overwhelming majority (79.7%) of incidents were due to collisions with a motorcycle. A tractor (11.9%) and either a car or bus (8.5%) were involved in the remaining injuries. The student's activity at the time of the injury was categorized by whether the student was walking or riding a bicycle as well as the setting of the incident. The highest percentage of injuries occurred while students were either walking or riding

a bicycle to or from school (35.8%). Of injuries that occurred during activities unrelated to school, 57.9% occurred while traveling on a rural road and 42.1% on a public road in town. Over one fifth of the injuries (21.4%) resulted in activity restrictions of one to seven days, and 17.9% of the injuries restricted the student's activities for more than one week.

Multivariate Regression Results

Table 5 reports the relative risk [RR] and associated 95% confidence intervals [CI] from the multivariate Poisson regression models. No consistent trends in gender or age were observed in any of the three models. All indicators that had been significantly correlated to pedestrian and bicyclist injury during univariate analysis were no longer statistically significant in the multivariate models.

DISCUSSION

This cross-sectional study analyzed the potential effects of sociodemographic characteristics, sleep patterns, and stress from school activities on road pedestrian injury among middle school students in rural China. Our data revealed some risk factors for road pedestrian and bicyclist injury among this population of Chinese adolescents including grade in school, pressure from parents regarding school work, and problems falling asleep. These findings support past research on sleep patterns among Chinese adolescents. However, our study provides new insight into the association of adolescent sleep patterns and stress with pedestrian and bicyclist injury. This association may have implication for prevention strategies among this population and in other developing countries.

Significant Risk Factors and Comparison Studies

The profile of road traffic injury in our study was consistent with previous research of pedestrian injury in developing countries. In contrast to motorized nations such as the United States where road traffic injury occurs predominantly among four wheel motor vehicle drivers and passengers, in developing countries such as China, the populations most affected by road traffic injury are vulnerable road users including pedestrians and bicyclists that were examined in this study (Nantulya and Reich, 2003; Odero et al., 1997; Wang et al., 2003). The high percentage of injury among pedestrians and bicyclists caused by collisions with motorcycles may be a result of increased motorcycle use that has been observed nationwide in China (Zhang et al., 2004). The lower proportion of incidents involving other motor vehicles such as cars and buses may be due to the low numbers of four-wheeled vehicles in the rural area studied. Also consistent with previous studies was the high incidence of injuries that occurred while students

traveled to or from school. This environment was identified as a high crash risk area for middle and high school students in Florida, USA and may be an even higher risk area for regions that lack school bussing (Abdel-Aty et al., 2007). The high incidence of school-related travel injury was observed despite the fact that the recall period included two months of summer vacation in July and August when students were not traveling to school. A study spanning a period of an entire year or longer would be able to address these seasonal variations. Injuries were self-reported by students in the survey and were unable to be verified by medical records; thus, the severity of road traffic injury in this population cannot be directly compared with previous studies.

The prevalence of sleep problems among Chinese adolescents in this study was similar to previous research by Liu et al. of adolescents aged 12-18 in Shandong Province, China (Liu et al., 2000). The average duration of sleep among adolescents in our sample was 7.87 hours while those in Shandong averaged 7.64 hours. Students in the Shandong study who were older, reported poorer physical health, or had higher life stress slept for shorter durations and had significantly more problems initiating and maintaining sleep (Liu et al., 2000). The Shandong study used a similar questionnaire but observed higher rates of sleep problems including difficulty going to sleep, awakening at night and having trouble going back to sleep, and having nightmares. This trend could be attributed to a sample of older students with an average age of 14.6 years compared to the average of 13.6 years in this study.

Two previous studies have examined the effect of sleep patterns on unintentional injury among adults at work and adolescents on farms in the United States (Spengler et al., 2004; Stallones et al., 2006). Among adult male part-time agricultural workers, the use of sleep medications and symptoms of sleep apnea were significant risk factors for injury (Spengler et al.,

2004). These specific sleep problems were not observed in this study because the number of adolescents who reported using sleep medications was too small to analyze, and sleep apnea symptoms were not measured. In a study by Stallones et al. among 262 adolescent students living on farms in the state of Colorado, those who averaged less than 9.25 hours of sleep on school nights or fell asleep after 3 AM were more likely to have experienced unintentional injury (Stallones et al., 2006). Sociodemographic factors such as gender, age, and school performance were not significant risk factors in the Colorado study. Our study expanded on these findings by focusing on road traffic injury among rural residents and examining additional factors including specific sleep problems, academic performance and stress. The study design included a larger sample size with a higher response rate and limited the recall period to three months as compared to one year.

Implications for Interventions

In this study, the risk factors associated with pedestrian and bicyclist injury will hopefully lead to the development of effective prevention strategies. Change can be achieved through awareness, social change, and environmental modifications. Many challenges to traffic control exist in developing countries: a high proportion of non-motorized and two-wheeler trips, presence of locally designed para-transit vehicles, high density living, and a severe limitation of resources (Mohan, 2002). Until recently, most interventional programs have been focused on passengers and not on vulnerable road users. Research on pedestrian and bicyclist education on traffic risks and safe behavior has been limited to developed countries. In a 2002 review, a link was found between education and behavior, but not necessarily behavior and injury (Duperrex et al., 2002; von Kries et al., 1998). Thus, programs targeting behavior must be accompanied by

social and environmental changes. Roadway countermeasures that have been examined in developing countries include sidewalks, roadway barriers, pedestrian crossing signs, and traffic calming strategies (Forjuoh, 2003). Policy and environmental changes can be catalyzed in many situations by the mobilization of community action for pedestrian safety similar to what was documented in Washington State (Bergman et al., 2002 8). Possible methods of addressing the risk factors related to sleep problems and school-related stress explored in this study include modifying school class schedules and curriculums to help alleviate academic stress. A study examining curriculum reform found that Taiwanese junior high school students who were in a curriculum less dependent on standardized testing slept on average more than those in a traditional exam-based curriculum (Gau and Soong, 1995). This reform may be transferable to the population in this study in rural China and in similar regions around the world.

Study Limitations

As a cross-sectional survey, several limitations need to be considered when interpreting our research findings. First, because information concerning injuries and risk factors was collected simultaneously, it is impossible to infer the causality of these factors. Previous studies in Europe found that psychological effects were observed in victims as a result of road traffic injury. In Austria, parents of injured children reported that 23.5% had psychological disturbances and 0.9% specifically reported trouble sleeping as a direct result of the injury in a post-injury period of 3 to 6 months (Mayr et al., 2003). The incidence of psychological problems was correlated with the severity of injury, measured by deformation of the motor vehicle (Mayr et al., 2003). However, the low rate of sleep problems resulting from injury found in the study does not account for the high rates of sleep problems found among this population. Our study presents

preliminary results for a longitudinal or case-crossover study that could elucidate the causal relationship of these risk factors.

Another limitation of our study is that the recall period for road traffic injuries was three months. Despite this relatively short recall period, we can not entirely prevent reporting bias. We set our recall period during the summer months when students have school in June and summer vacation during the months of July and August. During this time, students do not attend school; however, there is still a significant amount of summer schoolwork which students are obligated to complete and students are subjected to similar pressures from home to perform well academically. Additional seasonal variations including the amount of household chores, farm work, and leisure time could also have had an impact on the variables examined in this study. A third limitation is that the data in our survey collected contained approximately 5-10% missing or erroneous responses for each question, most likely because the child misunderstood or refused to answer the question. These responses were excluded in the χ^2 and multivariate analysis. Finally, the sample size of students who experienced pedestrian and bicyclist injury was relatively small, limiting the statistical power of our survey data. In future studies, a large sample size and longitudinal study design are needed to adequately examine the complex issues of sleep patterns, school-related stress, and road traffic injuries in rural areas of China.

In summary, school grade, pressure from parents regarding school work, and problems falling asleep were identified as significant, but weak, indicators for pedestrian and bicyclist injury among middle school students in rural China. Even as car ownership continues to increase dramatically, many areas in China still lack the basic safety infrastructures that protect pedestrians. Researchers, public health officials, and policymakers should consider social and cultural factors that impact pedestrian injury when addressing this pressing challenge.

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TABLES AND FIGURES

Figure 1

Map of the People's Republic of China with the Wuhan and Hunan region outlined, adapted from the CIA World Factbook (2008)



Table 2
Sociodemographic characteristics and road-traffic pedestrian injury in middle-school students (N = 1551) over a 3 month period in Hunan, China

Characteristics	Total no. of students	No. of injured students	Percentage injured	<i>p</i> Value ^a
Gender				
Male	776	35	4.51	.07
Female	763	21	2.75	
Unknown/Refused ^b	12	0	0.00	
Age (yrs)				
10–12	205	6	2.93	.54
13	472	19	4.03	
14	552	23	4.17	
≥ 15	321	8	2.49	
Unknown/Refused ^b	1	0	0.00	
Grade level				
7th	563	30	5.33	< .05
8th	492	15	3.05	
9th	495	11	2.22	
Unknown/Refused ^b	1	0	0.00	
Mother's Age (yrs)				
< 35	124	5	4.03	.11
35–39	536	11	2.05	
40–44	482	23	4.77	
≥ 45	267	11	4.12	
Unknown/Refused ^b	142	6	4.23	
Mother's Education (yrs)				
< 7	685	19	2.77	.09
7–9	508	22	4.33	
≥ 10	120	8	6.67	
Unknown/Refused ^b	211	17	8.06	
Brother lives in household				
Yes	840	29	3.45	.79
No	620	23	3.71	
Unknown/Refused ^b	91	4	4.40	
Sister lives in household				
Yes	627	30	4.78	< .05
No	785	21	2.68	
Unknown/Refused ^b	139	5	3.60	
Family estimated annual income (yuan)				
< 1,000	875	29	3.31	.29
1,000–2,999	463	15	3.24	
3,000–4,999	97	3	3.09	
≥ 5,000	47	4	8.51	
Unknown/Refused ^b	69	5	7.25	

^aBased on Pearson chi-square (χ^2) test.

^bUnknown/refused responses not included in χ^2 analysis

Table 3
School habits and sleep patterns and road-traffic pedestrian injury in middle-school students (N = 1551) during a 3 month period in Hubei, China

Characteristics	Total no. of students	No. of injured students	Percentage injured	<i>p</i> Value ^a
Time spent traveling to school (mins)				
< 20	390	17	4.36	.67
20–39	522	17	3.26	
≥ 40	504	18	3.57	
Unknown/Refused ^b	135	4	2.96	
Homework difficulty				
Not difficult	374	15	4.01	.88
A little difficult	1048	37	3.53	
Difficult	95	4	4.21	
Unknown/Refused ^b	34	0	0.00	
Total study scores				
Top 10%	201	6	2.99	.68
Middle 11%–74%	1177	43	3.65	
Low 25%	144	7	4.86	
Unknown/Refused ^b	29	0	0.00	
Parents assigned extra homework				
Never or rarely	847	20	2.36	< .001
Sometimes	553	26	4.70	
Often	83	8	9.64	
Unknown/Refused ^b	68	2	2.94	
Parent treatment for poor academic performance				
Encourage	1090	28	2.57	< .001
Scold or apathetic	419	28	6.68	
Unknown/Refused ^b	42	0	0.00	
Highest grade in school wanted to complete				
May not finish middle or high school	66	5	7.58	.06
Will finish high school	223	13	5.83	
Tier I–IV or other college	738	22	2.98	
Do not know	435	13	2.99	
Unknown/Refused ^b	89	3	3.37	
Average sleep on school nights (hours)				
<8	408	10	2.45	.14
8	783	36	4.60	
≥9	276	8	2.90	
Unknown/Refused ^b	88	2	2.27	
Difficulty going to sleep on school nights				
Never or rarely	608	12	1.97	< .05
Sometimes	710	31	4.37	
Often	168	10	5.95	
Unknown/Refused ^b	65	3	4.62	
Awakened at night and had trouble going back to sleep				
Never or rarely	838	24	2.86	.14
Sometimes	596	29	4.87	
Often	54	2	3.70	
Unknown/Refused ^b	63	1	1.59	
Had nightmares				
Never or rarely	701	19	2.71	.14
Sometimes	727	33	4.54	
Often	71	4	5.63	
Unknown/Refused ^b	52	0	0.00	

^aBased on Pearson chi-square (χ^2) test.

^bUnknown/refused responses not included in χ^2 analysis

Table 4

The number and proportion of road-traffic pedestrian injuries sustained by middle-school students (N=56) over a 3 month period in Hubei, China

Characteristics	No. of injuries	Percentage
Vehicle responsible for injury*		
Motorcycle	47	79.7
Tractor	7	11.9
Car or Bus	5	8.5
Activity at time of injury		
Walking to or from school	10	17.9
Riding a bicycle to or from school	10	17.9
Walking or riding a bicycle on a town road (school unrelated)	8	14.3
Walking or riding a bicycle on a rural road (school unrelated)	11	19.6
Other	4	7.1
Unknown/Refused	13	23.2
Time length of activity restriction from injury		
< 1 day	23	41.1
1–7 days	12	21.4
8–14 days	6	10.7
14 days–1 month	2	3.6
> 1 month	2	3.6
Unknown/Refused	11	19.6

*One subject was injured by multiple vehicles

Table 5

Multivariate Poisson regression and relative risk of road traffic injury among Chinese middle school children by selected sociodemographic factors, school habits, and sleep patterns

Characteristics	Model 1 RR (95% CI)	Model 2 RR (95% CI)	Model 3 RR (95% CI)
Sister living in household			
No ^a	1.00	1.00	1.00
Yes	0.99 (0.95, 1.04)	0.99 (0.95, 1.04)	1.00 (0.95, 1.04)
Parents assign extra homework			
Never or rarely ^a	1.00	1.00	1.00
Sometimes	1.01 (0.93, 1.08)	1.01 (0.93, 1.08)	1.01 (0.93, 1.08)
Often	0.98 (0.87, 1.10)	0.98 (0.87, 1.10)	0.98 (0.87, 1.10)
Average sleep on school nights (hours)			
≥9 ^a	...	1.00	...
8	...	1.00 (0.94, 1.05)	...
<8	...	1.00 (0.93, 1.07)	...
Difficulty falling asleep			
Never or rarely ^a	1.00
Sometimes	0.99 (0.91, 1.08)
Often	0.98 (0.86, 1.13)

Adjusted for gender and age

^aReference