

## A Study on the Road Crossing Behavior of High School & College Students in Dhaka City

A. Basunia<sup>1\*</sup>, T. H. Anchal<sup>2</sup>, T. Z. Mahzabeen<sup>3</sup>, N. Ahmed<sup>4</sup>, S. M. Rifaat<sup>5</sup>

<sup>1</sup>Department of Civil and Environmental Engineering, IUT, Bangladesh ([adityabasunia@iut-dhaka.edu](mailto:adityabasunia@iut-dhaka.edu))

<sup>2</sup>Department of Civil and Environmental Engineering, IUT, Bangladesh ([tanzimhossain@iut-dhaka.edu](mailto:tanzimhossain@iut-dhaka.edu))

<sup>3</sup>Department of Civil and Environmental Engineering, IUT, Bangladesh ([tanzilazannat@iut-dhaka.edu](mailto:tanzilazannat@iut-dhaka.edu))

<sup>4</sup>Department of Civil and Environmental Engineering, IUT, Bangladesh ([niazahmed@iut-dhaka.edu](mailto:niazahmed@iut-dhaka.edu))

<sup>5</sup>Department of Civil and Environmental Engineering, IUT, Bangladesh ([smrifaat@iut-dhaka.edu](mailto:smrifaat@iut-dhaka.edu))

### Abstract

In Bangladesh, student casualties in road accidents are escalating, especially in Dhaka city. According to the Road Safety Foundation, in 2022, 26.96% of student fatalities occurred in Dhaka. Studies have been conducted in South Korea, India, Qatar, and other countries on students' road-crossing behavior. However, this is scarcely addressed in Bangladesh's context and needs attention. Hence, this study used the logistic regression model to investigate the factors affecting the road-crossing habits of high school and college students in Dhaka City. Survey data was collected physically from 273 students of classes 6–12 from 13 schools and colleges that focused on their socio-economic and demographic features, parental supervision, travel behavior, medium of instruction of the institutions, etc. This study found that travel characteristics, respondent particulars & their walking behaviors had a significant effect on crossing behaviors. Sixth through ninth graders were most likely to jaywalk, especially those who use devices enhancing distractions and observe others involving unlawful road crossing. Urban settings, transport modes, and traffic conditions are the most significant factors influencing jaywalking while parental guidance and traffic knowledge are crucial in mitigating such behavior. The study results are expected to help policymakers to develop proper crossing policies, safer roads, and infrastructures among others.

**Keywords:** Road Safety Perception; Jaywalking; Road Crossing Behavior; Student Road Safety; Logistic Regression Model.

### 1 Background

Traffic injuries are the seventh largest cause of mortality and the sole leading cause of death for children and young people aged 5–29 (WHO, 2018). Bangladesh saw 6,829 traffic accidents that caused 7,713 deaths in 2022 (Rahman, 2023). Sadly, 60.53% of them were pedestrians, of which 16% were students, and the majority of these student fatalities occurred in Dhaka. Children under the age of 16 were implicated in 21% of all road deaths in Bangladesh (Anjuman and Siddiqui, 2007). It was found that 37% of child fatalities happened on national highways and arterial roads (Afifah & Hossain, 2016). Regrettably, in Dhaka, many educational institutions are built in accident-prone areas of the city. In addition, it was found most student accidents took place near school areas in Dhaka (Abdel-Aty et al., 2007). Dhaka has the highest number of educational institutions in Bangladesh, e.g., junior high, secondary, and college (Bangladesh Bureau of Statistics, 2022). This suggests a risky road condition for student movements in Dhaka. It was found that 63% of the time, pedestrian road accidents occur because of a lack of proper traffic control (Ahmed, 2012). Moreover, children's underdeveloped senses prevent them from accurately assessing traffic environments, visual timing, crossings, and speed. These attributes make school-going children more likely to jaywalk and get involved in risky behaviors, and different factors are responsible for jaywalking, which has been thoroughly investigated in our study.

### 2 Literature Review

Children perceive differently than adults while walking on roads, especially when jaywalking. Students who walked in urban settings were found to be more vulnerable (Gitelman et al., 2019). When crossing roads, studies showed that children frequently took the shortest or most direct route (Ampofo-Boateng et al., 1993). Peer pressure

played a profound role in partaking of children in dangerous conduct on purpose (Peden et al., 2008). Teenagers were also found to be less proficient than adults because of inexperience (O'Neal et al., 2018). It was also suggested that the lack of adult supervision in low-income neighborhoods due to financial constraints or other reasons might have increased unsafe road-crossing among students (Desapriya et al., 2011). It was proposed that the negligence of child pedestrians was caused by a lack of safety understanding (Koekemoer et al., 2017). However, studies only showed findings that influenced people during jaywalking or unconventional ways of road crossing. But what trigger and influences jaywalking? There are few studies targeting students on this matter in developing countries, especially in Bangladesh. Hence, our study aims to determine the different factors that trigger and affect jaywalking among high school and college students in Dhaka city.

### 3 Data Collection

A questionnaire survey was prepared considering the literature review, local issues (observed through field study), and a focused group discussion. There were 68 questions divided into 7 sections, which covered the following areas: respondent particulars, demography, socio-economic status of guardians(s), traffic knowledge of the respondent, travel characteristics, crash history, and usage of legal crossing options. These factors were used to develop the model. Considering a confidence interval of 90%, our sample population was 273. Hence, we collected 273 physical survey data from students in classes 6-12 from 13 schools in Dhaka city's Dhanmondi, Motijheel, Tejgaon, Mirpur, Uttara, and Mohammadpur areas. Education medium (English, Bangla, etc.) and gender of respondents were given equal importance. A field study was conducted for 30 minutes per location at the nearest crossing of 5 schools and colleges to visualize the current jaywalking situation in Dhaka city and justify our study as presented in Table 1.

Table 1. Physical evidence of jaywalking of high school and college students.

Crossing near School	Location	Boys		Girls	
		Jaywalking	Not Jaywalking	Jaywalking	Not Jaywalking
Rajuk Uttara Model College (Day Shift)	Uttara	75	30	20	33
Birshreshtha Noor Mohammad Public School (Morning Shift)	Dhanmondi	63	55	45	59
Holy Cross College (Day Shift)	Farmgate	-	-	36	71
Dhanmondi Tutorial (Morning)	Dhanmondi	49	27	28	37
Notre Dame College (Morning)	Motijheel	89	43	-	-

### 4 Statistical Model

The decision to jaywalk is our dependent variable which is binary in nature. The logistic regression model is, therefore, an appropriate statistical model. Logistic regression is widely used in road safety studies (Tay et al., 2008; Valent et al., 2002; Simoncic, 2001). The model is expressed in terms of the Odds Ratio (OR), in which the likelihood of the dependent variable increases when OR is greater than 1 and decreases when OR is less than 1. In our model, the decision to jaywalk is 1, otherwise 0. The probability P of jaywalking is expressed as:

$$Y = \text{logit}(P) = \ln \ln \left( \frac{P}{1-P} \right) = \beta X \quad (1)$$

Where  $\beta$  is a model parameter to be estimated, X is the vector of the independent variable, Y is the dependent variable, and P is the probability. When an independent variable  $X_i$  increases by one unit (other considered constant), the odds of that particular variable increase by  $\exp(\beta_i)$ . This is referred to as the odds ratio (range: 0 to  $\infty$ ). The survey data was thoroughly filtered and analyzed in STATA to extract the significant variables based on p-value after multiple iterations. We also analyzed the significant variables for correlation; the variables with low correlation (less than 0.5) were kept for final analysis. The significant independent variables were identified by p-value. Table 2 shows the descriptive statistics of the retained variables.

Table 2. Descriptive statistics of variables.

	<b>Explanatory Variables</b>	<b>Description for variables</b>	<b>Mean</b>	<b>Std. Dev.</b>
(1)	<i>Class of student</i>			
	6-8	Class 6-8=1; otherwise=0	0.326	0.470
	9-10	Class 9-10=1; otherwise=0	0.326	0.470
	11-12	Class 11-12=1; otherwise=0	0.348	0.477
(2)	<i>Estimated time of reaching school</i>			
	Just on time	Just on time=1; otherwise=0	0.304	0.461
	Well ahead of time	Ahead of time=1; otherwise=0	0.322	0.468
	Few minutes earlier	Few minutes earlier=1; otherwise=0	0.315	0.465
(3)	<i>Occupation of mother</i>			
	Service holder	Service holder=1; otherwise=0	0.190	0.393
	Businesswoman	Businesswoman=1; otherwise=0	0.062	0.242
	Teacher	Teacher=1; otherwise=0	0.095	0.294
	Housemaker	House maker=1; otherwise=0	0.553	0.498
	Others	Others=1; otherwise=0	0.095	0.294
(4)	<i>Travel Mode (school to home and vice versa)</i>			
	Walk only	Walk=1; otherwise=0	0.176	0.381
	Walk and use public transport	Walk and use PT=1; otherwise=0	0.198	0.399
	Private vehicle	Private vehicle=1; otherwise=0	0.374	0.485
	Rickshaw	Rickshaw=1; otherwise=0	0.183	0.388
	CNG/Auto Rickshaw	CNG=1; otherwise=0	0.055	0.228
	Others	Others=1; otherwise=0	0.015	0.120
(5)	<i>Time of more traffic exposure</i>			
	Morning	Morning=1; otherwise=0	0.399	0.491
	Noon	if noon=1; otherwise=0	0.201	0.402
	Evening	if evening=1; otherwise=0	0.392	0.489
(6)	<i>Location of school</i>			
	Commercial zone	Commercial=1, otherwise=0	0.275	0.447
	Residential zone	Residential=1, otherwise=0	0.223	0.417
	Mixed zone	Mixed=1, otherwise=0	0.502	0.501
(7)	<i>Residency in Dhaka (years)</i>			
	≤5	Years≤5=1; otherwise=0	0.066	0.249
	5-10	5<Years≤10=1; otherwise=0	0.216	0.412
	≥10	Years≥10=1; otherwise=0	0.718	0.451
(8)	<i>Traffic condition of the road</i>			
	Low traffic	Low traffic=1; otherwise=0	0.084	0.278
	Moderate traffic	Moderate traffic=1; otherwise=0	0.388	0.488
	High traffic	High traffic=1; otherwise=0	0.300	0.459
	Congested	Congested=1; otherwise=0	0.223	0.417
(9)	<i>Safety of overpass</i>			
	All the time	All the time=1; otherwise=0	0.168	0.375
	Sometimes	Sometimes=1; otherwise=0	0.359	0.481
	Never	Never=1; otherwise=0	0.465	0.500
(10)	<i>Jaywalking tendency (when others jaywalk)</i>	Yes=1; No=0	0.513	0.501
(11)	<i>Distractions while crossing (talking by cellphone, listening to music, etc.)</i>			
	Never	Never=1; otherwise=0	0.516	0.501
	Rarely	Rarely=1; otherwise=0	0.260	0.439
	Frequently	Frequently=1; otherwise=0	0.136	0.343
	Always	Always=1; otherwise=0	0.007	0.085
(12)	<i>Taking training/sessions on traffic knowledge</i>	Yes=1; No=0	0.535	0.500
(13)	<i>Condition of footpath</i>			
	Good	Good=1; otherwise=0	0.282	0.451

	<b>Explanatory Variables</b>	<b>Description for variables</b>	<b>Mean</b>	<b>Std. Dev.</b>
	Moderate	Moderate=1; otherwise=0	0.256	0.437
	Poor	Poor=1; otherwise=0	0.462	0.499
(14)	<i>Encroachment of footpath (i.e., Presence of hawkers, mobile shops, construction material etc.)</i>	Yes=1; No=0	0.846	0.361

## 5 Result & Discussion

The model results are shown in Table 3. After more than 200 iterations and primary screening, the model retained 16 significant variables based on p-values (significant variables (P<0.05) or marginally significant variables (P≤0.1)) that had low correlation (less than 0.5) from 14 questions that had 43 variables (Table 2).

Table 3. Estimates of the logistic regression model

	<b>Variables</b>	<b>Odds Ratio</b>	<b>P-Value</b>
(1)	Class of student		
	6-8	3.49	0.01
	9-10	3.01	0.018
(2)	Estimated time of reaching school		
	Just on time	0.45	0.035
(3)	Occupation of mother		
	Businesswoman	0.14	0.005
(4)	Mode of travel (school to home and vice versa)		
	Walk only	0.41	0.104
	Rickshaw	0.32	0.011
(5)	Time of more traffic exposure		
	Evening	0.40	0.016
(6)	Zone of school/college/educational institution		
	Commercial	0.41	0.03
(7)	Residency in Dhaka		
	5-10 years	2.56	0.029
(8)	Traffic condition of road		
	Moderate traffic	0.56	0.101
(9)	Safety of overpass		
	Never	2.86	0.003
(10)	Jaywalking tendency (when sees others jaywalking)	2.83	0.004
(11)	Distractions while crossing	2.17	0.001
(12)	Taking classes/training/sessions on traffic knowledge, if offered	0.28	0.001
(13)	Condition of footpath	1.53	0.051
(14)	Encroachment of footpath	0.42	0.067
	Number of observations		273
	Log likelihood		-121.3397
	Likelihood Ratio (LR) Chi-Square test (17)		124.62
	Prob > chi2		0.0000
	Pseudo R-squared		0.3393

Travel characteristics, respondent particulars & their walking behaviors have significant effects on road crossing behavior. However, the demographic characteristics and crash history of the respondents doesn't have much influence on this. Relative to 11-12 classes' students, it is found that students from classes 6-8 have the highest probability of jaywalking (OR=3.49), followed by the students of classes 9-10. This result clearly indicates that relatively younger adolescents show less safety consciousness while crossing the roads compared with their elder counterparts (Mfinanga, 2014). However, the students are 55% less likely to jaywalk or midblock road crossing if they arrive on time to attend school. Having more time on hand generally reduces dangerous road crossing tendencies by providing sufficient time for safe crossing. Previous studies show that students often get anxious if they are late for class and thus are in a rush to cross the street (Hansen, 2011).

Interestingly, students are 86% less likely to jaywalk (OR=0.14) if their mothers are businesswomen. The reason for this finding is that perhaps businesswomen have a stronger sense of responsibility and are more knowledgeable because of their job nature, making them more safety conscious, and thus, their better safety perception is channeled to their adolescent kids. While analyzing the effect of the mode of transportation, it is found from the model results that students who only walk to reach their institutions are less likely to exhibit jaywalking behavior (OR=0.41). Possible reasons could be that they are experienced as they spend more time on roads, which helps them be more safety conscious. Moreover, the students riding rickshaws are also less likely to engage in such risky behavior (OR=0.32) since rickshaws provided door-to-door service. Thus students, in this case, do not necessarily need to cross roads frequently. However, during the evening, students exhibit 60% less jaywalking behavior (OR=0.40) as traffic congestion starts to decrease by that time. If the schools are in commercial areas, the students would be more prone to use designated crossing locations (OR=0.40). This type of behavior is expected since commercial areas have stricter law enforcement and improved traffic infrastructure.

Students who lived in Dhaka for 5 to 10 years have a higher chance of jaywalking (OR=2.56). The longer living duration in the city might have boosted their confidence in navigating its streets, but it also erodes their sense of responsibility. In moderate traffic conditions, it was 44% less likely to be involved in this risky behavior compared with high or low traffic. Pedestrians are less likely to use unconventional crossing means in higher traffic densities (Wang et al., 2021). Although, in South Africa's Cape Town, it is observed that most traffic accidents occur when children use roads with moderate traffic to go to and from school (Koekemoer et al., 2017).

The negative perception of security issues (i.e., mugging) of overpasses significantly increases the likelihood of jaywalking (OR=2.86). Inconvenience to use, negative perception of safety, and lack of enforcement and surveillance system may be the reason for this finding. A previous study also observed a similar result (Debnath et al., 2021). In addition, it is found that students demonstrate unlawful road crossing behavior more (OR=2.83) when they see others jaywalking. This outcome is expected because of peer influence, bystander effect (a social psychological phenomenon where individuals are less likely to act where others are present), and underestimation of risk while in a flock. This result echoes the findings of previous studies (Zannat et al., 2019). Students distracted by cell phones or listening to music etc., while crossing are more likely to jaywalk (OR=2.17). Perhaps impaired judgment from less situational awareness of the students using cellphone during crossing provokes jaywalk (Gitelman et al., 2019). Students willing to take training/education sessions on traffic safety are less likely to jaywalk (OR=0.28). They are the cohort of students who are more concerned about their safety as they are eager to educate themselves on road safety issues, and their attitude of not jaywalking reflects this.

Footpath condition plays a significant role in road crossing behavior (OR=1.53). According to the result of Table 2, the chances of being involved in jaywalking is 53% higher when the footpath condition is poor. Poor footpath condition reflects several attributes, i.e., inadequate width, potholes, and undulated and discontinuous paths, which often discourage students from using this road furniture and encourage jaywalking. A similar result is observed in the study by Zannat et al. (2019), where footpath condition is found to play a crucial role in road crossing behavior. Another interesting finding is that students are 58% less likely to engage in this behavior if encroachment of the footpath is observed (OR=0.42). The presence of vendors, shops, and construction materials on pedestrian paths perhaps discourages students from jaywalking. Those footpath locations are probably surrounded by roadside barriers which limit the students from entering the traffic lane from pedestrian paths to cross the road illegally.

## 6 Conclusion

Our study explored multiple factors affecting road crossing behaviors among Dhaka city's high school and college students. Students, especially sixth to ninth graders, are most likely not to use legal crossing facilities, which coincides with the field observations as well. Students while observing other pedestrians jaywalking or using gadgets are more likely to use unauthorized locations to cross the road. In addition, students who have been living in Dhaka for several years and had a negative perception of the security issues of pedestrian overpasses are often involved in this unruly road crossing activity.

On the contrary, students who are willing to acquire traffic safety knowledge through safety education programs and having parental guidance are less likely to involve in jaywalking. Situational factors like traffic conditions, urban settings, and transportation modes significantly influence jaywalking. However, this study also has some limitations, such as small sample size and self-reporting bias. Nonetheless, the findings of this study would help policymakers, urban planners and relevant Government bodies to take necessary initiatives to reduce road crossing casualties from jaywalking, for example, organizing road safety education/campaigns for school and college students, taking necessary safety measures i.e., imposing safe speed limit, putting road crossing sign in proper

locations, allot sufficient signal timing for a proper road crossing, installing surveillance cameras, imposing more fines for jaywalkers, etc.

## References

- Abdel-Aty, M., Chundi, S.S. and Lee, C. (2007). Geo-spatial and log-linear analysis of pedestrian and bicyclist crashes involving school-aged children. *Journal of Safety Research*. Vol. 38, pp. 571-579.
- Afifah, F. and Hossain, M. (2016). The state of road safety education for children in Bangladesh. *IOSR Journal of Mechanical and Civil Engineering*. Vol. 13, No. 5, pp. 139-146.
- Ahmed, B. (2012). Traffic accident study in Dhaka city (2007-2011), Bangladesh. Dhaka: Clean Air and Sustainable Environment (CASE) project, Dhaka South City Corporation and Dhaka North City Corporation.
- Ampofo-Boateng, K., Thomson, J. A., Grieve, R., Pitcainr, T., Lee, D. N. and Demetre, J. D. (1993). A developmental and training study of children's ability to find safe routes to cross the road. *British Journal of Developmental Psychology*. Vol. 11, No. 1, pp. 31-45.
- Anjuman, T. and Siddiqui, C.K.A. (2007). The road safety situation for children in Bangladesh, Proc. of ACRS Conference: Infants, Children and Young People and Road Safety 2007, pp. 99-111.
- Bangladesh Bureau of Statistics. (2022). Bangladesh Education Statistics 2021.
- Debnath, M., Hasanat-E-Rabbi, S., Hamim, O. F., Hoque, M. S., McIlroy, R. C., Plant, K. L. and Stanton, N. A. (2021). An investigation of urban pedestrian behaviour in Bangladesh using the Perceptual Cycle Model. *Safety Science*. Vol. 138, Article No. 105214.
- Desapriya, E. B. R., Sones, M., Ramanzin, T., Weinstein, S., Scime, G. and Pike, I. (2011). Injury prevention in child death review: child pedestrian fatalities. *Injury Prevention*. Vol. 17, No. Suppl I, pp. i4-i9.
- Gitelman, V., Levi, S., Carmel, R., Korchatov, A. and Hakkert, S. (2019). Exploring patterns and risk factors in child pedestrian behaviors at urban intersections. *Accident Analysis & Prevention*. Vol. 122, pp. 36-47.
- Hansen, H. (2011, November 04). Consider students when addressing jaywalking. *The Daily Texan*
- Koekemoer, K., Van Gesselleen, M., Van Niekerk, A., Govender, R. and Van As, A. B. (2017). *Accident Analysis and Prevention*. Vol. 99, pp. 202-209.
- Mfinanga, D. A. (2014). Implications of pedestrians stated preference of certain attributes of crosswalks. *Transport Policy*. Vol. 32, pp. 156-164.
- O'Neal, E. E., Jiang, Y., Franzen, L. J., Rahimian, P., Yon, J. P., Kearney, J. K. and Plumert, J. M. (2018). Changes in perception-action tuning over long time scales: How children and adults perceive and act on dynamic affordances when crossing roads. *Journal of Experimental Psychology: Human Perception and Performance*. Vol. 44, No. 1, pp. 18-26.
- Peden, M., Oyegbite, K., Ozanne-Smith, J., Hyder, A. A., Branche, C., Rahman, A. F., Rivara, F. and Bartolomeos, K. (2008). *World report on child injury prevention*. Geneva: World Health Organization.
- Rahman, S. (2023, January 08). Road accidents kill highest number of students in 2022. *Prothom Alo*.
- Simoncic, M. (2001). Road fatalities in Slovenia involving a pedestrian, cyclist or motorcyclist and a car. *Accident Analysis & Prevention*. Vol. 33., No. 2, pp. 147-156.
- Tay, R., Rifaat, S. M. and Chin, H. C. (2008). A logistic model of the effects of roadway, environmental, vehicle, crash and driver characteristics on hit-and-run crashes. *Accident Analysis & Prevention*. Vol. 40, No. 4, pp. 1330-1336.
- Valent, F., Schiava, F., Savonitto, C., Gallo, T., Brusaferrero, S. and Barbone, F. (2002). Risk factors for fatal road traffic accidents in Udine, Italy. *Accident; Analysis and Prevention*. Vol. 34, No. 1, pp. 71-84.
- Wang, Y., Shen, B., Wu, H., Wang, C., Su, Q. and Chen, W. (2021). Modeling illegal pedestrian crossing behaviors at unmarked mid-block roadway based on extended decision field theory. *Physica A: Statistical Mechanics and its Applications*. Vol. 562, Article No. 125327.
- WHO. (2018). *Global status report on road safety 2018: summary*.
- Zannat, K. E., Raja, D. R. and Adnan, M. S. G. (2019). Pedestrian Facilities and Perceived Pedestrian Level of Service (PLOS): A Case Study of Chittagong Metropolitan Area, Bangladesh. *Transportation in Developing Economies*. Vol. 5, No. 2, Article No. 9.