








Factors Influencing Mode Choice for Trip Makers Between Gazipur and Dhaka: An Analytical Study

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Abstract. Choice of transportation mode is influenced by the socioeconomic characteristics of dwellers and trip characteristics, which aid in improving the overall transportation system and upgrading policies. Due to the interdependence of two cities, many people commute from Gazipur to Dhaka using buses, trains, bikes, CNGs, etc. This study aims to identify the factors that affect the mode choice of transportation; an analytical study was conducted at four distinct locations in the Gazipur municipal area. Different graphs and charts illustrated based on travel behaviors show how socioeconomic and trip characteristics affect the choice of a particular mode. It has been found that trains (87.2%) are the most preferred mode for males offering a cheap travel cost (50-150 BDT) whereas females prefer CNGs (33.3%) for security and comfort. Students mainly travel by bus (36.4%), which offers low travel costs (50-200 BDT), especially for those who travel daily. According to responses, bikes can be considered the least secure and uncomfortable mode without delay, but require the highest travel cost. To conclude, buses and trains are identified as the most favored modes of travel, underscoring the necessity to develop and upgrade alternative modes of transportation.

Keywords: Mode Choice, Transportation Modes, Travel Behavior, Trip Frequency, Comfort, Security.

1 Introduction

Due to the increase in traffic volume and complexity of urban travel in developing countries like Bangladesh, cause significant challenges for transportation planners and policymakers, leading to the importance of understanding travel behavior to investigate the relationship between urban structure, transportation systems, and public activity [1], [2]. Travel behavior is influenced by several factors such as trip-maker and household attributes, socioeconomic conditions, trip purposes, income, gender, educational qualification, and trip characteristics such as travel time, cost, comfort, and availability of

modes [3]. Thus, the choice of mode becomes a key aspect of travel behavior, significantly affecting urban mobility and transportation planning that serves as a fundamental model for strategic and integrated operational decisions [4], [5].

Factors influencing mode choice can be grouped into trip-maker characteristics, trip attributes, mode features, comfort, and security [6]. Several researchers investigated how travel behaviors influence mode choice for commuting in Dhaka city [7]. These findings highlight the need to analyze multiple factors to understand travel patterns comprehensively. Also, rail transit, as an integral part of the transportation system in urban areas, plays an important role in accommodating rising travel demands [8]. Consequently, mode choice analysis becomes essential for optimizing the operational planning in transportation systems.

This study aims to identify and analyze the factors influencing transportation mode choice among trip-makers commuting from Gazipur to Dhaka. The findings are intended to address traffic congestion, and improve mobility, ultimately informing sustainable transportation strategies that align with the region's socioeconomic and infrastructural policy.

2 Methodology and Data Collection

2.1 Methodology

This study designed an organized data collection process in order to meet the research objectives effectively. A comprehensive survey was conducted among 204 respondents from diverse socio-economic backgrounds to ensure a representative sample of the population of Gazipur municipal area. The survey questionnaires were precisely designed based on an extensive literature review as well as technical and psychological judgment, aiming to record trip characteristics and socioeconomic characteristics of trip-makers and identify the challenges they face when traveling by different modes of transportation.

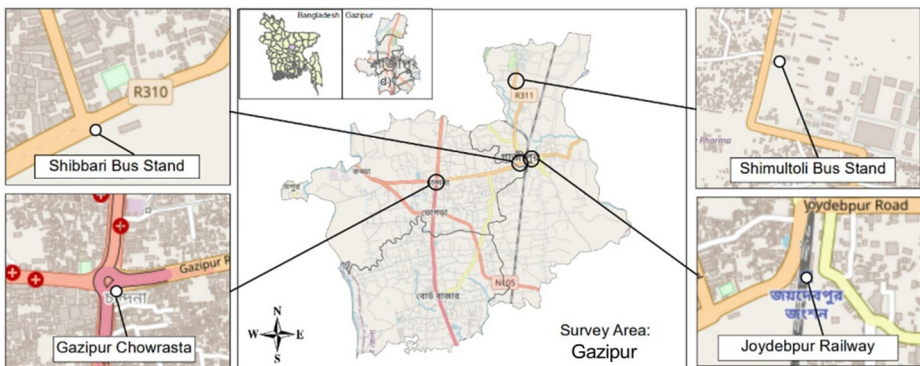


Fig. 1. Study area of Gazipur Municipal Area

2.2 Data Collection

This survey accumulated data on key factors such as gender, age, income, occupation, educational qualification, trip purpose, travel cost, comfort and security, trip delay, trip frequency, etc. The collected data included the perspectives of trip-makers on service attributes of four primary modes of transportation; train, bus, CNG, and bike. These data were then processed and organized for further analysis. A comprehensive statistical analysis was performed by illustrating bar charts, graphs, radar charts, and cluster bars, in order to identify the significant factors influencing mode choice, especially trip-makers’ attributes and trip characteristics of individual modes.

3 Study Area

Four different congested areas in Gazipur municipal areas were selected to collect data from locations where commuters choose their modes of travel to Dhaka. This survey was carried out at locations where target modes are available, including Shimultoli Bus Stand, Shibbari Bus Stand, Joydebpur Railway Station, and Gazipur Chowrasta, as illustrated in Fig. 1.

4 Result and Discussions

4.1 Socioeconomic characteristics

Table 1. Socioeconomic characteristics data of the respondents.

Socioeconomic characteristics					
Factor	Group	%	Factor	Group	%
Gender	Male	86.30%	Student	Student	30.40%
	Female	13.70%		Private employee	35.80%
Age group	10 to 25	32.80%	Occupation	Government employee	9.80%
	25 to 40	50.50%		Unemployed	4.40%
	40 to 55	13.70%		Businessperson	15.20%
	55 to 70	2.50%		Homemaker	2.50%
	70 to 85	0.50%		Other	2.00%
Income	No earnings	31.00%	Educational qualification	Primary school	2.00%
	<10000	3.40%		Secondary school	18.10%
	10000-25000	27.10%		Higher secondary School	25.50%
	25000-50000	32.00%		Bachelor's degree	39.70%
	50000-75000	5.40%		Master’s degree or higher	13.20%
	>75000	1.00%		No education	1.50%

Owing to the high population density of Gazipur and its proximity to Dhaka (approximately 25 to 30 kilometers), people of the Gazipur municipal area primarily rely on public transport for commuting between the two cities, driven by geo-economic factors.

In this study, the socioeconomic characteristics, collected from 204 respondents are tabulated in Table 1. In Fig. 2, several comprehensive illustrations have been shown that explain how socioeconomic characteristics of travelers affect selection mode, particularly for bus, train, bike, and CNG. The analytical illustration shows that buses are preferred by 48.9% of males and 46.4% of females, while trains are chosen by 46.6% of males and 42.9% of females, as illustrated in Fig. 2(a). Additionally, it is noteworthy that females depend more on CNGs, with 7.1% opting for this mode, compared to only 2.3% of males.

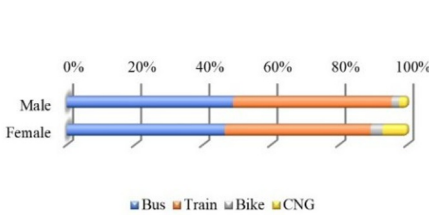


Fig. 2(a). % Mode share by gender

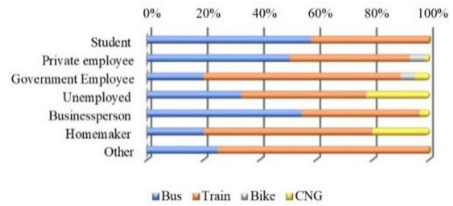


Fig. 2(b). % Mode share by occupation

According to the occupational trends as shown in Fig. 2(b), buses are the primary choice for students (58.1%) and private employees (50.7%). In contrast, government employees (70.0%) and individuals in the "other" category (75.0%) mainly use trains. Besides, businesspersons (54.8%) and homemakers (60.0%) also show a shift toward public transport. Considering the trip purpose, buses and trains are the predominant choices for education (50.0% each) and work (47.4% each), as shown in Fig. 2(c). Medical trips are more spread out, with buses (16.7%), trains (50.0%), and bikes and CNGs (16.7% each) being used for emergencies. Shopping trips lean heavily toward trains (60.0%), while leisure travelers (56.3%) prefer buses.

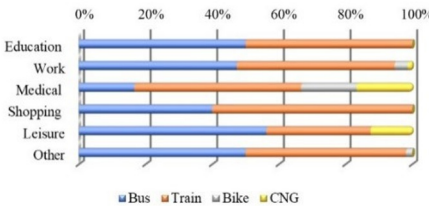


Fig. 2(c). % Mode share by trip purpose

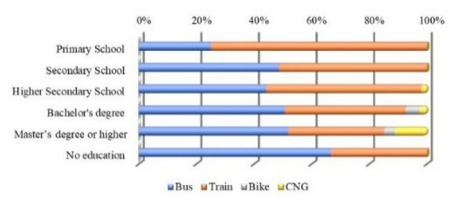


Fig. 2(d). % Mode share by edu. qualification

Fig. 2(d) reveals that trip-makers with lower educational qualifications, such as primary (75.0%) and secondary school (51.4%) levels, mostly use trains. As education levels rise, bus usage increases, peaking at 51.9% for master's degree holders or higher, while bikes (4.9%) and CNGs (11.1%) become more common among those with higher degrees, whereas the non-educated trip-makers (66.7%) rely heavily on buses. Fig. 2(e) indicates that buses (49.3%) and trains (50.7%) are almost equally favored by the 10

25 age group, while middle-aged individuals (25 to 55) exhibit more diversity in preferences, including bikes (3.6 to 3.9%) and CNGs (4.9%). Older individuals aged 55+, especially those between 55 and 70 years, predominantly choose trains (60.0%) and CNGs (20.0%).

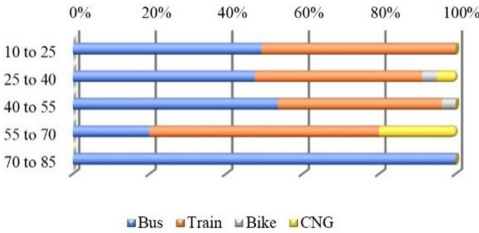


Fig. 2(e). % Mode share by age group

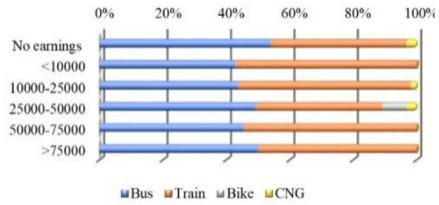


Fig. 2(f). % Mode share by income

Tripmakers with no income primarily rely on buses (54.0%) and trains (42.9%), with minimal use of CNGs, as depicted in Fig. 2(f). Lower-income groups (< 25,000 BDT) prefer trains (54.5% to 57.1%) and buses, while middle-income groups (10,000-50,000 BDT) also use these modes but show minimal bike (7.7%) and CNG (3.1%) usage.

4.2 Trip Characteristics

The choice of transportation mode in Bangladesh is significantly influenced by the various trip characteristics such as trip cost, security and comfort, delays, etc, [3, 6]. Fig. 3 demonstrates how trip characteristics affect commuters while choosing modes of transportation for traveling.

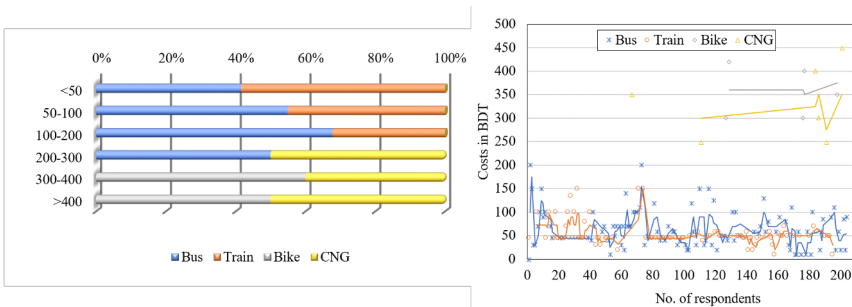


Fig. 3(a). % Mode share by trip cost

Fig. 3(a) illustrates that buses are the most popular mode within 50-200 BDT range, with the highest preference at 0-100 BDT (54.9%). Trains follow a similar trend, preferred in 50-150 BDT range, but showing higher preference with lower costs than that of buses. Also, Fig. 3(a) provides an overview, as costs exceed 200 BDT, CNGs, and bikes become popular, particularly within the 300-400 BDT and >400 BDT ranges,

where both options are favored, indicating a shift toward private transport as travel costs increase, offering greater flexibility and convenience.

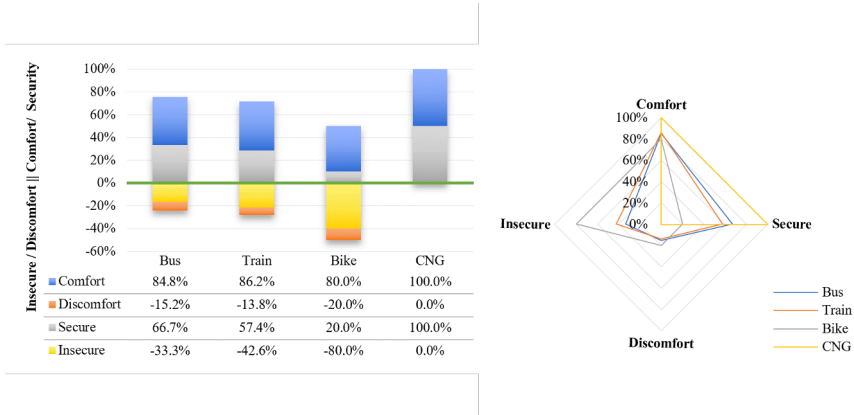


Fig. 3(b). % Comfort and security level by modes

As a private mode, CNGs are rated highest in both comfort (100%) and security (100%), making them the preferred choice for those prioritizing safety and convenience, as shown in Figure 3(b). Buses and trains offer relatively high comfort (85% and 86%, respectively), but buses are recognized as safer (67%) compared to trains (57%). In contrast, bikes are the least secure (only 20%) and have the highest discomfort (20%), conforming to risky trips and inconveniences despite their flexibility in traffic.

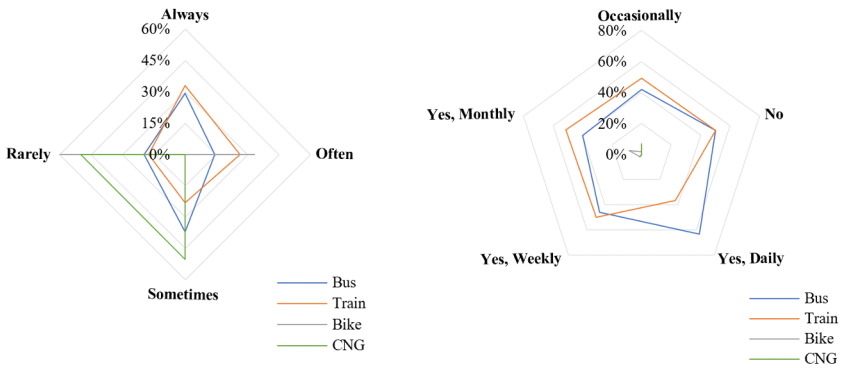


Fig. 3(c). % Trip delays & travel frequency by different modes

Based on survey data, it's evident from Fig. 3(c) that buses and trains experience frequent delays, with 29% of bus users and 33% of train passengers reporting delays "always," while CNGs and bikes face little to no consistent delays. Bikes are the most

reliable, with 67% of users reporting "rarely" experiencing delays, whereas CNGs have a mixed record, with 50% experiencing occasional delays but never frequent ones. This implies that although public transport can be unpredictable, private options such as bikes and CNGs provide more reliability, making them a better choice for time-sensitive journeys. Fig. 3(c) shows that buses and trains are the primary choices for regular trips, with buses being the dominant mode for daily commutes (63.3%) and trains slightly more preferred for monthly trips (51.4%). Occasional travelers also favor buses (42.1%) and trains (49.1%). This suggests that public transport remains the backbone of daily and weekly commuting, whereas private options like bikes and CNGs are less frequent choices, likely due to cost.

5 Conclusion

This study identified that buses and trains are the top choices for daily travel, with nearly 49% of males and 46% of females preferring buses, and about 47% of males and 43% of females preferring trains. On the other hand, CNGs and bikes stand out for their reliability, as half of CNG users experience only occasional delays, and 67% of bike users hardly ever face delays. Factors like income and education significantly influence mode preferences, with affordable options like buses being popular for regular, budget-friendly trips, while private transport like CNGs and bikes are often chosen for higher-cost or urgent trips.

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