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Investigating the Pedestrian Willingness to Pay to Choose Appropriate Policies for Improving the Safety of Pedestrian Facilities

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Abstract**—**Road traffic accidents lead to a higher rate of death and injury, especially in vulnerable road users such as pedestrians. Improving the safety of facilities for pedestrians is a major concern for policymakers because of the high number of pedestrian fatalities and direct and indirect costs which are imposed to the society. This study focuses on the idea of determining the willingness to pay of pedestrians for increasing their safety while crossing the street. In this study, three different scenarios including crossing the street with zebra crossing facilities, crossing the street with zebra crossing facilities and installing a pedestrian traffic light and constructing a pedestrian bridge with escalator are presented. The research was conducted based on stated preferences method. The required data were collected from a questionnaire that consisted of three parts: pedestrian's demographic characteristics, travel characteristics and scenarios. Four different payment amounts are presented for each scenario and a logit model has been built for each proposed payment. The results show that sex, age, education, average household income and individual salary have significant effect on choosing a scenario. Among the policies that have been mentioned through the questionnaire scenarios, the scenario of crossing the street with zebra crossing facilities and installing a traffic lights is the most frequent, with willingness to pay 10,000 Rials and the scenario of crossing the street with a zebra crossing with a willingness to pay 100,000 Rials having the least frequency. For all scenarios, as the payment is increasing, the willingness to pay decreases.

Keywords**—**Pedestrians, willingness to pay, safety, immunization.

I. Introduction

NOWADAYS, along with the increase in losses among road users, especially pedestrians, thinking about a thorough and comprehensive solution is felt more than ever. The comprehensiveness of the solution is quintessential as although every year we see corrective measures to improve safety of pedestrians, the methods that are welcomed by pedestrians are less visible. Perhaps one of the underlying reasons for this is the lack of awareness of the priorities of the individuals in the community. Investments made for safety measures are always defined in the form of government duties, and people in the community do not directly contribute to their costs; however, it is obvious that they contribute indirectly to such costs. In doing this research, it was strived to directly identify people's priorities for direct costs by asking people for policy, safety, and indicator measures. Understanding these priorities can make it more effective in making policy decision makers more aware of the preferences of individuals who are even willing to pay for it. The cost of safety measures can be taken as a safety toll akin to other tolls from individuals.

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II. Review of the Related Literature

Ortúzar et al. examined two applications of willingness-to-pay (WTP) approach to assess the contingent value of transportation in Santiago, Chile. The first consisted of a contingency assessment study of mortality risks due to pollution-related causes, and the latter is a stated preference study to assess the risk reduction of road deaths. They concluded in this study that approaches, in particular, those based on stated preference methods provide practical and adaptive outcomes in developing countries. It seems that WTP methods are more appropriate to justify allocating more resources to pollution and safety standards of units opposed to those derived from more traditional approaches [1].

In a study conducted by Iragüen and his colleague, a survey was conducted using stated preference method to assess the WTP in order to reduce the risk of fatal accidents in urban areas. The survey was conducted through a web page that provided quick and complete customization of the interview. In this questionnaire, a set of route selection alternatives was presented based on travel time, cost, and number of fatal accidents. Based on the proposed model, suitable values for WTP to reduce the accident risk were estimated [2].

Dissanayake explored the determinants of WTP to reduce the risk of road fatalities using the discrete choice models and stated preference methods. In this regard, eight models were developed for the loss of cars and motorcycles, taking into account four levels of injury, including: minor, serious but not permanent, serious with permanent disability, and death. Analyses showed that the level of education and ownership of automobiles had a significant relationship with willingness to pay. Also, there was a high correlation between the history of losses and WTP [3].

Ainy et al. conducted a study using a WTP with the aim of achieving the cost of traffic injuries in Iran. In this study, the data were collected through the distribution of questionnaires among 846 randomly selected road users. Data on WTP were collected for four scenarios i.e. car passengers, pedestrians, car drivers, and motorcycle riders. The final analysis was performed using maximum likelihood estimation method, in which the average WTP was reported as $18.61 [4].

Chaturabong and colleagues analyzed the cost of motorcyclist crashes using the WTP method. In this study, motorcyclists were evaluated for their high share of the cost of accidents in Thailand, and the method of WTP or value that individuals tend to pay in order to reduce their risk of losing their lives. According to the results of this study show that the age, sex, occupation, income, and behavior of wearing helmet were significant factors affecting the willingness of motorcyclists to reduce the risk of accident mortality [5].

Haddak et al. examined the WTP for improving road safety. The purpose of this study was to determine the material value of loses that did not result in traffic deaths. For this purpose, using contingent value, the WTP among French families was determined to improve road safety and reduce the risk of casualties resulting from traffic accidents. Tobit and Logit models were used to identify the factors affecting the payment choices of individuals. The results showed a positive and significant relationship between the severity of accidents and the WTP for the participants in the survey. The direct or indirect experience of traffic accidents also had a significant and positive role in the traffic accident that could result in traffic deaths [6].

In a study by D'Acci, the WTP among the citizens to make policy decisions for improving safety was estimated [7].

Mofadal et al. conducted a study on the WTP in order to evaluate the cost of pedestrian accidents in Sudan. In their study, the Willingness-to-Pay-Contingent-Value (WTP-CV) approach was used to determine the amount of money each pedestrian wants to pay to reduce the risk of death. Also, the impact of socioeconomic factors, risk levels, and pedestrian walking behaviors were sought in their WTP for reducing the risk of death. The data from this study were collected in Khartoum (the capital and largest city of Sudan) and Nyala (the capital of state of South Darfur in the south-west of Sudan), which were performed using 1,400 questionnaires. The WTP among Sudanese pedestrians to reduce their mortality risk increases with age, household income, education level, safety awareness, and average time spent on social activities with the family and the community [8].

Sadhukhan et al. conducted a study in 2016 on the WTP, in which they examined the willingness of passengers to pay for improving transportation facilities around and in metro stations in Calcutta. A stated preference method was designed to collect selected responses from subway passengers and the obtained data were analyzed using Random Parameter Logit (RPL) model. This study showed a high willingness to pay compared to the average cost of subway tickets to improve the quality characteristics of different transfer facilities such as those for changing levels (ramps, escalators, and elevators), facilities for improving the environment for travelers, and those for improving their visual visibility. The level of willingness to pay among travelers changed with the purpose of travel, monthly household income, type of station, and different metro costs. Travelers were willing to pay more for a work trip to improve access times, environments for travelers and escalators [9].

By reviewing the studies conducted in this field, it was concluded that using discrete choice models to investigate the factors affecting people's WTP is one of the applied policies. Given the regional conditions and the objectives of the study, the desired factors are considered for examination.

III. Materials and Method

Given the research topic, WTP method was used to collect the required data. In most developing countries, the cost of accidents is assessed using the traditional human capital approach. This approach reduces the estimated underestimation of the actual cost of accidents by focusing on the economic impact of losing life and not considering the value of enjoyment of life ahead. Willingness to pay with contingent value is considered as an approved method for non-market goods or social economic costs of road traffic accidents in both developed and developing countries. Research on the cost of accidents to estimate the value of statistical life (VOSL) for all users of the road is carried out using a road safety impact assessment principle in cost-benefit analysis. As in many developing countries, the economic costs of traffic accidents in Iran are significant. Research shows that pedestrians are a major contributor to these costs as the most vulnerable group of road users.

To design the questionnaire, some hypotheses were formulated so as to design the items in the questionnaire. The assumptions were: to what extent do personal and family characteristics affect people's WTP for securing their passage through the cross section? Do the characteristics of traveling and having a crash experience affect pedestrians themselves or their family members in the desire of the individual to pay for the safety of their passage through crossing the roadways? The final questionnaire consisted of 19 items. At the beginning of the questionnaire, a general introduction to the research was presented to the respondents.

The purpose of the study was to examine three scenarios, including crosswalk markings for the passage of pedestrians with more safety, crosswalk markings and installation of traffic lights for pedestrians and, finally, the installation of a footbridge equipped with an escalator. The individuals were asked to declare their willingness to pay in each scenario individually. To test the willingness of individuals to pay for this facility, the Binary Logit Model, a subset of discrete choice models, was used.

The variables used in the questionnaire in the modeling process are described in the table below, in which some data were fabricated and some were determined continuously and simply by the values obtained in the questionnaires.

A. Discrete Choice Models

Logit models are one of the methods for predicting discrete events, and the purpose is to identify descriptive variables and their relationship with the occurrence of events, and eventually to estimate of the probability of occurrence of an incident for a particular person.

TABLE I
VARIABLES USED IN MODELING EXTRACTED FROM THE QUESTIONNAIRE

Abbreviation	Variable
IND	Individual
SEX	Gender (male-1; otherwise-0)
AGE	Age
WEIGHT	Weight
TALL	Height
EDU1	Education (Primary School Education-1; otherwise-0)
EDU2	Education (High School Education -1; otherwise-0)
EDU3	Education (Bachelor of Science-1; otherwise-0)
EDU4	Education (Masters of Science and higher -1; otherwise-0)
HHSIZE	Household size
CAR	Number of cars owned by households
USECAR1	The likelihood of using the family car (no = 1, otherwise = 0)
USECAR2	The likelihood of using the family car (yes, as the driver = 1, otherwise = 0)
USECAR3	The likelihood of using the family car (yes, as the passenger = 1, otherwise = 0)
HHSAL1	Household income (less than 1 million Toman[b] = 1, otherwise = 0)
HHSAL2	Household income (1-2 million Tomans = 1, otherwise = 0)
HHSAL3	Household income (2-4 million Tomans = 1, otherwise = 0)
HHSAL4	Household income (over 4 million Tomans = 1, otherwise = 0)
INDSAL1	Individual income (0 Toman = 1, otherwise = 0)
INDSAL2	Individual income (less than 1 million Toman = 1, otherwise = 0)
INDSAL3	Individual income (1-2 million Tomans = 1, otherwise = 0)
INDSAL4	Individual income (2-4 million Tomans = 1, otherwise = 0)
INDSAL5	Individual income (over 4 million Tomans = 1, otherwise = 0)
	Walking travel profile
OBJECT1	Purpose of the journey (education = 1, otherwise = 0)
OBJECT2	Purpose of the journey (work = 1, otherwise = 0)
OBJECT3	Purpose of the journey (recreation = 1, otherwise = 0)
OBJECT4	Purpose of the journey (shopping = 1, otherwise = 0)
OBJECT5	Purpose of the journey (personal work = 1, otherwise = 0)
OBJECT6	Purpose of the journey (others = 1, otherwise = 0)
W_TIME1	Length of time of walking journey in minutes (less than 15 minutes = 1, otherwise = 0)
W_TIME2	Length of time of walking journey in minutes (16 to 30 minutes = 1, otherwise = 0)
W_TIME3	Length of time of walking journey in minutes (31 to 60 minutes = 1, otherwise = 0)
W_TIME4	Length of time of walking journey in minutes (61 to 90 minutes = 1, otherwise = 0)
W_TIME5	Length of time of walking journey in minutes (more than 90 minutes = 1, otherwise = 0)
	Accident profile as a pedestrian
IND-CRA1	Having an individual crash experience as a pedestrian (yes = 1, otherwise = 0)
IND-CRA2	Having an individual crash experience as a pedestrian (no = 1, otherwise = 0)
HH-CRA1	Having a household crash experience as a pedestrian (yes = 1, otherwise = 0)
HH-CRA2	Having a household crash experience as a pedestrian (no = 1, otherwise = 0)
	The policies defined in the form of 3 scenarios
ZEBRA1	Annual payment of zero Tomans for crosswalk marking = 1, otherwise = 0
ZEBRA2	Annual payment of 10000 Tomans for crosswalk marking = 1, otherwise = 0
ZEBRA3	Annual payment of 50000 Tomans for crosswalk marking = 1, otherwise = 0
ZEBRA4	Annual payment of 100000 Tomans for crosswalk marking = 1, otherwise = 0
LIGHT1	Annual payment of zero Tomans for crosswalk marking and traffic light = 1, otherwise = 0
LIGHT2	Annual payment of 10000 Tomans for crosswalk marking and traffic light = 1, otherwise = 0
LIGHT3	Annual payment of 50000 Tomans for crosswalk marking and traffic light = 1, otherwise = 0
LIGHT4	Annual payment of 100000 Tomans for crosswalk marking and traffic light = 1, otherwise = 0
BRIDGE1	Annual payment of zero Tomans for footbridge equipped with escalator = 1, otherwise = 0
BRIDGE2	Annual payment of 10000 Tomans for footbridge equipped with escalator = 1, otherwise = 0
BRIDGE3	Annual payment of 50000 Tomans for footbridge equipped with escalator = 1, otherwise = 0
BRIDGE4	Annual payment of 100000 Tomans for footbridge equipped with escalator = 1, otherwise = 0

[b] 1 dollar = 14030 tomans = 140300 rials

T_{in} is assumed to be a linear function of the variables characteristics of individual n that is related to the probability of occurrence of the event i. In this case, based on (1):

$$T_{in} = \beta_i X_{in} + \varepsilon_{in} \quad (1)$$

where X_{in} is a vector of measurable characteristics of the individual n (including individual characteristics and redirection behaviour), βi is also a vector of measured coefficients calculated using the maximum exponential method. ε_{in} also represents the non-visible parts of the features. In this regard, if ε_{in} follows Gumbel distribution, then the probability of occurrence of i for the individual n is $P(i, n)$ by using the logit model in the closed form of (2):

$$P(i, n) = e^{Tin} / \sum_{j \in C_n} e^{Tin} \quad (2)$$

Binary logit model is a special case of the multinomial logit models, in which the dependent variable is an binary type and can have only 0 or 1 values. In this research, the dependent variable in each of the models is the chosen alternative for the WTP based on the proposed scenarios, which any of the alternatives in the selection set with the number 1 is selected and the alternative with the number 0 in the database is not selected [10].

IV. Modelling

Before examining the results of the modelling, and in order to ensure proper distribution of the explanatory variables, their frequencies are statistically analyzed. The statistical examinations carried out are summarized as follows:

TABLE II
STATISTICAL ANALYSIS OF MODELLING VARIABLES

Gender	Male (242)	Female (142)
Mean age	33.03	
Mean weight	69.78	
Mean height	176.8	
Mean household size	3.67	
Mean car ownership	1.27	

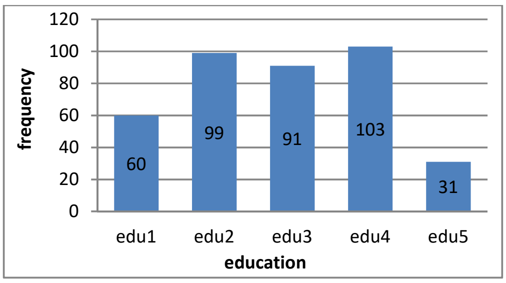

Fig. 1 Frequency distribution of level of education

In order to put forward policies in the questionnaire, people were asked to imagine that on the street, the number of accidents resulting in the death of pedestrians was 30 per 100,000 population, while the street had no safety for the pedestrians. In these conditions, people were given three different policies that individuals could choose the WTP for improving safety. These policies included:

Crosswalk markings by which the number of deaths dropped by 30 to 10 people per 100,000 population (or by one-third).

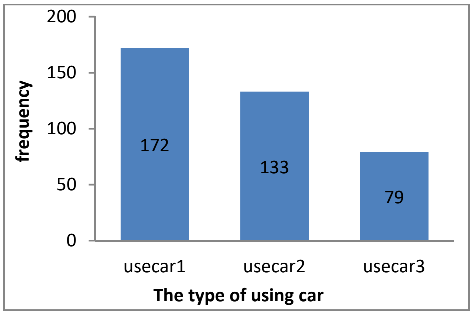

Fig. 2 Frequency distribution of type of car use

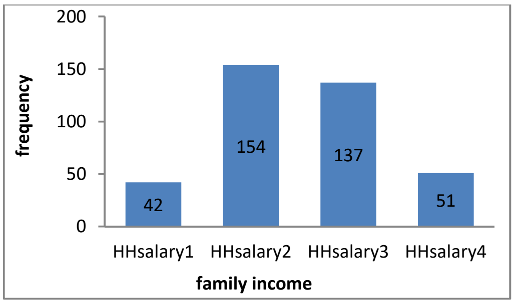

Fig. 3 Frequency distribution of household income

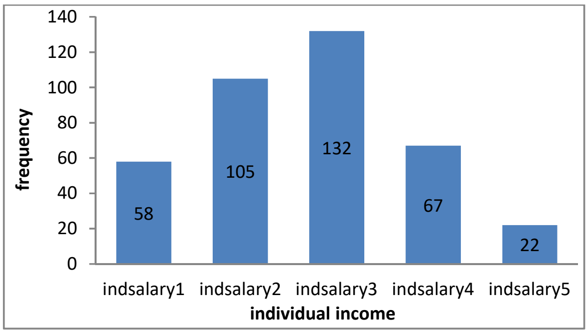

Fig. 4 Frequency distribution of individual income

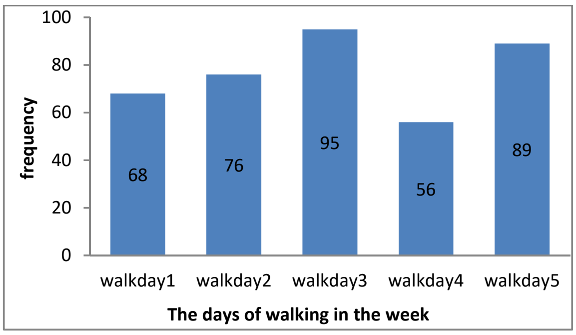

Fig. 5 Frequency distribution of walking days per week

Crosswalk markings and installation of traffic lights for pedestrians by which the number of deaths dropped from 30 to 6 per 100,000 populations (or by one-fifth).

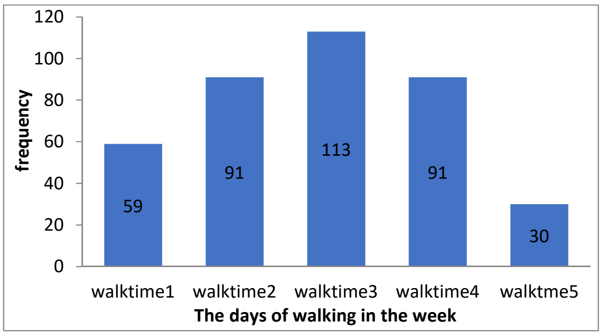

Fig. 6 Frequency distribution of the time spent on walking

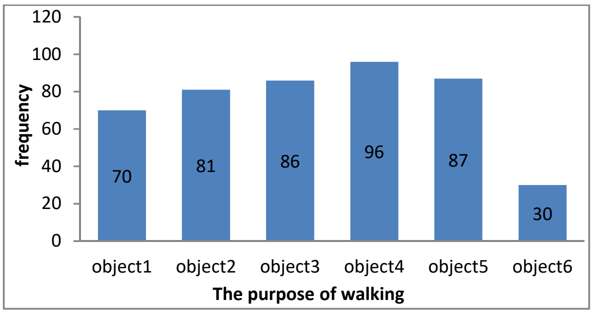

Fig. 7 Frequency distribution of walking purpose

Installation of a footbridge equipped with an escalator for pedestrians by which the number of deaths dropped from 30 people to zero per 100,000 populations.

The alternatives of the policies included: unwillingness (0 Tomans), 10,000 Tomans, 50,000 Tomans, and 100,000 Tomans.

The distribution of the choices of each of the policy alternatives is as follows.

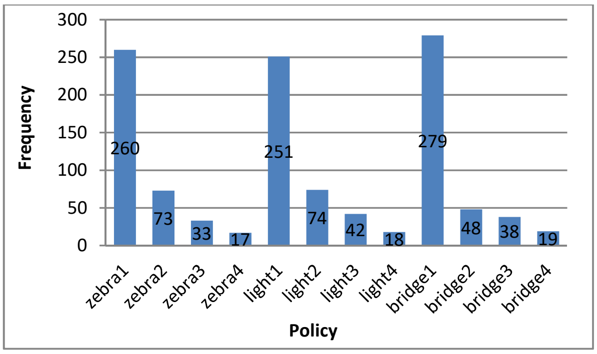

Fig. 8 Frequency distribution of choosing the desired policy-making in the viewpoints of the subjects

V. Discussions

The first scenario of the modelling was the payment of the cost for appropriate crosswalk marking for pedestrians, which leads to increased safety. Significant variables in the modelling process can be seen in Table III. As indicated in Table III, males are not willing to pay for the appropriate crosswalk markings for pedestrians. This is deduced from the positive sign of the first alternative (zero) and the negative sign of the other two alternatives (500000 Tomans and 100,000 Tomans) which have become significant in the process of the modelling. With the increasing age of the respondents, the willingness to pay decreases.

TABLE III
Results of the Coefficients of the Binary Logit Model for the Scenario of the Payment of Cost for Appropriate Crosswalk Marking

Variables	zebra1	zebra2	zebra3	zebra4
Gender	0.60190***	0.16684	-0.68201***	-1.57259***
Age	0.05749***	-.02768***	-0.10118***	-0.05435***
Weight	-0.01268***	-0.00563	0.05411***	0.00037
Tall	-0.00543**	-.02202***	-0.02266***	-0.00853
edu1	-0.87294***	-0.20808	2.51558***	1.95050***
edu2	-0.73291***	0.16015	-30.926	3.09661***
edu3	-0.77057***	0.32783	1.85407***	1.90333***
edu4	-1.41721***	0.98882***	2.06918***	1.92037***
edu5	-1.86798***	0.86503***	3.43835***	3.79355***
HHsize	-0.00758	0.20529***	-0.11754*	-0.40746***
Car	-0.07913	-0.35947***	0.49111***	0.54084***
usecar1	1.79696***	2.00117*	-1.4284	-1.34444**
usecar2	2.41294***	3.18366***	-2.26795**	-1.42330**
usecar3	2.28569***	2.89139***	-2.68921**	-33.485
object1	-0.14532	-0.02071	-0.353	-2.97384***
object2	-0.81774***	0.51218***	-0.38199*	-2.05559***
object3	-00.07799	-0.15464	0.36446**	-35.425
object4	-0.22979**	-0.12021	1.60449***	-35.5371
object5	-0.82637***	0.23599*	1.05161***	-2.35138***
object6	-0.69243***	-0.28245	.79123***	-35.8858
HHsalary1	2.10595***	-4.31561***	-0.19914	2.14832***
HHsalary2	2.24843***	-4.34368***	-0.15294	-0.31869
HHsalary3	2.08059***	-4.22317***	0.02306	0.53948*
HHsalary4	1.19175***	-3.64197***	0.46048	2.20519***
indsalary1	1.15951***	0.64611	-0.08105	-3.87735***
indsalary2	1.70228***	0.51807	-0.56457	-5.14967***
indsalary3	2.33228***	-0.63862	-0.60663	-3.72951***
indsalary4	3.24394***	-1.12309**	-1.14075*	-36.1858
indsalary5	1.54610***	0.16535	1.19172**	-36.6945
walkday1	-2.77104***	0.17839	-1.25462*	-35.2029
walkday2	-2.70387***	0.68949	-1.68360**	-3.19867***
walkday3	-3.06406***	0.90862	-1.17476*	-4.12965***
walkday4	-2.93480***	1.26707	-3.17672***	-35.2029
walkday5	-2.36660***	0.02751	-2.81493***	-1.87216***
walktime1	-0.44507***	2.24692***	-1.48042***	-34.2029
walktime2	-0.78823***	2.47984***	-0.38810*	-4.06192***
walktime3	-0.53943***	1.94009***	-0.09053	-3.16506***
walktime4	0.00767	1.65090***	0.00533	-4.09577***
walktime5	-0.46792**	1.54539***	-0.56231	-1.38629***

, **, and * indicate a significant level of 1%, 5% and 10%, respectively*

As the level of education increases, the chances of choosing the first alternative, which is the unwillingness to pay, is reduced. Based on the model, it can be concluded that in the first scenario, as the number of people with graduate and postgraduate education and higher education increases, the probability of paying the second alternative i.e. 10,000 Tomans increases. In the first scenario, the likelihood of choosing the third and fourth alternatives increase with higher levels of education.

TABLE IV
RESULTS OF THE COEFFICIENTS OF THE BINARY LOGIT MODEL FOR THE SCENARIO OF THE PAYMENT OF COST FOR APPROPRIATE CROSSWALK MARKING AND TRAFFIC LIGHTS FOR PEDESTRIANS

Variables	light1	light2	light3	light4
Sex	-0.46881***	0.67483***	0.30131	1.26398***
Age	0.04579***	-0.03860***	-0.01521**	-0.12003***
Weight	-0.00716**	0.01372***	0.0003	0.00642
Tall	0.00481*	-0.05236***	-0.03451***	0.00129
edu1	-0.66569**	0.13292	2.19933***	-31.8308
edu2	-1.48230***	0.48993	4.74324***	0.90814
edu3	-2.15975***	0.79720**	39.6381	0.97477
edu4	-2.72471***	1.38443***	39.0771	-0.0677
edu5	-2.74995***	-0.81293*	40.5651	1.65212**
HHsize	-0.18449***	0.00166	0.13057***	0.01529
Car	-0.14275***	-0.07737	0.40713***	0.73499***
usecar1	3.17844***	6.21446***	-36.4217	-2.77488***
usecar2	3.53469***	6.42585***	-35.7305	-4.49543***
usecar3	3.41313***	6.54161***	-36.2289	-35.9848
object1	-1.34528***	0.35041**	-.40795*	-0.55647
object2	-1.73053***	1.11474***	-0.1021	0.64481***
object3	-1.03355***	0.44225***	-0.04307	0.58239**
object4	-0.26452*	-0.47295***	-0.16731	0.78705***
object5	-1.46788***	0.35511***	1.26267***	1.48468***
object6	-1.44264***	1.35108***	-33.2085	-0.19272
HHsalary1	2.67769***	-4.82450***	-1.14940***	-0.18323
HHsalary2	1.79579***	-3.22124***	-2.82201***	-1.85379***
HHsalary3	1.66632***	-3.28916***	0.48302	-0.65415
HHsalary4	0.67236*	-4.78589***	0.17632	1.23146
indsalary1	1.12547	0.58817	1.28678	25.5718
indsalary2	1.75159***	0.14962	0.63705	27.0784
indsalary3	1.66537***	0.36728	0.84507	26.4416
indsalary4	1.82965***	0.86073*	0.80052	-7.31438
indsalary5	-0.12085	2.09211***	-0.09484	25.6924
walkday1	-2.50690***	1.91809***	-2.00478**	-82.7923
walkday2	-2.18627***	1.80811***	-3.15032***	-29.866
walkday3	-2.30191***	1.54000***	-2.81412***	-28.1832
walkday4	-2.59083***	2.03836***	-1.76643*	-28.6418
walkday5	-2.38418***	1.23844**	-1.89475**	-27.2539
walktime1	0.80022***	-1.04381*	0.08108	-2.41894***
walktime2	0.18777	-0.96856*	1.50584***	-0.61330**
walktime3	0.41139***	-1.57228***	1.36011***	-2.15957***
walktime4	-0.00753	0.17968	0.00743	0.01019
walktime5	-0.49470***	-0.32495	1.31623***	-2.25604***

, **, and * indicate a significant level of 1%, 5% and 10%, respectively.*

People who have the alternative to use the family car as drivers have more WTP compared to those with no access to car. Furthermore, those who can use the family car as either a driver or a passenger have a WTP of 10,000 Tomans.

In the first scenario, people with the purpose of work and personal work prefer to pay 10,000 Tomans, and people with the purpose of recreation, shopping, and personal work prefer to pay 50,000 Tomans. Households with an average income level of more than 4 million Tomans do not prefer to pay for crosswalk markings. Also, people with an income level of less than one million Tomans do not prefer to pay, which seems logical. In contrast, people with an income level of over 4 million Tomans are prefer to pay 100,000 Tomans. Individuals with individual income levels of zero and less than one million Tomans and 1 to 2 million Tomans and 2 to 4 million Tomans do not prefer to pay. In the first scenario, people who spend 16 to 30 minutes as their usual walking time prefer to pay 10,000 Tomans.

TABLE V
RESULTS OF THE COEFFICIENTS OF THE BINARY LOGIT MODEL FOR THE SCENARIO OF THE PAYMENT OF COST FOR FOOTBRIDGE EQUIPPED WITH ESCALATOR

Variables	bridge1	bridge2	bridge3	bridge4
Sex	0.24844*	-0.40906**	-0.1413	0.77147**
Age	0.06567***	-0.02979***	-0.00379	-0.12010***
Weight	-0.03901***	0.00532	0.04908***	0.02933***
Tall	0.01081***	-0.02128***	-0.05370***	-0.01880*
edu1	0.55725*	0.17865	36.8185	-31.3095
edu2	0.01455	0.26412	-29.0541	-27.6385
edu3	-0.73507**	0.67420*	36.1391	29.1815
edu4	-2.05814***	2.10675***	2.98758***	28.7739
edu5	-1.31251***	0.61927	36.2826	30.9072
HHsize	-0.15065***	-0.10564**	0.48833***	0.10767
Car	-0.44237***	0.29364***	-0.44241***	0.80021***
usecar1	3.61914***	0.36615	-35.4235	-30.32
usecar2	4.56394***	1.09507	-33.6585	-30.9839
usecar3	3.74751***	1.39341	-33.1961	-32.2142
object1	-2.27962***	0.22886	1.14371***	-0.98121**
object2	-2.10154***	0.89961***	0.35055*	-0.63443**
object3	-2.13785***	0.45073***	0.62766***	0.59257**
object4	-1.45232***	-0.33618**	-0.78318***	1.67568***
object5	-2.44181***	0.69451***	0.37123**	1.87335***
object6	-1.03875***	-0.20007	-0.83257**	0.09208
HHsalary1	0.69044**	-2.36019***	-2081.11	-2.52719***
HHsalary2	-0.49199*	-0.74699**	0.03903	-35.2029
HHsalary3	-0.49943*	-0.89770***	0.20835	-3.38396***
HHsalary4	-1.41640***	-1.04927***	0.70570**	-1.68935***
indsalary1	2.65098***	-0.79076**	0.35789	-2.91777***
indsalary2	2.32406***	-0.59480**	-0.29568	-3.12228***
indsalary3	3.27552***	-1.29211***	-1.99781***	-3.78524***
indsalary4	3.23791***	-1.17577***	-1.38789**	-3.06805***
indsalary5	3.04013***	-32.031	0.1378	-2.40447***
walkday1	-1.63844***	-1.44036***	-1.37315	-34.2029
walkday2	-1.47410***	-1.54045***	-1.66118	-3.19867***
walkday3	-1.48935***	-2.25266***	-0.90595	-2.45165***
walkday4	-1.36171***	-2.16905***	-1.63669	-3.63759***
walkday5	-0.17963	-2.64105***	-2.42747*	-3.36883***
walktime1	0.20692	-1.41707***	0.13746	-3.68888***
walktime2	-0.10436	-0.84242***	-0.93726	-2.93873***
walktime3	-0.19854	-1.26098***	0.71066	-3.19339***
walktime4	-0.00488	0.00366*	-2.0546	0.00126
walktime5	0.03534	-0.84730***	-0.55829	-2.19722***

, **, and * indicate a significant level of 1%, 5% and 10%, respectively.*

The second scenario was the proper crosswalk marking and installation of traffic lights for pedestrians. The negative sign of the first alternative, which is the non-payment of costs, and the positive signs for other alternatives, shows the willingness of males to pay for this facility. In the second scenario, people with a bachelor's degree tend to choose the second alternative namely, paying 10,000 Tomans, and those with a higher education degree tend to pay 100,000 Tomans. People with a bachelor's degree tend to choose the second alternative i.e. a payment of 10,000 Tomans and those with a master's degree or higher, they are willing to pay 100,000 Tomans (alternative 3). The sign of household size in the second scenario shows that as the number of households' increase, the willingness to pay 50,000 Tomans increases.

As the number of family cars increases, the likelihood of choosing more expensive alternatives increases. In all three scenarios, when an average family income increases above 4 million Tomans, the likelihood of unwillingness to pay decreases. Individuals with average household income less than one million Tomans and 1 to 2 million Tomans are unwilling to pay. People with an income level of 2 to 4 million Tomans are willing to pay 50,000 Tomans. People with family income of more than 4 million Tomans prefer to pay 100,000 Tomans. Persons with incomes less than one million Toman, 1 to 2 million Tomans, 2 to 4 million Tomans prefer to pay 10,000 Tomans, while those with an income level of above 4 million Tomans are willing to pay 50,000 Tomans. Among those who walk one to three days a month, the likelihood of a willingness to pay 50,000 Tomans is higher. Also, people who walk for 16-30 minutes and 31-60 minutes per day are willing to pay 50,000 Tomans.

The third scenario is payment for the construction of a pedestrian footbridge equipped with an escalator for pedestrians. For the gender variable, the negative sign of the first alternative and the positive sign of other alternatives show that men do not prefer to pay for this facility. As the age of person increases, the willingness to pay in this scenario is reduced. The results show that with an increase in the weight of the pedestrians surveyed, the chances of choosing the fourth alternative to pay 100,000 Tomans will increase.

By increasing the level of education, the chances of choosing the first alternative, which is the unwillingness to pay, is reduced. Also, people with a bachelor's degree have a willingness to pay 50,000 Tomans. With the increase in the number of cars owned by a household, the likelihood of choosing the more costly alternatives increases. Meanwhile, people who can use the family car as a driver, and then as a passenger, tend to be willing to pay more compared to those who cannot use family cars.

In this scenario, when an increase in the average family income to more than 4 million Tomans, the likelihood of a unwillingness to pay decreases. Individuals with an average household income of less than one million Tomans are reluctant to pay the cost, while those households with an income level of over 4 million Tomans are willing to pay 50,000 Tomans.

VI. Conclusions

Using the results of the questionnaire and the modeling performed, the following results are obtained:

For all three policies, the unwillingness to pay is the most frequent.

With regard to all three policies, the willingness to pay decreases according to increase in the payment.

For all three policies, as average household income increases to more than 4 million Tomans, the likelihood of unwillingness to pay decreases. Individuals with average household income less than one million Tomans and 1 to 2 million Tomans are unwilling to pay.

Among the policies in question and in cases where there is a willingness to pay, the results show that respondents are most likely prepared to pay 10,000 Tomans for the purpose of crosswalk marking and installation of the pedestrian traffic light for safety and to prevent accidents.

Among the policies in question, in cases where there is a willingness to pay, for the purpose of crosswalk marking for safety and preventing an accident, willingness to pay 100,000 Tomans has the lowest frequency.

In the case of appropriate crosswalk markings, men are reluctant to pay. As the age of respondent increases, the willingness to pay decreases, and with increasing levels of education, the probability of choosing the first alternative, which is the unwillingness to pay the cost, is reduced.

With the increase in the number of cars owned by a family, the likelihood of choosing the alternatives with higher costs increases. People who have the chance of using a family car as a driver and a passenger are more likely to pay more than those who cannot use family cars.

With regard to the policy of paying for the construction of a footbridge for pedestrians, men are reluctant to pay for this facility; as age increases, the willingness to pay in this scenario decreases and as level of education increases, the probability of choosing the first alternative, which is the unwillingness to pay decreases.

The results of this research show that for improving safety in each situation, the target society should be recognized and by informing and developing the level of their knowledge, the probability of willingness to pay would increase.

One of the efficient outcomes of this research is that in order to increase the willingness to pay of people for improving their safety, people should be informed about the number of pedestrian accident and accident severity and know about the reduction in the number of accidents based on previous experiences; in that situation, people will cooperate in efforts to improve safety.

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