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Urban traffic-related determinants of health questionnaire (UTDHQ): an instrument developed for health impact assessments

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Abstract

Background: Traffic and transport is a substantial part of a range of economic, social and environmental factors distinguished to have impact on human health. This paper is a report on a preliminary section of a Health Impact Assessment (HIA) on urban traffic and transport initiatives, being conducted in Sanandaj, Iran. In this preliminary study, the psychometric properties of Urban Traffic related Determinants of Health Questionnaire (UTDHQ) were investigated.

Methods: Multistage cluster sampling was employed to recruit 476 key informants in Sanandaj from April to June 2013 to participate in the study. The development of UTDHQ began with a comprehensive review of the literature. Then face, content and construct validity as well as reliability were determined.

Results: Exploratory Factor Analysis showed optimal reduced solution including 40 items and 8 factors. Three of the factors identified were Physical Environment, Social Environment, Public Services Delivery and Accessibility. UTDHQ demonstrated an appropriate validity, reliability, functionality and simplicity.

Conclusion: Despite the need for further studies on UTDHQ, this study showed that it can be a practical and useful tool for conducting HIAs in order to inform decision makers and stakeholders about the health influences of their decisions and measures.

Keywords: Urban traffic, Health Impact Assessment, Social Determinants of Health, Factor Analysis, Questionnaire, Psychometric Properties.

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Introduction

Traffic and transport is a substantial part of a range of economic, social and environmental factors beyond the health care sector which are distinguished to have impact on human health (1-3). This impact may damage or promote health (4). Examples of these potential health impacts may include air and noise pollution, health services delivery, enabling access, social support, employment, economic development and road traffic injuries. “Traffic congestion” is a significant issue in almost every urban area around the world (5) and in Iran, as well. As a public health issue, it may be resulted from several causes including bad street layout, too many cars, poor driving behaviors and inefficient traffic control systems (6). Whatever the reason is, it is clear that the impact of urban traffic and transport and their related policies and projects on health determinants are influential.

Acheson in a seminal report on inequalities in health in the UK had a special emphasis on the association between urban traffic and health (7). As he noted, urban

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traffic and transport may have positive and negative influences on health and so, there is a need to address these influences through relevant models such as Health Impact Assessment (HIA). Urban traffic and transport policy is highly relevant to HIA , which is "a combination of procedures, methods and tools by which a policy, program or project may be judged as to its potential effects on the health of a population, and the distribution of those effects within the population" (8). HIA may comprise a broad definition of health; careful consideration of social, environmental or economic determinants of health; participation of affected stakeholders; application to a broad set of policy sectors; and concerns about social equity (9).

After collecting data and interpreting evidence regarding potential urban traffic-related health impacts and demonstrating the well-timed and relevant results and recommendations to decision- and policy-makers by HIA, it may be expected to include the obtained information into the urban traffic-related decision-making process to help lessen harm and increase health advantages (10).

Therefore, it was decided to conduct a HIA on urban traffic in Sanandaj, Iran, with a special focus on traffic calming measures performed by local government. To the best of our knowledge, this is the first HIA study conducted on urban traffic in Iran. In order to study any subject and, also, collect required information with the highest accuracy and the least mistakes, there is a need to reliable and valid instruments related to that subject (11). Searching literature in the area of HIA, especially on urban traffic and transport, showed that the number of reliable and valid instruments in this area is scarce. Also, the studies that conducted HIA on urban traffic, have not reported the reliability and validity of the instruments used for data collection (4, 12-14). A reason for the rare number of instruments may be the novelty of HIA, which has not been well introduced and accepted as an important public health method (13) nor a tool for socially responsible policy and practice, especially in developing countries like Iran.

Thus, the researchers decided to develop a trustworthy instrument, as a first stage of HIA, in order to ensure obtaining comprehensive data on urban traffic-related health determinants in Sanandaj, Iran. One positive point of the present study is providing such an instrument for conducting retrospective HIAs on urban traffic. Because there are difficulties in accessing data and availability of certain data on the impacts of urban traffic on public health and its determinants (4) such as primary health care and hospital admissions in almost every urban areas around the world and, particularly, in Iran. Moreover, there is a lack of timeliness of information in relation to urban traffic related mortality, morbidity (4) and health, as a whole, which is an obvious disadvantage necessitating the development of such instruments.

The Urban Traffic-related Determinants of Health Questionnaire (UTDHQ) may be a useful tool for researchers working on HIA of urban traffic in collecting information regarding urban traffic related determinants of health. This paper reports the psychometric properties of UTDHQ in Sanandaj, Iran.

Methods

Population under study and Sampling

Multistage cluster sampling was employed to recruit 500 key informants working in universities, schools, health care centers and traffic offices in Sanandaj, Iran, from April to June 2013, to participate in the study. The diverse key informants working in the above mentioned institutions and organizations ensured a broad representation of the target population. In this study, 25 schools, 5 universities, 10 health care centers, and 10 traffic offices were randomly selected. Clusters were sampled with likelihood proportional to the target population coverage (i.e., the higher coverage of the institution/organization, the higher recruitment). The purpose of the study, which included their rights as human

subjects for a research study, was explained to participants and all signed informed consent forms. As the number of questions in the questionnaire was somewhat high and answer to the questions needed a high attention, some of the respondents refused to participate in the study; therefore, the response rate was about 93%.

Instrumentation

In order to design a new instrument, conducting literature review, qualitative research and/or selecting items from available instruments or a mix of these methods may be used (15). The development of UTDHQ began with a comprehensive review of the literature (1, 4, 12-16) and the Merseyside Guidelines for HIA (13) was employed as a base for providing the instrument. As the research topic was new, no similar instrument was found in the literature; therefore, efforts were focused on the studies which have investigated traffic-related determinants of health and HIAs of traffic and transportation. So, the statements related to urban traffic and determinants of health extracted from the literature and translated into Persian by two Persian native translators and the initial questionnaire was designed. After reviewing the obtained instrument in a consensus panel, it was translated back to English. Finally, the proper items were constructed considering the cultural differences between Iran and communities of the conducted studies.

Finally, the initial UTDHQ with 3 sections, 5 dimensions and 63 items (health determinants) was prepared. In section 1, the respondents were asked to indicate, on a 5-point Likert scale, how much Sanandaj urban traffic had negative impacts on the health determinants. In section 2 and 3, they were asked to rate the impacts according to their measurability (qualitative, estimable or calculable) and the risk of occurrence (definite, probable or speculative), respectively. The 5 dimensions of health determinants, encompassed Personal/Family circumstances and lifestyle (17 items), Social Environment (9 items), Physical Environment (17 items), Public Services (14 items) and Public Policy (6 items). As noted above, A 5-point Likert-type scaling was used (1= very low, 2= low, 3= moderate, 4= high and 5= very high) for section 1. The theoretical range for this section was 63 - 315, in which the higher scores indicate more negative impact.

Along with UTDHQ a Demographic Data Form included 11 questions has been developed by researchers to obtain data related to the socio-demographic characteristics of the respondents, such as age, gender, education, occupation, being motor vehicle (car/motorcycle) owner, history of having accident resulted in bodily injury or motor vehicle damage in the city since 10 years ago and in the case of having accident resulted in bodily injury, if he/she was aboard or pedestrian.

The consensus panel discussed the difficulty level of items. Ten key informants (4 university teachers, 3 school teacher and 3 health care providers) were interviewed face to face to examine the difficulty level of items. They were asked to report the level of importance of each item. Finally, the items with Impact Score≥ 1.5 (17) were considered for the next analysis.

In order to determine the content validity of UTDHQ, the consensus panel of experts, reviewed and assessed the items, qualitatively, by evaluating the appropriateness and relevance of the items to urban traffic, their necessity, significance, scaling and response format. The feedback from the consensus panel, which mostly was regarding the wording and phrasing of items, was used to revise and modify the instrument. Applying 2 indices, Content Validity Index (CVI) and Content Validity Ratio (CVR), the content of the instrument validated, quantitatively. To determine CVR, 10 specialists in the area of health education and behavior, health promotion, community health nursing, environmental health, and epidemiology were asked to report the necessity of each item on the basis of a 3-point Likert-type scale (It is necessary, It is useful but not necessary, It is not necessary). If the

value obtained for each item was more than 0.62 (based on Lawshe table), it was considered as necessary for the instrument (18). In order to determine CVI (19), the 10 specialists mentioned above were, also, requested to determine the relevancy, clarity, and simplicity of each item. A 4-point Likert-type scaling was used to analyze these three criteria, separately. The CVI value greater than 0.75 for each item considered to be appropriate and acceptable (20). Therefore, the items with CVI less than 0.75 deleted from the questionnaire.

Exploratory Factor Analysis (EFA) was performed to determine the construct validity and factor structure of the UTDHQ. Several studies considered 5-10 samples per item for conducting EFA (21). For the present study, EFA was conducted on the data collected from 476 key informants, applying the principal component factor analysis with varimax rotation.

In order to test the reliability of UTDHQ, Cronbach's alpha coefficient was used. Cronbach's alpha is the most common method used for investigating the internal consistency of instruments (22). The test–retest reliability coefficient was also calculated. Thus, 20 randomly selected key informants were asked to complete the questionnaires, on a second occasion, 8-12 days later. Intra-class correlation coefficients (ICC) with 95% confidence intervals (CI) were calculated and an ICC equal to or greater than 0.70 was considered acceptable. To compare the construct validity, correlations between the dimensions of UTDUQ were tested using Pearson's correlation test.

Statistical analysis

The Statistical Package for the Social Sciences (SPSS) version 17.0 for Windows was utilized for the purpose of data entry, manipulation, and analysis. Measures of central tendency and variability were used to summarize and organize the data. Content validity of the instrument investigated applying Content Validity Index (CVI) and Content Validity Ratio (CVR). Exploratory Factor Analysis (EFA) was used to determine the construct validity and factor structure of the UTDHQ. Also, in order to investigate the internal consistency of the instrument, Cronbach's alpha method was used. Intra-class correlation coefficients (ICC) were applied to calculate the test–retest reliability coefficient. Pearson's correlation coefficient was used to demonstrate the nature of associations between UTDHQ factors. The level of significance was set, a priori, at .05.

Results

The age of the participants ranged from 22 to 70 years (mean= 33.6; SD= 8). Males (53.1%) and health care workers (39.3%) constituted the majority of the subjects. The majority (67.4%) of the participants were bachelor. Only 1.5% out of all respondents used bicycle as a vehicle to perform their daily works. Applying a series of descriptive statistic tests, independent sample t-test and one-way ANOVA tests, the characteristics of the respondents as well as the associations between their characteristics and the mean score of the factors were investigated which is shown in Table 1.

Regarding the face validity of UTDHQ, as the Impact Score for all items was more than 1.5, no item was deleted; however, the wording and phrasing of some items were modified. Also, the qualitative content validation resulted in some modifications in the items. In quantitative content validation, due to low CVR value (less than 0.62), 10 items (such as "Housing condition", "The range of shopping" and "Land use") were deleted. According to CVI assessment, 6 items, with CVI value less than 0.75, were deleted. The mean items' relevancy, clarity, simplicity, and their total mean score were 87.2 ± 0.3, 91.8 ± 0.7, 85.4 ± 0.7, and 88.1 ± 0.6, respectively. At the end of this step 46 items remained.

The mean and standard deviations for the remained items and risk of impact and predicted health impact of the items are shown in Table 2. Overall, the mean score of items for all participants was moderate to low

Table 1. Relationship between the respondents' characteristics and the mean score of the factors (n=476)

variable	Frequency (%)	1	2	3	4	5	6	7	8
		p	p	p	p	p	p	p	p
Age (year) (n = 454, M=33.6±8)		.161	.032	.066	.093	.011	.380	.684	.222
Under 25	91(19.1)								
26-30	105(22.1)								
31-35	91(19.1)								
36-40	70(14.7)								
41-45	60(12.6)								
More than 46	37(7.8)								
Occupation (n = 465)		.104	.581	.161	.670	.926	.035	.316	.915
School teacher	176(37)								
University teacher	35(7.4)								
Health worker	187(39.3)								
Traffic officer	67(14.1)								
Education (n=456)		.052	.154	.049	.599	.317	.847	.866	.694
Diploma	20(4.2)								
Super Diploma	48(10.1)								
Bachelor	321(67.4)								
Postgraduate	67(14.1)								
Owning an MV* (n=464)		.347	.134	.949	.031	.520	.075	.269	.303
Yes	289(58.7)								
No	175(36.8)								
History of accident resulted in MV damage in the city since 10 yrs ago (n = 388)		.512	.562	.238	.136	.003	.111	.004	.408
Yes	145 (37.4)								
No	243 (62.6)								

*MV= Motor Vehicle; Factor 1= Physical Environment; Factor 2 = Social Environment; Factor 3=Public Services Delivery and Accessibility; Factor 4= Family Circumstances; Factor 5 = Public Policy; Factor 6 = Substance Use; Factor 7 = Public Welfare Services; Factor 8 = Air Quality. Only, the demographic variables which had significant correlation with, at least, one factor were included.

except for the following three items: "Air quality", "Energy usage", "Public transport services". Moreover, the ris k of occurrence for the most of the items was announced probable by most of the respondents. More than 40% of the participants rated the risk of urban traffic impact as definite for the items such as "Risk-taking behaviors", "Work trend", "Air quality" and "Public transport services" and, also, more than 30% rated the risk as speculative for the items including "Education provided for adults", "Non-drinking", "Non-smoking" and "Substance misuse".

In order to determine the construct validity of the instrument, Exploratory Factor Analysis (EFA) was conducted using principal component factor analysis with varimax rotation. Kaiser-Meyer-Olkin (KMO) measure (KMO= 0.886) and Bartlett's Test of Sphericity (Approx. Chi-Square= 7807.830, df=435, $p<0.001$) showed sampling adequacy and suitable correlation matrix for factor analysis, respectively.

Ten factors extracted with eigenvalues greater than 1 which altogether accounted for 58.73% of the total variance between items. Applying Cattell's scree test, it was indicated that between nine and eleven factors extracted. Then, multiple runs of factor analysis were conducted, varying the number of factors. It was found that the ten factor solution yielded a clearer pattern of loading. Table 3 shows the rotated factor pattern coefficient for variable solution. For each factor, information is provided regarding the initial eigenvalues (before rotation), variance accounted for after rotation (rotation sum of squares), percentage of variance explained (after rotation), intra-class correlation coefficients (ICC) with 95% confidence intervals (CI) and internal consistency reliability as indicated by Cronbach's alpha for each factor.

As it is indicated in Table 3, three of the ten factors had low internal consistency reliability (Cronbach's alpha less than 0.7), which argues omitting of these factors.

Table 2. Items' mean (M) and standard deviation (SD) of UTDHQ and risk of impact and predicted health impact of the items

How much Sanandaj urban traffic has had negative impact on the following health determinants?	M (SD)	Risk of impact - is it: D, P or S?*			Predicted health Impacts How measurable impact is – is it: Q, E or C?¥		
		D (%)	P (%)	S (%)	Q (%)	E (%)	C (%)
Family functioning (ie, nurturing children and their socialization)	2.5 (1.1)	149 (31.3)	239 (50.2)	88 (18.5)	221 (46.4)	191 (40.2)	64 (13.4)
Education provided for primary and guidance school students	2.7 (1)	140 (29.4)	206 (43.3)	130 (27.3)	167 (35.1)	219 (46)	90 (18.9)
Education provided for high school and the university students	2.7 (1)	133 (27.9)	228 (47.9)	115 (24.2)	165 (34.7)	205 (43)	106 (22.3)
Education provided for adults (ie, Literacy Movement)	3 (1.1)	131 (27.5)	202 (42.4)	143 (30)	162 (34)	197 (41.4)	117 (24.6)
Occupation and employment status of the residents	2.6 (1)	151 (31.7)	194 (40.7)	131 (27.5)	129 (27.1)	234 (49.2)	113 (23.7)
Income status of the residents	2.6 (1)	144 (30.3)	219 (46)	113 (23.7)	133 (27.9)	232 (48.7)	111 (23.3)
Risk-taking behavior (ie, while driving)	2.3 (1.1)	194 (40.8)	179 (37.6)	103 (21.6)	163 (34.2)	209 (45.9)	104 (21.8)
Diet status (ie, the contents of household food basket)	3 (1.1)	90 (18.9)	230 (48.3)	156 (32.8)	163 (34.2)	220 (46.3)	93 (19.5)
Non-smoking	2.9 (1.2)	111 (23.3)	207 (43.5)	158 (33.2)	154 (32.4)	215 (45.1)	107 (22.5)
Non-drinking	2.9 (1.2)	130 (27.3)	223 (46.8)	123 (25.8)	166 (34.9)	213 (44.8)	97 (20.4)
Substance misuse	2.7 (1.2)	140 (29.4)	184 (38.7)	152 (31.9)	161 (33.8)	212 (44.6)	103 (21.6)
Doing exercise by people	2.6 (1.1)	152 (31.9)	205 (43.1)	119 (25)	147 (30.9)	202 (42.4)	127 (26.7)
Work trend (ie, the work trend of people who forced to commute in the city, several times daily because of their work situation)	2.1 (1)	208 (43.7)	172 (36.1)	96 (20.2)	142 (29.8)	215 (45.1)	119 (25)
The society culture (observing respect and courtesy to citizens)	2.1 (1)	175 (36.8)	237 (49.8)	64 (13.4)	209 (43.9)	208 (43.7)	59 (12.4)
Joining in peer groups (ie, gathering elderly groups in parks)	2.5 (1)	118 (24.8)	252 (53)	106 (22.3)	153 (32.1)	250 (52.5)	73 (15.3)
Social justice (ie, equitable distribution of services delivered by different organizations)	2.6 (1)	106 (22.3)	251 (52.7)	119 (25)	133 (27.9)	241 (50.7)	102 (21.4)
Family relations	2.7 (1)	112 (23.5)	270 (56.7)	94 (19.7)	163 (34.2)	230 (48.3)	83 (17.4)
Neighborhood relations	2.8 (1.1)	110 (23.1)	273 (57.3)	93 (19.5)	166 (34.9)	235 (49.4)	75 (15.8)
Community participation (ie, participation as health volunteers)	2.9 (1.1)	115 (24.2)	247 (51.9)	114 (23.9)	161 (33.8)	227 (47.7)	88 (18.5)
Cultural participation (ie, attending art and literacy exhibitions)	2.8 (1.1)	130 (27.3)	253 (53.2)	93 (19.5)	153 (32.1)	230 (48.3)	93 (19.5)
Spiritual participation (ie, attending charity institutions or congregational prayers)	2.8 (1.1)	122 (25.6)	250 (52.5)	104 (21.8)	163 (34.2)	212 (44.5)	101 (21.2)
Air quality of the city	2 (1)	204 (42.9)	190 (39.9)	82 (17.2)	136 (28.6)	213 (44.8)	127 (26.7)
Water quality of the city	2.6 (1.1)	150 (31.5)	225 (47.2)	101 (21.2)	131 (27.5)	218 (45.8)	127 (26.7)
Noise condition within the city	2.2 (1.1)	191 (40.1)	200 (42)	85 (17.8)	139 (29.9)	224 (47.1)	113 (23.7)
Smell condition within the city	2.2 (1.1)	192 (40.3)	181 (38)	103 (21.6)	153 (32.1)	222 (46.6)	101 (21.2)
Urban landscape and the face of local environment	2.3 (1)	182 (38.2)	217 (45.6)	77 (16.2)	163 (34.2)	217 (45.6)	96 (20.2)
Selecting the place of living in the city	2.2 (1)	193 (40.5)	187 (39.3)	96 (20.2)	149 (31.3)	216 (45.4)	111 (23.3)
Recreations performed by residents (ie, going to a movie or park)	2.4 (1.1)	156 (32.8)	232 (48.7)	88 (18.5)	156 (32.8)	221 (46.4)	99 (20.8)
Public safety (ie, parents feeling of safety from sending their children to school)	2.2 (1)	181 (38)	196 (41.2)	99 (20.8)	160 (33.6)	197 (41.4)	119 (25)
civic planning (ie, making the streets one-way, mandatorily)	2.2 (1.1)	178 (37.4)	195 (41)	103 (21.6)	122 (25.6)	220 (46.2)	134 (28.2)
Selecting the place of shopping	2.3 (1)	176 (37)	204 (42.8)	96 (20.2)	172 (36.1)	198 (41.6)	106 (22.3)
The quality of shopping (ie, feeling comfort while shopping)	2.4 (1)	157 (33)	223 (46.8)	96 (20.2)	123 (25.8)	240 (50.5)	113 (23.7)
Energy usage (ie, the amount of oil use)	2 (1.1)	201 (42.2)	181 (38)	94 (19.7)	125 (26.3)	206 (43.3)	145 (30.5)
Access of residents to destination	2.1 (1)	176 (37)	209 (43.9)	91 (19.1)	143 (30)	213 (44.8)	120 (25.2)
Access of disables to destination	2.2 (1)	160 (33.6)	224 (47.1)	92 (19.3)	131 (27.5)	230 (48.3)	115 (24.2)
Access of elderly residents to destination	2.3 (1)	179 (37.6)	218 (45.8)	79 (16.6)	144 (30.3)	221 (46.5)	111 (23.3)
The costs of access to destination	2.2 (1)	175 (36.8)	208 (43.7)	93 (19.5)	131 (27.5)	200 (42)	145 (30.5)
The status of primary health care delivery	2.2 (1)	169 (35.5)	225 (47.3)	82 (17.2)	138 (29)	207 (43.5)	131 (27.5)
Urban services to take care of children (ie, the existence of pedestrian lane on the streets near to schools)	2.3 (1)	158 (33.2)	223 (46.9)	95 (20)	149 (31.3)	214 (45)	113 (23.7)
Urban services to keep the environment clean and beautiful	2.4 (1)	158 (33.2)	221 (46.4)	97 (20.4)	157 (33)	234 (49.2)	85 (17.9)
Recreational services (ie, constructing parks or places for playing and/or launching a public walking congress)	2.4 (1)	145 (30.5)	213 (44.7)	118 (24.8)	157 (33)	227 (47.7)	92 (19.3)
Social security services (ie, the services delivered by security forces)	2.4 (1.1)	171 (35.9)	204 (42.9)	101 (21.2)	153 (32.1)	215 (45.2)	108 (22.7)
Public transport services (ie, the process of services delivered by taxies)	1.7 (.9)	243 (51.1)	194 (40.7)	39 (8.2)	210 (44.1)	176 (37)	90 (18.9)
Economic development trend (ie, the trend of construct-ing factories)	2.3 (1)	146 (30.7)	247 (51.8)	83 (17.4)	139 (29.2)	233 (49)	104 (21.8)
Social development trend (ie, the trend of promoting driving behaviors)	2.2 (1)	175 (36.8)	212 (46.5)	89 (18.7)	176 (37)	218 (45.8)	82 (17.2)
The implementation trend of the local and national programs and projects (ie, the implementation of a underpass/overpass project)	2.2 (1.1)	186 (39.1)	199 (41.9)	91 (19.1)	169 (35.5)	177 (37.2)	130 (27.3)

*D= Definite, P= Probable, S= Speculative ¥Q= Qualitative, E= Estimable, C= Calculable

After determining simple structure and the best solution considering visual inspection and the hyperplane count (23), respectively, the authors decided to eliminate items one at a time and rerun the factor analysis. The items omitted were as follows: The society culture, Water Quality, Diet status, Work trend, doing exercise by people, Public safety. Finally, the optimal reduced solution consisted of 40 items and 8 factors, which is shown in Table 4.

In order to interpret factors, the factor pattern coefficient values were considered. Based on the cut-offs recommended by Gorsuch (23) and Tabachnick and Fidell (24) and also, similar with the study con-

Table 3. Rotated factor pattern coefficients for variable solution (46 variables) of UTDHQ

	How much Sanandaj urban traffic has had negative impact on the following health determinants?	Factor pattern coefficient*									
		1	2	3	4	5	6	7	8	9	10
1	Smell condition within the city	.717									.231
2	Noise condition within the city	.714									
3	Recreations performed by residents	.703									
4	Urban landscape and the face of local environment	.628	.299								
5	Selecting the place of shopping	.609	.259								
6	Selecting the place of living in the city	.530									.233
7	The quality of shopping	.521	.219	.219							
8	civic planning	.404	.310						.270	.345	
9	Access of elderly residents to destination	.268	.802								
10	Access of disables to destination	.287	.763								
11	Access of residents to destination	.204	.718								
12	The costs of access to destination	.261	.702								
13	The status of primary health care delivery		.486					.333			
14	Energy usage	.324	.402					.261	.326		
15	Cultural participation			.733							
16	Family relations			.711							
17	Community participation			.710				.227			
18	Spiritual participation			.682						.229	
19	Neighborhood relations			.660							
20	Social justice			.503	.276					.320	
21	Occupation and employment status of the residents				.670						
22	Education provided for primary and guidance school students				.648	.325					
23	Income status of the residents				.642						
24	Education provided for high school and the university students				.637	.321					
25	Education provided for adults				.619	.309					
26	Family functioning				.538	.244					
27	Risk-taking behavior				.486				.257	.283	
28	Non-drinking				.227	.806					
29	Non-smoking				.218	.790					
30	Substance misuse			.224		.763					
31	Economic development trend						.784				
32	Social development trend	.201	.224				.720				
33	The implementation trend of the local and national projects						.669		.233		
34	Public transport services	.204					.665			.323	
35	Recreational services	.355						.723			
36	Social security services	.221						.643			
37	Urban services to take care of children		.410					.567			
38	Urban services to keep the environment clean and beautiful	.391						.463			
39	Work trend		.201						.734		
40	Air quality of the city	.294			-.204				.502		.427
41	Doing exercise by people	.225			.334				.400	.286	
42	Public safety	.301	.341						.385	.271	
43	The society culture			.250						.715	
44	Joining in peer groups			.493						.537	
45	Water quality of the city	.258									.685
46	Diet status			.258	.348	.380			-.241		.380
	Initial Eigenvalues	9.31	5.59	2.36	1.93	1.61	1.4	1.36	1.21	1.14	1.06
	Rotation sums of squares	4.25	3.69	3.62	.325	2.63	2.54	2.03	1.86	1.79	1.3
	Percent of variance explained	9.25	8.03	7.87	7.08	5.72	5.53	4.42	4.05	3.9	2.84
	Cronbach α	.83	.83	.803	.77	.81	.78	.703	.577	.655	.349

Factor 1= Physical Environment; Factor 2 = Public Services Delivery and Accessibility; Factor 3= Social Environment; Factor 4= Family Circumstances; Factor 5 = Substance Use; Factor 6 = Public Policy; Factor 7 = Public Welfare Services; Factor 8 = others; Factor 9 = Culture/Peers; Factor 10 = Diet/Water; * In order to help in decreasing complexity of the table, the loadings above .4 were indicated in bold type and the loadings less than .2 are omitted

ducted by Mousavi et la., (25) the cut-off of 0.40 was considered to include one item in interpretation of a factor (Tables 3 and 4). The factors were named as follows: Physical Environment, Social Environment, Public Services Delivery and Accessibility, Family Circumstances, Public Policy, Substance Use, Public Welfare Services, Air Quality. This solution accounted for 57.25% of the total variance.

Applying Pearson's correlation coefficient, it was found that the factor correlations were in the low (at the lowest 0.016 between the factors, "Substance use" and "Public welfare services") to modest (at the highest 0.612 between the factors "Physical environment" and "Public services delivery and accessibility") range (Table 5).

Discussion

There was found several quite clear factors, which altogether can define the urban traffic related determinants of health. The first four factors were, particularly, so strong that together explained more than 35% of the total variance. Factor 1 refers to "Physical Environment", Factor 2 refers to "Social Environments", Factor 3 refers to "Public Services Delivery and Accessibility" and Factor 4 refers to "Family Circumstances". Despite the moderate and strong relationships found between Factors 1 and 2 and Factors 2 and 3, respectively, each of the factors is completely distinct. Two of the other factors were regarded with lifestyle within personal (Factor 6) and family circumstances (Factor 4). Moreover, these two Factors had a relatively strong relation-

Table 4. Rotated factor pattern coefficients for reduced solution (40 variables) of UTDHQ

How much Sanandaj urban traffic has had negative impact on the following health determinants?	Factor pattern coefficient*							
	1	2	3	4	5	6	7	8
Smell condition within the city	.739							
Noise condition within the city	.721							.202
Recreations performed by residents	.691							
Urban landscape and the face of local environment	.622		.276					
Selecting the place of shopping	.605		.254					
The quality of shopping	.515	.210	.232				.201	
Selecting the place of living in the city	.510							.444
Civic planning	.367		.326		.222			
Community participation		.729					.224	
Spiritual participation		.723						.203
Cultural participation		.714						.235
Family relations		.695						
Neighborhood relations		.629						
Joining in peer groups		.607		.280				
Social justice		.571		.305				
Access of elderly residents to destination	.260		.805					
Access of disables to destination	.282		.777				.227	
Access of residents to destination	.203		.721					
The costs of access to destination	.245		.716					
The status of primary health care delivery			.469				.339	.358
Energy usage	.343		.426				.265	.243
Income status of the residents				.628				
Occupation and employment status of the residents	.224			.620				
Education provided for primary and guidance school students		.244		.614		.345		-.289
Risk-taking behavior				.603			.202	.211
Education provided for high school and the university students				.596		.368		
Family functioning		.246		.589		.214		
Education provided for adults				.547		.352		-.202
Economic development trend					.795			
Public transport services					.719			
Social development trend	.201		.222		.716			
The implementation trend of the local and national projects					.661			
Non-drinking				.207		.821		
Substance misuse		.230				.784		
Non-smoking				.213		.777		
Recreational services	.335						.729	
Social security services	.231						.646	
Urban services to take care of children		.202	.388				.556	
Urban services to keep the environment clean and beautiful	.420						.477	
Air quality of the city	.326							.676
Initial Eigenvalues	8.54	5.11	2.25	1.82	1.59	1.35	1.15	1.08
Rotation sums of squares	4.05	3.72	3.51	2.93	2.58	2.56	2.07	1.46
Percent of variance explained	10.1	9.3	8.79	7.34	6.46	6.41	5.18	3.67
Cronbach α	.83	.82	.83	.78	.78	.81	.703	-
ICC (95% CI)	.83 (.81-.85)	.82 (.8-.84)	.83 (.81-.85)	.78 (.75-.81)	.78 (.74-.81)	.81 (.78-.84)	.7 (.65-.84)	-

Factor 1= Physical Environment; Factor 2 = Social Environment; Factor 3=Public Services Delivery and Accessibility; Factor 4= Family Circumstances; Factor 5 = Public Policy; Factor 6 = Substance Use; Factor 7 = Public Welfare Services; Factor 8 = Air Quality; ICC: Intra-class Correlation Coefficient; CI: Confidence Interval; * In order to help in decreasing complexity of the table, the loadings above .4 were indicated in bold type and the loadings less than .2 are omitted

ship with Factor 2 (Social Environment) suggesting that the lifestyle of people in a wide variety of social contexts and networks and in different ways may be associated with urban traffic.

The UTDHQ and its derived factors showed acceptable internal consistency. The Cronbach's alpha for the questionnaire and its factors ranged from 0.70-0.83, which are in the range of high to very high based on the reference table presented by DeVellis (26) as well as Sim and Wright (27). Similar to the present study, Taymoori (28), Mahmoodi et al., (29), Parshal (30) and Montazeri et al., (31) used internal consistency to confirm the reliability of their instruments. Moreover, the face and content validity ensured the simplicity and clarity of the instrument and, also, CVI showed an acceptable relevancy.

In the present study, when investigating construct validity, there was found that the ten factor solution yielded a clearer pattern of loading, but three of the ten factors had low internal consistency reliability. Therefore, as Munro (21) recommended, the items loaded on these three factors eliminated and the factor analysis reran. Based on the decision made in an additional expert panel, the item "Air Quality" chose not

Table 5. UTDHQ factors Correlation Matrix

Variables	1	2	3	4	5	6	7	8
1	1							
2	0.202**	1						
3	0.612**	0.238**	1					
4	0.102*	0.371**	0.071	1				
5	0.458**	0.268**	0.429**	0.184**	1			
6	-0.025	0.326**	-0.075	0.482**	0.025	1		
7	-0.040	0.035	-0.042	0.047	-0.026	-0.016	1	
8	0.420**	0.152*	0.367**	-0.077	0.231**	-0.027	-0.086	1

* p< .01, ** p< .05

Factor 1= Physical Environment; Factor 2 = Social Environment; Factor 3=Public Services Delivery and Accessibility; Factor 4= Family Circumstances; Factor 5 = Public Policy; Factor 6 = Substance Use; Factor 7 = Public Welfare Services; Factor 8 = Air Quality

to be omitted because of its high importance and relevancy and so, the optimal reduced solution found in the factor analysis consisted of 40 items and 8 factors. This result strongly confirms the conceptual analysis of urban traffic related determinants of health. For example, the first five Factors, namely, Physical Environment, Social Environment, Public Services Delivery and Accessibility, Family Circumstances and Public Policy all present the main conceptual components of health determinants related to urban traffic, as discussed in the literature (13). Moreover, these factors explained about 42% of the total variance, which is another confirmation on their importance as the main components of urban traffic-related determinants of health.

The results of the present study showed that there was a small difference between the total variance explained in ten (58.73%) and eight (57.25%) factors solutions. In addition, by declining two factors, the total variance decreased only about 1.5%. In the other hand, the total variance explained by each factor increased in almost all factors, after decreasing the ten factor solution to eight. Also, a clearer pattern of item loading found in the eight factors solution. All of these findings approve the decision on considering the eight factors solution as the best solution.

As recommended by Gorsuch (23), correlations between the factors were showed in the present study. The presentation of correlations between factors in this study may help researchers in comparing the results of their future studies with those found in the present study. The correlation between a factor and its associated factor scores may be interpreted like alpha which indicates the stability of each factor (23).

This is for the first time that such an effort has been made in Sanandaj and it is presumed that conducting this study gave birth to HIA in Iran. An extensive literature review showed that except for some review studies on HIA (32-33) and two HIA on air pollution in Tehran (34) and Shiraz (35), no other HIA studies has documented. Although the best practice is to carry out HIA, prospectively, in accordance with the same international studies, in some cases this is not possible due to delays with employing associates, lack of knowledge on HIA and delays in acquiring fund (4). For example, in Sanandaj, before commencing this HIA on urban traffic, a large part of measures were completed. Therefore, UTDHQ designed to use in retrospective HIAs on urban traffic. Similar with the present study, the steering group of a HIA conducted in Ballyfermot (4) on traffic and transport, necessitated the need for a special survey on urban traffic related determinants of health in order to obtain such complementary information from general practice.

Considering the novelty of HIA in Iran and some other countries especially the developing ones, conducting such studies may have several implications for practice; increasing knowledge and awareness about HIA and its usage around the countries, providing evidence for applicability of HIA in different settings, increasing its political acceptability to help in obtaining healthy

public policy, serving in designation of curriculums for HIA educational courses (1).

Conclusion

Based on the results of the present study, UTDHQ demonstrated an appropriate validity, reliability, functionality and simplicity. Therefore, this instrument is a practical and useful tool for researchers, health promoters, community agencies and organizations interested in HIA in order to provide the finest available information to decision makers and stakeholders on the health influences of their decisions and measures. Certainly, further studies are needed to compare different dimensions of the instrument in different communities and also, to compare the dimensions with other public health indicators derived from qualitative and quantitative studies.

Limitations

A limitation of the study may be the difficulty in comparing the developed UTDHQ with the other similar instruments, due to the lack of comparable instruments in Iran and/or other countries or instruments which would be specific to urban traffic related determinants of health.

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References

1. Dannenberg A L. BR, Cole BL., Heaton SK, Feldman JD, Rutt CD. Use of Health Impact Assessment in the U.S. 27 Case Studies, 1999-2007. Am J Prev Med. 2008;34(3):241-56.
2. Office. DT. A platform for change: outline of an integrated transportation strategy for the Greater Dublin Area 2000 to 2016. Dublin Dublin Transportation Office. 2000.
3. A platform for change: outline of an integrated transportation strategy for the Greater Dublin Area 2000 to 2016. Dublin Dublin Transportation Office, Office DT; 2000.
4. A health impact assessment of traffic and transport in Ballyfermot, December 2004. 2004.
5. Levy J.I. BJJ, & von Stackelberg K. The Public Health Costs of Traffic Congestion: . Environmental Health. 2010;9(1):65.
6. Isradisaikul C. Urban Traffic Control. 2009.
7. Acheson D. Independent inquiry into inequalities in health report. 1998.
8. Health impact assessment: main concepts and suggested approach, Gothenburg consensuspaper. . 1999.
9. Quigley R dBL, Furu P, Bond A, Cave B, and Bos R. Health Impact Assessment, International Association for Impact Assessment,International Best Practice Principles. 2006.
10. Introducing health impact assessment (HIA): Informing the decision-making process. 2002.
11. Eslami M, Heidrania, A.A, et al. Designing and determining validity and reliability of the questionnaire for the effect of HBM on users of two methods of birth control with pills and condoms. Oromieh Journal. 2011;21(5):382-90.
12. Kearns N PL. Evaluation of the HIA of Traffic and Transport in Ballyfermot. 2007.
13. Scott-Samuel A. AK, Birley M. Assessing health impacts on a population. 2010.
14. Jackson RJ. The impact of the built environment on health: an emerging field. Am J Public Health. 2003;93:1382-4.
15. Frank-Stromborg M. Instruments for clinical health-care research (3rd ed.). 2004.
16. Frumkin H FL, Jackson R. Urban Sprawl and Public Health: Designing,Planning, and Building for HealthyCommunities. 2004.
17. Lacasse Y, Godbout C, & Series F. Health-related quality of life in obstructive sleep apnoea. European Respiratory Journal. 2002;19(3):493-503.
18. Lawshe CH. A qualitative approach to content. Personnel Psychology. 1975;28(4):63-575.
19. Waltz CF, Strickland, O.L, & Lenz E.R. Measurement in nursing and health research (3rd ed.). New York 2005.
20. Polit DF, Beck, C.T, & Owen S. V. Is the CVI an acceptable indicator of content validity? Appraisal and recommendations. Research in Nursing & Health. 2007; 30(4):459-67.
21. Munro B, H. Statistical methods for health care research. (5th ed). 2004.
22. Polit D, Beck C, & Hungler, B. Essentials of Nursing Research: Methods, Appraisal, and Utilization. 2006.
23. Gorsuch RLL. Factor analysis. 1983.
24. Tabachnick BG, & Fidell L.S. Using multivariate statistics (4th ed). 2001.
25. Mousavi S.J, Askary Ashtiani A.R, Mohamad Hadian R, Rostamian A, and Montazeri A. Translation and validation study of the Persian version of the Arthritis Impact Measurement Scales 2 (AIMS2) in patients with osteoarthritis of the knee. Musculoskeletal Disorders. [Original Article].

2009;10(95).
26. DeVellis RF. Scale Development: Theory and Applications. 1991.
27. Sim J WC. Research in Health Care. 2000.
28. Taymoori P, Moeini B, Lubans D, & Bharami M. Development and psychometric testing of the Adolescent Healthy Lifestyle Questionnaire. Journal of Education and Health Promotion. 2012;1(1).
29. Mahmoodi Z KM, Sajjadi H, Dejman M & Vameghi M. Development of Mother's Lifestyle Scale during Pregnancy with an Approach to Social Determinants of Health. Global Journal of Health Science. 2013;5(3):208-19.
30. Parshal MB. Psychometric charachteristics of dispnea descriptor rating in Emergency Department patients with exacerbated Chronic Obstructive Pulmonary Disease. Research in Nursung and Health. 2002;25.
31. Montazeri A, Harirchi A.M, Shariati M, Garmaroudi G, Ebadi M, & Fateh A. The 12-item General Health Questionnaire (GHQ-12): translation and validation study of the Iranian version. . Health and Quality of Life Outcomes. 2003;1(1).
32. Jaafarzadeh N. AMB. A Review on Health Impact Assessment (HIA), Its frame of structure and types. 2009.
33. Shojaei P. FAS. Health Impact Assessment of Transport Plan. 2012.
34. Naddafi K. HMS, Yunesian M., Momeniha F., Nabizadeh R., Faridi S. and Gholampour A. . Health impact assessment of air pollution in megacity of Tehran, Iran. Iranian Journal of Environmental Health Sciences & Engineering. 2012; 9 (28).
35. Gharehchahi E. MAH, Amini H, Nabizadeh R, Akhlaghi A.A, Shamsipour M, and Yunesian M. Health impact assessment of air pollution in Shiraz, Iran: a two-part study. Journal of Environmental Health Sciences & Engineering. 2013;11.