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 HIASs 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.


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
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 policymakers 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 UTDHQ 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.
except for the following three items: “Air quality”, “Energy usage”, “Public transport services”. Moreover, the risk 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>
<thead>
<tr>
<th>variable</th>
<th>Frequency (n=476)</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (year)</td>
<td>M=33.6±8</td>
<td>.161</td>
<td>.032</td>
<td>.066</td>
<td>.093</td>
<td>.011</td>
<td>.380</td>
<td>.684</td>
<td>.222</td>
</tr>
<tr>
<td>Occupation</td>
<td>School teacher</td>
<td>176(37)</td>
<td>.104</td>
<td>.581</td>
<td>.161</td>
<td>.670</td>
<td>.926</td>
<td>.035</td>
<td>.316</td>
</tr>
<tr>
<td>Education</td>
<td>Diploma</td>
<td>20(4.2)</td>
<td>.052</td>
<td>.154</td>
<td>.049</td>
<td>.599</td>
<td>.317</td>
<td>.847</td>
<td>.866</td>
</tr>
<tr>
<td>History of accident resulted in MV damage in the city since 10 yrs ago</td>
<td>Yes</td>
<td>289(58.7)</td>
<td>.347</td>
<td>.134</td>
<td>.949</td>
<td>.031</td>
<td>.520</td>
<td>.075</td>
<td>.269</td>
</tr>
</tbody>
</table>

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

<table>
<thead>
<tr>
<th>How measurable impact is – is it: D, P or S?</th>
<th>Risk of impact – is it: D, P or S?</th>
<th>Predicted health impact</th>
</tr>
</thead>
<tbody>
<tr>
<td>M (SD)</td>
<td>D (%)</td>
<td>P (%)</td>
</tr>
<tr>
<td></td>
<td>[169 (35.5)]</td>
<td>[177 (37.2)]</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>How measurable impact is – is it: Q, E or C?</th>
</tr>
</thead>
<tbody>
<tr>
<td>Risk of impact – is it: D, P or S?</td>
</tr>
<tr>
<td>M (SD)</td>
</tr>
<tr>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Predicted health impact</th>
<th>M (SD)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>D (%)</td>
</tr>
<tr>
<td></td>
<td>[169 (35.5)]</td>
</tr>
</tbody>
</table>

*D= Definite, P= Probable, S= Speculative  
*Q= Qualitative, E= Estimable, C= Calculable
Table 3. Rotated factor pattern coefficients for variable solution (46 variables) of UTDHQ

<table>
<thead>
<tr>
<th>How much Sanandaj urban traffic has had negative impact on the following health determinants?</th>
<th>Factor pattern coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>1</td>
<td>Sneeze condition within the city</td>
</tr>
<tr>
<td>2</td>
<td>Noise condition within the city</td>
</tr>
<tr>
<td>3</td>
<td>Recreations performed by residents</td>
</tr>
<tr>
<td>4</td>
<td>Urban landscape and the face of local environment</td>
</tr>
<tr>
<td>5</td>
<td>Selecting the place of shopping</td>
</tr>
<tr>
<td>6</td>
<td>Selecting the place of living in the city</td>
</tr>
<tr>
<td>7</td>
<td>The quality of shopping</td>
</tr>
<tr>
<td>8</td>
<td>civic planning</td>
</tr>
<tr>
<td>9</td>
<td>Access of elderly residents to destination</td>
</tr>
<tr>
<td>10</td>
<td>Access of disabilities to destination</td>
</tr>
<tr>
<td>11</td>
<td>Access of residents to destination</td>
</tr>
<tr>
<td>12</td>
<td>The costs of access to destination</td>
</tr>
<tr>
<td>13</td>
<td>The status of primary health care delivery</td>
</tr>
<tr>
<td>14</td>
<td>Energy usage</td>
</tr>
<tr>
<td>15</td>
<td>Cultural participation</td>
</tr>
<tr>
<td>16</td>
<td>Family relations</td>
</tr>
<tr>
<td>17</td>
<td>Community participation</td>
</tr>
<tr>
<td>18</td>
<td>Spiritual participation</td>
</tr>
<tr>
<td>19</td>
<td>Neighborhood relations</td>
</tr>
<tr>
<td>20</td>
<td>Social justice</td>
</tr>
<tr>
<td>21</td>
<td>Occupation and employment status of the residents</td>
</tr>
<tr>
<td>22</td>
<td>Education provided for primary and guidance school students</td>
</tr>
<tr>
<td>23</td>
<td>Income status of the residents</td>
</tr>
<tr>
<td>24</td>
<td>Education provided for high school and the university students</td>
</tr>
<tr>
<td>25</td>
<td>Education provided for adults</td>
</tr>
<tr>
<td>26</td>
<td>Family functioning</td>
</tr>
<tr>
<td>27</td>
<td>Risk-taking behavior</td>
</tr>
<tr>
<td>28</td>
<td>Non-drinking</td>
</tr>
<tr>
<td>29</td>
<td>Non-smoking</td>
</tr>
<tr>
<td>30</td>
<td>Substance misuse</td>
</tr>
<tr>
<td>31</td>
<td>Economic development trend</td>
</tr>
<tr>
<td>32</td>
<td>Social development trend</td>
</tr>
<tr>
<td>33</td>
<td>The implementation trend of the local and national projects</td>
</tr>
<tr>
<td>34</td>
<td>Public transport services</td>
</tr>
<tr>
<td>35</td>
<td>Recreational services</td>
</tr>
<tr>
<td>36</td>
<td>Social security services</td>
</tr>
<tr>
<td>37</td>
<td>Urban services to take care of children</td>
</tr>
<tr>
<td>38</td>
<td>Urban services to keep the environment clean and beautiful</td>
</tr>
<tr>
<td>39</td>
<td>Work trend</td>
</tr>
<tr>
<td>40</td>
<td>Air quality of the city</td>
</tr>
<tr>
<td>41</td>
<td>Doing exercise by people</td>
</tr>
<tr>
<td>42</td>
<td>Public safety</td>
</tr>
<tr>
<td>43</td>
<td>The society culture</td>
</tr>
<tr>
<td>44</td>
<td>Joining in peer groups</td>
</tr>
<tr>
<td>45</td>
<td>Water quality of the city</td>
</tr>
<tr>
<td>46</td>
<td>Diet status</td>
</tr>
<tr>
<td>Initial Eigenvalues</td>
<td>9.31</td>
</tr>
<tr>
<td>Rotation sums of squares</td>
<td>4.25</td>
</tr>
<tr>
<td>Percent of variance explained</td>
<td>9.25</td>
</tr>
</tbody>
</table>

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.

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-
Psychometric properties of Urban Traffic-related Determinants of Health Questionnaire

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

<table>
<thead>
<tr>
<th>How much Sanandaj urban traffic has had negative impact on the following health determinants?</th>
<th>Factor pattern coefficient</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>1</td>
</tr>
<tr>
<td>Smell condition within the city</td>
<td>.739</td>
</tr>
<tr>
<td>Noise condition within the city</td>
<td>.721</td>
</tr>
<tr>
<td>Recreations performed by residents</td>
<td>.691</td>
</tr>
<tr>
<td>Urban landscape and the face of local environment</td>
<td>.622</td>
</tr>
<tr>
<td>Selecting the place of shopping</td>
<td>.605</td>
</tr>
<tr>
<td>The quality of shopping</td>
<td>.515</td>
</tr>
<tr>
<td>Selecting the place of living in the city</td>
<td>.510</td>
</tr>
<tr>
<td>Civic planning</td>
<td>.367</td>
</tr>
<tr>
<td>Community participation</td>
<td>.729</td>
</tr>
<tr>
<td>Spiritual participation</td>
<td>.723</td>
</tr>
<tr>
<td>Cultural participation</td>
<td>.714</td>
</tr>
<tr>
<td>Family relations</td>
<td>.695</td>
</tr>
<tr>
<td>Neighborhood relations</td>
<td>.629</td>
</tr>
<tr>
<td>Joining in peer groups</td>
<td>.607</td>
</tr>
<tr>
<td>Social justice</td>
<td>.571</td>
</tr>
<tr>
<td>Access of elderly residents to destination</td>
<td>.260</td>
</tr>
<tr>
<td>Access of disabled to destination</td>
<td>.282</td>
</tr>
<tr>
<td>Access of residents to destination</td>
<td>.203</td>
</tr>
<tr>
<td>The costs of access to destination</td>
<td>.245</td>
</tr>
<tr>
<td>The status of primary health care delivery</td>
<td>.469</td>
</tr>
<tr>
<td>Energy usage</td>
<td>.343</td>
</tr>
<tr>
<td>Income status of the residents</td>
<td>.628</td>
</tr>
<tr>
<td>Occupation and employment status of the residents</td>
<td>.224</td>
</tr>
<tr>
<td>Education provided for primary and guidance school students</td>
<td>.244</td>
</tr>
<tr>
<td>Risk-taking behavior</td>
<td>.603</td>
</tr>
<tr>
<td>Education provided for high school and the university students</td>
<td>.596</td>
</tr>
<tr>
<td>Family functioning</td>
<td>.246</td>
</tr>
<tr>
<td>Education provided for adults</td>
<td>.244</td>
</tr>
<tr>
<td>Economic development trend</td>
<td>.795</td>
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<tr>
<td>Public transport services</td>
<td>.719</td>
</tr>
<tr>
<td>Social development trend</td>
<td>.201</td>
</tr>
<tr>
<td>The implementation trend of the local and national projects</td>
<td>.601</td>
</tr>
<tr>
<td>Non-smoking</td>
<td></td>
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<tr>
<td>Substance misuse</td>
<td></td>
</tr>
<tr>
<td>Non-smoking</td>
<td></td>
</tr>
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<td>Recreational services</td>
<td>.335</td>
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<td>Social security services</td>
<td>.231</td>
</tr>
<tr>
<td>Urban services to take care of children</td>
<td>.202</td>
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<tr>
<td>Urban services to keep the environment clean and beautiful</td>
<td>.420</td>
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<tr>
<td>Air quality of the city</td>
<td>.326</td>
</tr>
<tr>
<td>Initial Eigenvalues</td>
<td>8.54</td>
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<td>Rotation sums of squares</td>
<td>4.92</td>
</tr>
<tr>
<td>Percent of variance explained</td>
<td>10.1</td>
</tr>
<tr>
<td>Cronbach a</td>
<td>.83</td>
</tr>
<tr>
<td>ICC (95% CI)</td>
<td>.83</td>
</tr>
</tbody>
</table>

Factor 1 = Physical Environment; Factor 2 = Social Environment; Factor 3 = Public Services Delivery and Accessiblility; 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 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
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

Table 5. UTDHQ factors Correlation Matrix

<table>
<thead>
<tr>
<th>Variables</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>0.202**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>0.612**</td>
<td>0.238**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>0.102*</td>
<td>0.371**</td>
<td>0.071</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>0.458**</td>
<td>0.268*</td>
<td>0.429**</td>
<td>0.184**</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>-0.025</td>
<td>0.0326**</td>
<td>-0.075</td>
<td>0.482**</td>
<td>0.025</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>-0.040</td>
<td>0.035</td>
<td>-0.042</td>
<td>0.047</td>
<td>-0.026</td>
<td>-0.016</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>0.420**</td>
<td>0.152*</td>
<td>0.367**</td>
<td>-0.077</td>
<td>0.231**</td>
<td>-0.027</td>
<td>-0.086</td>
<td>1</td>
</tr>
</tbody>
</table>

* 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
Psychometric properties of Urban Traffic-related Determinants of Health Questionnaire

public policy, serving in designation of curricula 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.

**Acknowledgments**

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**References**

