

Health, Safety and Environment (HSE) assessment in neighborhoods: A case study in Tehran

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Received: 03 Mar.2014, Revised: 10 Jun. 2014, Accepted: 05 Jul. 2014

ABSTRACT

Urbanization is growing rapidly in recent centuries. This phenomenon can cause many changes in various aspects of human life including the economy, education and public health. This study was conducted to assess the Health, Safety and Environment (HSE) problems in Tehran neighborhoods.

A new instrument was developed based on the results of a literature review and formulated during a pilot study. Through cluster sampling, 10 neighborhoods were selected based from 374 neighborhoods of Tehran. Six observers completed observational items during the field studies. Secondary data were used to obtain non-observation characteristics. Standard descriptive statistics were used to compare the HSE characteristics in sampled neighborhoods. Furthermore, control chart was used to as a decision rule to identify specific variation among sampled neighborhoods.

Niavaran neighborhood had the best HSE status ($52.80\% \pm 25.03$) whereas Khak Sefid neighborhood had the worst one ($20.09\% \pm 27.51$). Standard deviations of HSE characteristics were high in different parts of a neighborhood. Statistical analysis indicated that significant differences in HSE characteristics exist among sampled neighborhoods. HSE status was in warning situation in both rich and poor neighborhoods. Community-based interventions were suggested as health promotion programs to involve and empower people in neighborhoods.

Keywords: Health, Safety and Environment (HSE); Assessment; Community-based intervention; Neighborhood; Tehran.

INTRODUCTION

Urbanization is growing rapidly in recent centuries. This phenomenon can cause many changes in various aspects of human life including the economy, education and public health [1-5]. The effect of "place" on health was noted due to differences in geographic location [6-8]. There is also evidence that neighborhood environment plays a major role in health of the residents [9]. In recent years, more researches have been done in the field of public health to evaluate the physical and environmental characteristics of rich and poor neighborhoods [10]. Previous studies have associated "lack of local green

space" with the health [11-13], along with "low physical quality of the residential environment", "unemployment" [14], "heavy traffic load" [15] and "physical activity" [16]. In addition, poor neighborhoods have been associated with several health problems such as heart diseases [17-19], mortality [20], smoking [21, 22] and alcohol consumption [23].

Today, community based programs were emphasized as a successful strategy in health promotion [24]. Such programs can be conducted with participation of neighborhood residents. Community-based participatory research (CBPR) is also presented as a promising collaborative approach that combines systematic inquiry, participation, and action to

address urban health problems [25, 26]. The CBPR can be used as a tool to prioritize the Health, Safety and Environment (HSE) problems in neighborhoods level. Such research can increase our knowledge and understanding of how to design high quality, reliable and effective community-based interventions (CBIs) to improve HSE characteristics in neighborhoods. Therefore, this study was conducted to assess HSE problems in Tehran neighborhoods.

MATERIALS AND METHODS

Procedure and tools

A new instrument was developed to assess HSE characteristics in Tehran neighborhoods. Items of the original instrument were based on the results of a literature review and formulated during a pilot study. Then, six urban health experts were called upon to approve the face and content validity of the characteristics. The reliability process was conducted through a pilot study in the Tehran university neighborhood. To evaluate inter-rater reliability, five trained observers rated the condition of HSE characteristics of the pilot neighborhood. To evaluate intra-rater reliability, two trained observers rated the condition of HSE characteristics during a two-week interval. Inter- and intra-rater reliability was assessed using internal Correlation Coefficient (ICC) and Kappa coefficient [27], respectively. Internal consistency was computed using Cronbach’s alpha.

Six observers completed observational items of the instrument during the field studies. Observations were conducted based on a similar procedure. For example, in four-way items, the observers were obliged to stop at a safe point and complete the related items. In some items, the observers were obliged to record their observations by using a camera. Secondary data were used to obtain non-observation characteristics including: number of clean air days, drinking water status, electromagnetic field, and annoying industries inside the neighborhood. After data gathering, data processing was conducted by using the EXEL software.

Selection of neighborhoods

Tehran neighborhoods (n=374) have been divided up into 10 clusters based on income, illiteracy and migration [28]. In this study, sampled neighborhoods (n=10) were chosen from each cluster (Table 1). Tehran neighborhoods are heterogeneous status. Therefore, cluster sampling increased the chance of the representativeness of these data and the generalizability of the results to Tehran neighborhoods.

Statistical analysis

Standard descriptive statistics were used to compare the HSE characteristics in sampled neighborhoods (such as mean, standard deviation, as well as chi-square test). Furthermore, control chart was used to as a decision rule to identify specific variation among sampled neighborhoods (Table 2). The SPSS software was used only for data analysis.

Table 1: Cluster sampling of neighborhoods based on income, illiteracy, and migration [28]

Cluster	Cluster situation	Selected neighborhood
1	low income, high illiteracy, low migration	Kaasar
2	low income, high illiteracy, high migration	Emamzade Abdullah
3	moderate income, high illiteracy, low migration	Abuzar
4	moderate income, high illiteracy, high migration	Khak sefid
5	moderate income, low illiteracy, low migration	West of Narmak
6	moderate income, low illiteracy, high migration	Koasar
7	moderate income, low illiteracy, low migration	Sheikh hadi
8	moderate income, low illiteracy, high migration	Tehran university
9	high income, low illiteracy, low migration	Niavarán
10	high income, low illiteracy, high migration	Sa'adat abad

Table 2: Decision rules for HSE characteristics in sampled neighborhoods

Description	Decision rules
Moderate to high (good)	LCL of the neighborhood is between LCL and UCL of all neighborhoods and also UCL of the neighborhood is upper than all neighborhoods
Moderate (under control)	LCL and UCL of neighborhood is between or match with LCL and UCL of all neighborhoods
Moderate to low (warning)	LCL of the neighborhood is lower than LCL of all neighborhood and UCL of neighborhood is between LCL and UCL of all neighborhoods
Low (Undesirable)	LCL of the neighborhood is lower than LCL and UCL of all neighborhoods

RESULTS AND DISCUSSION

Inter- and intra-rater reliability was considered acceptable (>0.77) for all HSE characteristics. Internal consistency was considered acceptable (>0.79) for all HSE characteristics except Urban aesthetic and Alleys status (>0.65).

Descriptive statistics in Table 3 shows that some HSE characteristics that were assessed as undesirable (below 50 percent) including: pathways and sidewalks, alleys, urban aesthetic, solid waste management, parks, pedestrian bridges, winter safety and access to health facilities. Other characteristics were categorized as moderate to highly desirable (above 50 percent).

Table 4 shows overall comparisons of on neighborhoods. Niavaran neighborhood had the best HSE status (52.80 ± 25.03) and Khak Sefid neighborhood had the worst one (20.09 ± 27.51). Except for Niavaran and Sa'adat Abad, HSE status in other neighborhoods was undesirable (less than 50%). On the other hand, the standard deviations were high in different parts of a neighborhood. These variations conclude that HSE status has been heterogeneous in the neighborhood level.

Table 5 shows detailed comparison of sampled neighborhoods based on HSE characteristics. Intersection safety was at moderate to high level in Tehran University, Sheikh Hadi and Sa'adat Abad. Khak Sefid, Emamzade Abdollah, Koohsar and Niavaran were categorized at moderate level (or under control) based on intersection safety. However, Abuzar, Kaosar and Narmak Gharbi were at moderate to low level (or warning situation). Pathways and sidewalks were placed under control in all neighborhoods except Khak Sefid and Koohsar. Alleys condition was in warning status in Tehran

University, Khak Sefid, Sheikh Hadi and Kaosar neighborhoods. This characteristic was right on moderate level (under control) in other neighborhoods.

The urban aesthetic of Sa'adat Abad and Niavaran was at moderate to high condition. This characteristic was placed under control in Sheikh Hadi, Abuzar, Kaosar, west of Narmak and Kohsar. Khak Sefid, Tehran University and Emamzade Abdullah were categorized in warning condition. Solid waste management was in moderate to extreme condition in Sheikh Hadi and Abuzar. This characteristic was placed under control for other neighborhoods. Noise in the Kohsar was right on moderate to high condition. Sheikh Hadi, Emamzade Abdullah and Kosar were in warning condition. Other neighborhoods were in moderate condition (under control).

Fueling facility of Tehran University neighborhood was at moderate (under control), Sheikh Hadi, Emamzade Abdullah and Kaosar were in warning condition, and other neighborhoods were at moderate to high condition.

Bus stations were in warning condition for some neighborhoods including Tehran University, Khak Sefid, Emamzade Abdullah, and Kaosar. In other neighborhoods, this characteristic was right on moderate condition (under control). Parks condition was undesirable in Tehran University neighborhood. Sheikh Hadi, Abuzar and Kohsar in warning condition, and other neighborhoods were assessed at moderate condition (under control).

Several neighborhoods including Tehran University, Sheikh Hadi, Khak Sefid, Emamzade Abdullah and Kaosar were assessed in warning condition based on electromagnetic field. Other neighborhoods were in moderate condition (under control).

Table 3: Descriptive statistics for HSE characteristics in sampled neighborhoods

Characteristics	Sample	Data gathering	Scale	Min	Max	Mean	SD	LCL	UCL
Intersection safety	11800	observation	percent	23.00	82.00	53.22	11.78	30.13	76.31
Pathway and sidewalk	20060	observation	percent	13.13	78.50	39.09	11.01	17.51	60.67
Alley	3540	observation	percent	3.33	75.00	46.18	17.69	11.51	80.85
Urban aesthetic	16520	observation	percent	5.71	78.57	35.10	13.16	9.31	60.89
Solid waste	7670	observation	percent	16.56	68.75	42.50	8.64	25.57	59.43
Noise	400	observation	percent	40.40	92.80	77.80	10.93	56.80	99.22
Fueling facility	88	observation	percent	48.00	100.00	97.14	10.02	77.50	100.00
Bus station	708	observation	percent	0.00	83.33	61.70	15.45	30.79	91.35
Park	1265	observation	percent	0.00	80.20	41.57	32.58	0.00	100.00
Pedestrian bridge	56	observation	percent	0.00	100.00	31.97	26.51	0.00	83.93
Electromagnetic field	590	documents	percent	0.00	100.00	57.08	23.86	10.31	100.00
Winter safety	2950	observation	percent	0.00	66.00	34.09	16.52	1.71	66.47
Annoying industry	826	documents	percent	7.00	100.00	90.69	19.74	52.00	100.00
Health facility	102	documents	percent	0.00	70.00	38.85	32.85	0.00	100.00
Clean air days	2508	documents	percent	6.94	95.00	54.54	31.29	0.00	100.00
Drinking water	2014	documents	percent	80.66	92.00	86.56	3.18	80.33	92.79

Table 4: Overall comparison of sampled neighborhoods based on HSE characteristics

Neighborhood	Mean	SD
Tehran university	38.23	32.90
Khak Sefid	20.09	27.51
Sheikh Hadi	45.90	31.49
Abuzar	47.16	26.34
Emamzade Abdullah	36.71	20.90
Kaosar	36.96	22.93
West of Narmak	44.76	30.79
Kohsar	40.83	28.52
Niavaran	52.80	25.03
Sa'adat abad	51.60	27.10

Pedestrian bridges were undesirable in Tehran University and Khak Sefid. However, Sheikh Hadi, Emamzadeh, Abdullah, Kaosar and Kohsar were in warning condition and Sa'adat Abad, Niavaran, west of Narmak, Abuzar neighborhoods were at moderate to high condition taken into account this characteristic.

Winter safety condition was assessed in warning condition in Kaosar, west of Narmak and Kohsar. Other neighborhoods were categorized at moderate condition (under control). Annoying industry was in warning of Sheikh Hadi and Kohsar. However, other neighborhoods were assessed in moderate condition (under control).

Number of Clean air days was in warning condition in Tehran University, Sheikh Hadi, west of Narmak, Abuzar. Khak Sefid and Sa'adat Abad were assessed as moderate to high condition. This characteristic was under control in Emamzade Abdullah, Kaosar, Niavaran and Kohsar. Finally, except for Abuzar neighborhood, all neighborhoods were assessed in warning condition based on drinking water status.

Furthermore, statistical analysis in Table 5 suggests that the significant differences in HSE characteristics (except fueling facility, electromagnetic field and drinking water) exist among sampled neighborhoods. In general, results of this study showed that the HSE status was in cautioning situation in both rich and poor neighborhoods. This study confirmed that different neighborhoods have different priorities. Therefore, Tehran municipality needs to select intervention programs based on neighborhood priorities. Previous studies showed that community involvement and empowerment help to a community group to promote their decision-making skills [29-32]. This study suggests community-based interventions as health promotion programs to involve and empowers people in Tehran neighborhoods.

Table 5: Detail comparison of sampled neighborhoods based on HSE characteristics

	Mean (SD)															
	Intersection safety	Pathway and sidewalk	Alley	Urban aesthetic	Solid waste	Noise	Fueling facility	Bus station	Park	Electromagnetic field	Pedestrian bridge	Winter safety	Annoying industry	Health facility	clean air days	Drinking water
Tehran University	69.12 (10.92)	36.58 (13.81)	21.45 (18.23)	29.01 (12.45)	42.86 (2.75)	75.22 (15.37)	97.72 (4.55)	49.58 (27.22)	0.00 (0.00)	58.30 (31.91)	0.00 (0.00)	50.00 (0.00)	92.47 (10.89)	0.00 (--)	21.00 (28.40)	87.33 (15.53)
Khak Sefid	45.5 (0.70)	14.32 (1.70)	11.66 (11.78)	13.57 (3.03)	17.96 (1.98)	60.6 (0.00)	100 (0.00)	25 (35.35)	11.65 (16.47)	100 (0.00)	0.00 (0.00)	35.2 (7.35)	71.1 (1.55)	0.00 (--)	95.00 (5.94)	84.66 (13.05)
Sheikh Hadi	66.33 (7.02)	36.47 (3.62)	15.55 (2.54)	34.52 (10.13)	56.66 (5.80)	49.2 (10.34)	87.66 (21.36)	76.11 (6.30)	31.6 (41.20)	44.4 (19.22)	31.90 (55.26)	45 (8.66)	40 (40.36)	60 (--)	13.05 (30.69)	84.00 (21.16)
Abuzar	39.5 (6.36)	34.38 (0.87)	40.41 (8.83)	31.42 (1.01)	65.84 (4.11)	82.5 (3.53)	100 (0.00)	55.83 (2.35)	20 (28.28)	80.5 (20.50)	65 (14.14)	18 (2.82)	85 (7.07)	56 (--)	76.66 (18.58)	92.00 (10.58)
Emamzade Abdullah	44.66 (2.08)	35.85 (3.01)	42.22 (15.48)	33.33 (6.93)	38.06 (8.39)	74.1 (0.85)	83.33 (28.86)	38.05 (22.94)	26.66 (23.09)	73.33 (46.18)	10.95 (18.97)	36.66 (15.27)	55.53 (31.49)	62.66 (--)	87.50 (10.64)	86.00 (15.09)
Kaosar	43.06 (8.37)	38.06 (7.11)	33.77 (13.74)	21.59 (5.00)	40.43 (7.09)	79.96 (6.43)	82.66 (30.02)	42.66 (19.39)	34 (0.00)	82.00 (7.21)	25.71 (44.53)	40 (20)	86.33 (12.34)	37 (--)	69.72 (18.66)	80.66 (18.87)
West of Narmak	50.68 (12.44)	40.9 (9.60)	52.06 (10.99)	33.17 (6.64)	41.95 (3.01)	78.28 (6.61)	100 (0.00)	67.00 (1.66)	43.52 (30.47)	56.46 (20.86)	27.77 (11.17)	32.28 (20.53)	75 (0.00)	70 (--)	6.94 (10.58)	86.33 (15.17)
Kohsar	52 (4.35)	36.14 (10.97)	52.77 (9.62)	20.95 (13.67)	41.97 (4.31)	83 (7.21)	100 (0.00)	63.88 (12.72)	31.60 (41.60)	66.6 (0.00)	28.57 (49.48)	25 (15)	100 (0.00)	0.00 (--)	68.61 (38.01)	89.33 (10.06)
Niavaran	52 (11.14)	42.78 (26.60)	62.5 (10.75)	58.391 (3.94)	41.95 (3.52)	84.52 (7.45)	100 (0.00)	68.33 (1.92)	77.35 (3.02)	49.95 (19.22)	70 (23.09)	30 (11.54)	95 (10.00)	64 (--)	48.05 (17.31)	86.00 (15.09)
Sa'adat Abad	59.8 (9.61)	44.01 (7.60)	59.16 (6.14)	49.61 (8.53)	41.62 (3.04)	86.6 (3.13)	100 (0.00)	68.33 (3.51)	82.46 (4.81)	56.61 (16.08)	62 (19.32)	31 (17.91)	95.50 (11.16)	0.00 (--)	58.88 (30.36)	89.33 (10.06)
P-value	0.01	0.29	0.00	0.00	0.01	0.00	0.08	0.00	0.00	0.08	0.00	0.58	0.00	0.00	0.00	0.75

CONCLUSION

In general, HSE status was in warning situation in both rich and poor neighborhoods. It is necessary to improve the HSE status in Tehran neighborhoods based on the priorities of this study. Community-based interventions were suggested as health promotion programs to involve and empower people in neighborhoods.

ACKNOWLEDGEMENT

The study was financially supported by Tehran Municipality. The authors would like to thank Salar Khosravi and Ghasem Zareh for data processing and to Ali Akbar Sadeghi and Dr. Hassan Amari for insightful comments.

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