Published in final edited form as:

Int J Environ Health Res. 2006 April ; 16(2): 99–111. doi:10.1080/09603120500538341.

Harboring illnesses: On the association between disease and living conditions in a Palestinian refugee camp in Lebanon

RIMA R. HABIB, SHIRAZ H. BASMA, and JOUMANA S. YERETZIAN

Faculty of Health Sciences, American University of Beirut, Lebanon

Abstract

This research examined the association between the domestic built environment in a Palestinian refugee camp in Beirut, Lebanon, and the presence of illness among household members. Data on the domestic built environment, socio-demographics and health were collected in 860 households. The association between the presence of illness among household members and three environmental indices, namely infrastructure and services, housing conditions, and crowding was evaluated. These indices were based on a number of items that reflected the existing problems in the domestic built environment. The main finding was the positive association between poor housing conditions and the presence of illness among household members. Households with 8-15 housing problems were twice more likely to report the presence of illness than those with less than four housing problems (OR = 2.08, 95% CI = 1.40-3.11). This research contributes to the understanding of the influence of the built environment on the health of a refugee population.

Keywords

Domestic built environment; housing conditions; illness; Palestinian refugees

Introduction

Published studies define the term “adequate housing” as one that entails the basic physical conditions, satisfies one’s psychosocial needs and comprises protection from communicable diseases, chronic illnesses, injuries and mental health problems (Filfil 1999; Dunn 2002; Krieger & Higgins 2002; Kumie & Berhane 2002; Sirinivasan et al. 2003). A number of researchers have assessed the direct relation of the domestic built environment (infrastructure and services, housing conditions, indoor air quality, and overcrowding) with health (Giacaman 1985; Krieger & Higgins 2002; Kumie & Berhane 2002; Al-Khatib et al. 2003; Jackson 2003; Northridge et al. 2003; Perdue et al. 2003; Samet & Spengler 2003; Sirinivasan et al. 2003; Xavier et al. 2003). In fact, the literature widely documents the association between poor housing conditions, characterized by the presence of humidity/mould, indoor pollutants, infestation, and the absence of a source of heating on the one hand, and reported illnesses by household members, such as dizziness, headache, irritation of eyes and skin, upper respiratory tract infection and an increase in the prevalence of cardiovascular diseases on the other hand (Jones 1998; Krieger & Higgins 2002; Al-Khatib et al. 2003; Roux 2003; Sirinivasan et al. 2003; Xavier et al. 2003).

The literature also indicates that inadequate infrastructure and services namely lack of a safe water source, unreliable electrical supply and improper disposal of solid wastes, contribute

to public health outbreaks (Northridge et al. 2003; Galea & Vlahov 2005). Crowded cramped conditions have also been associated with acute respiratory infections, poor mental health among children as well as household burns and accidents (Filfil 1999; Evans et al. 2002).

It is argued that a safely built environment, including adequate housing conditions, is one of the most elemental human needs (UNHCR 2004). Nonetheless, around one billion (one-sixth) of the world's population currently live in slums and squatters (UN-HABITAT 2003) and a large proportion of refugees reside in inadequate shelters (UNHCR 2004).

Since 1948 Palestinian refugees, who constitute one of the five largest groups of refugees in the world (UNHCR 2004), have been dispersed, in several Arab countries including Jordan (42%), the Syrian Arab Republic (10%) and Lebanon (10%), in addition to the refugees living in the Gaza strip (23%) and the West Bank (16%) (UNRWA 2004). To carry out direct relief and works programmes for Palestinian refugees, the United Nations Relief and Work Agency (UNRWA) was established by the United Nations in 1949 (UNRWA 2004). Currently, one third of the refugees registered with UNRWA reside in 59 official camps, of which 12 are located in Lebanon, (UNRWA 2004) while the other two-thirds live in unofficial camps, gatherings and squatter-like areas (An-Natour 2004). Overcrowding and the lack of infrastructure and services namely wastewater networks and sanitation systems have been previously reported to fall below acceptable standards of environmental health in refugee camps in West Bank and Gaza strip (Farah 2000). Also, poor housing conditions have been positively correlated with poor health in camps of the West Bank (Giacaman 1985; Filfil 1999; Farah 2000; Al-Khatib et al. 2003).

One of the largest and oldest Palestinian refugee camps in Lebanon is Burj Barajneh camp established in 1948 on the outskirts of Beirut by the International League of Red Cross Societies (UNRWA 2004). The camp is densely populated and currently accommodates 20,405 refugees in hastily aggregated illegal squatters in an area of 1.6 km² area (UNRWA 2004). According to UNRWA sources, the camp suffers from overcrowding, lack of proper services and infrastructure, poor housing conditions and poverty. Around 1630 persons in the camp were classified as “special hardship cases” denoting individuals who lack access to “basic medical and social facilities, live on food rations and with no main breadwinner member in the household” (UNRWA 2004). Despite this situation, the health of Palestinians residing in refugee camps in Lebanon has not received enough attention in the literature. As far as we know our study is the first to investigate the association between the domestic built environment in Burj Barajneh camp and the presence of illness among household members.

Methodology

The sample

The sample used in this analysis, is part of data collected in the Urban Health Survey (UHS), carried out by the Faculty of Health Sciences at the American University of Beirut in 2002. The cross-sectional survey was based on a two-stage probability sample of 860 households from a total of 3548 households in Burj Barajneh camp. Data were collected during a face-to-face interview with a proxy respondent from each selected household. A structured questionnaire specifically designed for this study included sections on housing characteristics and information on household members. The section on housing characteristics consisted of questions on infrastructure, services, and housing conditions. Information on household members provided information on demographics and data on the presence and type of illnesses among household members. Prior to data collection, the study was granted ethical approval by the University Review Board. All respondents were

informed of the objective of the study and oral consent was obtained. The response rate was 97.7%.

The variables

Three domestic built environment indices, including infrastructure and services, housing conditions, and crowding, were developed to reflect the environmental quality in the households (Jones 1998; Rylander & Megevand 2000; Takano & Nakamura 2001; Al-Khatib et al. 2003). The infrastructure and services index consisted of nine items relating to drinking water, electrical power, sewage and garbage disposal, as well as floods due to rainwater (see Table I). The housing conditions index was based on 15 items including household infestation, adequate lighting, ventilation, heating, the presence of humidity and cracks in walls and ceiling, and others presented in Table I.

All the items used in the calculation of these two indices were dichotomized such that the zero denoted the absence of a problem and 1 denoted its presence. These items were then summed to form a score ranging from 0-9 problems for infrastructure and services, and 0-15 problems for housing conditions; the larger the score is, the poorer the conditions are. Finally, based on the respective frequency distributions, the indices were divided into three categories that reflect the magnitude of the problem per index. The infrastructure and services index was categorized into: 0-1 problems (low), 2-3 problems (moderate) and 4-9 problems (high) while the housing conditions index was categorized into: 0-4 problems (low), 5-7 problems (moderate) and 8-15 problems (high).

The household crowding index was calculated as the ratio of the number of people in the household to the number of rooms excluding the kitchen, unclosed balconies, bathrooms and garage (Lowry 1991; Gray 2001; US Census of Bureau 2000; Evans & Kantrowitz 2002; Evans et al. 2002; Al-Khatib et al. 2003). Although it represents the most common way of measuring crowding, the interpretation of this index varies with geographical location. In the US for example, overcrowding refers to more than one person per room (Myers et al. 1996; US Census of Bureau 2000), while in a study carried out by Kumie & Berhane (2002) in Ethiopia, undercrowding refers to one person per room and crowding refers to two or more persons per room. In this study, the index was divided into three levels; undercrowded (one person per room), crowded (two to three persons per room), and overcrowded (four or more persons per room).

Other covariates used in the study included the educational level of the head of the household and the total household monthly income measured in thousands of Lebanese pounds (LBP). Based on frequency distributions, the income variable was categorized into low (<460,000 LBP), medium low (460,000-700,000 LBP) and medium high (>700,000 LBP). Completed years of education for the head of household were also categorized into three categories: none-elementary, primary-intermediate, and secondary and above.

The presence of illness in the household was the outcome of interest; it was dichotomized into 0 for the absence of illness among all household members and 1 for the presence of illness among one or more members in the household. Using a checklist included in the questionnaire, the proxy respondent reported on illnesses which household members suffered from. Illnesses were classified according to the 10th revision of the International Classification of Diseases (ICD-10) (WHO 1992).

Statistical methods

Data were analyzed using the Statistical Package for Social Science (SPSS) Version 11.00 (SPSS 2003). Odds ratios and 95% confidential intervals (CI) were calculated using a logistic regression model that evaluated the association between the presence of illness

among household members and the three indices, controlling for the monthly income of the household, and the educational level of the head of household.

Results

Characteristics of the surveyed population

The age distribution of this sample indicates a relatively young population with 36.0% aged 14 years or younger and only 7.0% over 60 years. The majority of the households were nuclear (81.4%), male headed (84.0%), with an average family size of five persons per household (see Table II). While 14.3% of household heads did not complete an elementary education, 27.0% attained a secondary level or more. Nearly one third (30.5%) of household heads were economically inactive. Of those who were economically active, one third (31.7%) were involved in crafts and related fields, and 39.6% earned a monthly salary of less than 300,000 LBP.

Characteristics of the domestic built environment

Findings on infrastructure and services indicated that most households reported problems with the sewage system (87.5%) and garbage disposal (87.6%) (Table III). The latter were mostly related to the type of trucks and haulers used as well as problems due to the timing (day or night) and frequency (number of times) of garbage collection. The majority of the households (91.2%) reported the availability of electricity for more than 4 hours per day, however around two third (64%) indicated problems with the quality of the electrical power (low or high voltage). Although 21.4% of households indicated problems due to flooding from rainwater, only 3.2% of those were evacuated. The majority of households (76.2%) utilized cisterns or tanker trucks for drinking purposes, 21.0% purchased bottled water, and only 0.2% had access to municipal water.

With respect to housing conditions, 83.3% of households indicated cockroach infestation, 32.7% complained from the presence of mice inside the home, and 20.5% reported the presence of rats (see Table III). Half of the households suffered from lack of adequate lighting in the living room, 44.1% suffered from the lack of adequate lighting in the bedroom and the majority of households reported poor ventilation (80.3%), humid conditions (66.0%), cracks in the walls (62.9%) as well as seepage in the ceilings (60.7%) and walls (73.7%). Almost half of the households (48.1%) indicated the presence of cracks in the ceiling and 13.5% always suffered from water overflow from floor drains. Other inadequate housing conditions included the absence of a proper heating system in 33.1% of the households, as well as broken glass and exposed electrical wires in 25% of the households.

The domestic built environment indices indicated that nearly half the households (47.6%) suffered from 4-9 problems relating to infrastructure and services. More than half (55.3%) of households reported 5-7 problems relating to housing conditions. As to crowding, 61.4% of surveyed households had 2-3 persons per room while 8.4% reported 4 or more persons per room (see Table III).

Presence of illnesses among household members

Table II indicates that 69.5% of the households reported the presence of illnesses among household members. Among households that reported illnesses, 30.8% reported one illness, and 69.2% reported two or more types of illness. Results showed that the majority of the illnesses were those of the circulatory system (21.5%), the musculoskeletal system (18.9%), and the respiratory system (15.2%) (see Table IV).

Association between education, income and the presence of illness

A multiple logistic regression model was carried out to uncover the association between the domestic built environment indices and the presence of illness among household members (see Table V).

The association between the education of the head of the household and the presence of illness among household members showed a significant negative gradient. Households whose head attained a primary to intermediate education were less likely to report an illness, compared to households whose head attained an elementary education or none (OR = 0.39, 95% CI = 0.26-0.57) (Table V). Also, households whose head had attained a higher education (intermediate and above) were less likely to report an illness compared to those whose head had attained a low education (OR = 0.28, 95% CI = 0.19-0.40). Households with high income were more likely to report an illness compared to those with low income; however, this association only reached a borderline significance (OR = 1.66, 95% CI = 1.04-2.62).

Association between the domestic built environment and the presence of illness

The association between housing conditions and the presence of illness among household members showed a significant positive gradient. Households with 5-7 problems in housing an illness conditions were one and a half times more likely to report an illness (OR 1.53, 95% CI = 1.02-2.29), and those with 8-15 problems were twice more likely to report (OR = 2.08, 95% CI = 1.40-3.11) compared to households with 0-4 problems.

Chi-square analyzes of selected housing conditions such as heating, humidity, ventilation and pest infestation, did not show a significant association with the presence of specific illnesses such as circulatory and/or respiratory illnesses ($p > 0.05$). This may be attributed to the fact that disaggregating the index reduces the numbers and therefore the power and the chance to detect a significant association.

The prevailing conditions of infrastructure and services did not show a significant association with the presence of illness among household members in Burj Barajneh camp.

Discussion

Income and labor in Burj Barajneh camp

Households in Burj Barajneh camp are considered poor by Lebanese standards; the median yearly household income in the camp was about US dollars 3,700 (\$308 monthly) in 2004 compared to a national average of nearly \$12,300 US dollars in 1997 (Administration Centrale de la Statistique 1998). The economic conditions in the camp are partially attributed to legal aspects relating to accessibility to work and to the type of work. While Palestinians have free access to casual, manual and agricultural labor, they require a work permit for other jobs that can only be granted by a ministerial decision. According to Lebanese Law, 72 occupations are restricted to Palestinian refugees and other foreigners (Ministry of Labor decree No 621/1, December 15, 1995). In addition, the presence of foreign laborers in Lebanon, mainly Syrians and Egyptians, increases the competition for casual work (Makhoul et al. 2003) which has made it even more difficult for Palestinian refugees to find labor.

The domestic built environment in Burj Barajneh camp

The domestic built environment in Burj Barajneh camp is characterized by precarious housing conditions, basic accessibility to infrastructure and services and crowded living conditions. The dwellings in the camp suffer from poor housing conditions mainly relating

to inadequate lighting and ventilation, excess humidity, cracks and leakage in walls and ceilings, in addition to pest infestation. Similar inadequate housing conditions in other Palestinian camps have been previously described in the literature (Al-Khatib et al. 2003; FAFO 2003). Al-Khatib et al. (2003) indicated that close to half of the surveyed households in Al-Amari Camp in the West Bank (43%) reported the lack of adequate sunlight and more than a third (78.2%) suffered from humidity, leakage or mould. In a survey on the living conditions of Palestinian refugees in camps and gatherings in Lebanon, around 58% of sampled households suffered from inadequate lighting, 45% complained from poor ventilation and 65% reported humidity/dampness (FAFO 2003).

The study findings on infrastructure and services are not so bleak. They indicated that the majority of households in Burj Barajneh camp are connected to a sewage system and a domestic water source despite the absence of official municipal provision of such services. Palestinian refugees residing in Burj Barajneh camp pay monthly water tariffs to a local popular committee in charge of privately purchasing and supplying service water for the camp residents. This committee also manages household sewage disposal through “self-help” projects supported by local NGOs and UNRWA. However, the camp still suffers from open sewer systems (An-Natour 2004). This may be due to the decline in services provided by UNRWA, and the improper allocation and sustainability of projects relating to infrastructure and services by funding agencies (An-Natour 2004).

Although domestic water and sewage conditions in Burj Barajneh camp seemed acceptable when compared to those in slums and squatter settlements in sub-Saharan Africa (Kifle 2000), they rated worse than those in Al-Amari Camp where nearly all surveyed households are connected to a sewage system (98.4%) and a piped water supply (100%) (Al-Khatib et al. 2003).

Our results indicated that 69.8% of the surveyed households in Burj Barajneh camp housed two or more persons per room. This finding showed that crowding in this camp was worse than that reported in selected camps and gatherings in the West Bank and Gaza strip, where 40% of households suffered from “overcrowding” with two or more persons residing in a room (Farah 2000). It is worth noting that residential units in Burj Barajneh camp generally expand vertically due to the lack of space in the camp and the unavailability of legal building permits and ownership thus resulting in cramped and poorly built houses.

Education, income and the presence of illness in Burj Barajneh camp

The results of our study concur with the literature on the negative association between education, as a measure of socioeconomic status, and the presence of illness (Dunn & Hayes 2000; Evans & Kantrowitz 2002). However, the results on income did not concur with the majority of studies that show a better health status with a higher income (Takano & Nakamura 2001; Evans et al. 2002). Our findings on the association between income and the presence of illness in Burj Barajneh camp should be interpreted with care. We do not consider income to be an accurate measure of socioeconomic status within the boundaries of the camp where the majority of households are considered poor by Lebanese standard (76% of households earned less than 500 \$ per month), and families with a fairly good income tend to move outside the camp.

The domestic built environment and the presence of illness in Burj Barajneh camp

Our findings on the positive association between health (measured by the presence of illness among household members) and poor housing conditions, concur with what has been previously reported in the literature (Rylander & Megevand 2000; Wolf et al. 2001; Thomson et al. 2001; Krieger & Higgins 2002; Al-Khatib et al. 2003; Samet & Spengler

2003; Sirinivasan et al. 2003; Xavier et al. 2003). Published studies have associated poor housing conditions, manifested by excessive humidity, inadequate ventilation in addition to rodent and pest infestation, with ill-health (Jones 1998; Krieger & Higgins 2002; Al-Khatib et al. 2003; Roux 2003).

The lack of an association between the presence of illness among household members and the prevailing conditions of infrastructure and services was not surprising given the sufficient provision of essential services including domestic water and sewage disposal through “self-help” projects discussed above.

Contrary to several published studies (Gray 2001; Evans et al. 2002; Evans & Kantrowitz 2002; Kumie & Berhane 2002; US Census of Bureau 2004) our results did not show an association between crowding conditions and ill-health, although a large proportion of the camp residents live under crowded conditions. It is worth noting that the relationship between crowding and health is complex and may be influenced by a number of potentially confounding variables that were not accounted for in this analysis due to lack of data. These variables include the practices of hygiene and the access to health care services (Myers et al. 1996; US Census of Bureau 2000).

Study limitations

The inherent limitations of the cross-sectional design may have impinged on the results of this survey. Bearing in mind these limitations, our analyzes were designed to establish significant associations rather than deriving causal inferences.

Several indicators of the built environment were missed in the analysis due to the lack of data. These include determinants of the indoor environmental quality such as home dust mite, type of building material, lifestyle habits such as smoking, in addition to the quality of water sources. Moreover, other determinants that were also missed in the analysis include the access to healthcare services, the practice of preventive health activities, and others such as the urban clutter and the social environment, all of which have been previously associated with the presence of illness (Takano & Nakamura 2001; Evans et al. 2002; Galea & Vlahov 2005).

Conclusion

Housing quality and well-being are key issues on the political agendas of both developing and developed nations. Our study revealed an association between the poor housing conditions and the presence of illness in a Palestinian refugee camp on the outskirts of Beirut. The prevailing poor housing conditions in Burj Barajneh camp coupled with low-income jobs among Palestinian refugees, call for immediate action to ensure sustainable living conditions. The timeliness of this issue is evident by the latest developments whereby the Lebanese Minister of Labor issued an order in June 2005 allowing Palestinians born and registered in Lebanon to work in jobs that do not require official registration in a syndicate.

Acknowledgments

The authors thank the many people who have contributed to the data collection. We would also like to thank all those who took part in the survey. This project was supported by grants from the Wellcome Trust, Mellon and Ford Foundations.

References

- Administration Centrale de la Statistique. Etude Statistiques: Conditions de vie des ménages en 1997. Beyrouth, Liban: Publications de l'Administration Centrale de la Statistique; 1998. (Etudes Statistiques No. 9) (Fevrier).
- Al-Khatib I, Juba A, Kamal N, Hamed N, Hmeidan N, Massad S. Impact of housing conditions on the health of the people at al-Ama'ri refugee camp in the West Bank of Palestine. *Int J Environ Health Res.* 2003; 13(4):315–326. [PubMed: 14594698]
- An-Natour, S. The Palestinian Refugees in Lebanon. Beirut, Lebanon: Human Rights Protection Center; 2004. Technical Report (4)
- Dunn JR. Housing and inequalities in health: A study of socioeconomic dimensions of housing and self reported health from a survey of Vancouver residents. *J Epidemiol Comm Health.* 2002; 56:671–681.
- Dunn J, Hayes MV. Social inequality, population health, and housing: A study of two Vancouver neighborhoods. *Soc Sci Med.* 2000; 51:563–587. [PubMed: 10868671]
- Evans G, Kantrowitz E. Socio economic status and health: The potential role of environmental risk exposure. *Ann Rev Pub Health.* 2002; 23:303–331. [PubMed: 11910065]
- Evans G, Lercher P, Kofler W. Crowding and children's mental health: The role of house type. *J Environ Psychol.* 2002; 22:221–231.
- Farah R. A report on the psychological effects of overcrowding in refugee camps in the West Bank and Gaza strip. (IDRC) April. 2000 Available: <http://www.arts.mcgill.ca/MEPP/PRRN/Farah.html>
- Filfil, M. The housing environment and women's health: The case of Ramallah Al-Tahta. West Bank, Palestine: Institute of Community and Public Health, Birzeit University; 1999.
- FAFO. Difficult past, uncertain future: Living conditions among Palestinian refugees in camps and gatherings in Lebanon. Fafo Publications; 2003.
- Giacaman, R. A profile of life and health in three Palestinian villages. West Bank, Palestine: Community Health Unit, Birzeit University; 1985.
- Galea S, Vlahov D. Urban health: Evidence, challenges and directions. *Ann Rev Pub Health.* 2005; 26:1–25. [PubMed: 15760279]
- Gray, A. Definitions of crowding and the effects of crowding on health: A literature review. New Zealand: Ministry of Social Policy; 2001.
- Jackson M. The impact of the built environment on health: An emerging field. *Am J Pub Health.* 2003; 93:1382–1384. [PubMed: 12948946]
- Jones AP. Asthma and domestic air quality. *Soc Sci Med.* 1998; 47(6):755–764. [PubMed: 9690822]
- Kifle, A. Housing situation and its policy implications in Ethiopia. A paper presented for a workshop on: Housing and urban development for low-income groups in sub-Saharan Africa.; Accra, Ghana. April, 2000; 2000.
- Krieger J, Higgins DL. Housing and health: Time again for public health action. *Am J Pub Health.* 2002; 92(5):758–768. [PubMed: 11988443]
- Kumie A, Berhane Y. Crowding in a traditional rural housing ("Tukul") in Ethiopia. *Ethiop J Health Develop.* 2002; 16(3):303–309.
- Lowry, S. Housing and health. London: BMJ; 1991.
- Makhoul J, Abi-Ghanem D, Ghanem M. An ethnographic study of the consequences of social and structural forces on children: The case of two low-income Beirut suburbs. *Environ Urbanization.* 2003; 15(2)
- Ministry of Labour. Lebanon: 1995. Decree No. 621/1. December 15, 1995
- Myers D, Baer W, Choi SY. The changing problem of overcrowded housing. *J Am Planning Assoc.* 1996; 62(5):66–84.
- Northridge M, Sclar E, Biswas P. Sorting out the connection between the built environment and health: A conceptual framework for navigating pathways and planning health cities. *J Urban Health: Bull NY Acad Med.* 2003; 80(4):556–567.
- Perdue WC, Stone L, Gostin LO. The built environment and its relationship to the public's health: The legal framework. *Am J Pub Health.* 2003; 93:1390–1394. [PubMed: 12948949]

- Rylander R, Megevand Y. Environmental risk factors for respiratory infections. *Arch Environ Health*. 2000; 55(5):300–303. [PubMed: 11063404]
- Roux AD. Residential environments and cardiovascular risk. *J Urban Health: Bull NY Acad Med*. 2003; 80(4):539–591.
- Samet J, Spengler JD. Indoor environments and health: Moving into the 21st century. *Am J Public Health*. 2003; 93(9):1489–1493. [PubMed: 12948968]
- Sirinivasan S, O'Fallon L, Dearn A. Creating healthy communities, health homes, healthy people: Initiating a research agenda on the built environment and public health. *Am J Pub Health*. 2003; 93(9):1446–1450. [PubMed: 12948961]
- SPSS. 2003. Statistical Package for Social Science Version 11.0.
- Takano T, Nakamura K. An analysis of health levels and various indicators of urban environments for Healthy Cities projects. *J Epidemiol Comm Health*. 2001; 55:263–270.
- Thomson H, Petticrew M, Morrison D. Health effects of housing improvement: Systematic review of intervention studies. *BMJ*. 2001; 323:187–190. [PubMed: 11473906]
- US Census of Bureau. Census 2000: The American Housing Survey. US: 2000.
- UNRWA Profile of Camps in Lebanon. United Nations and Relief Works Agency annual report; 2004. [Cited 2005 Jan 1]. Available: <http://www.un.org/unrwa/refugees/camp-profiles.html>
- UN-HABITAT. Sheltering refugees around the world. UN Publication. Nairobi: UN-HABITAT; 2003.
- UNHCR. United Nations High Commission for Refugees annual report. UNHCR; Geneva: 2004. Refugees by numbers.
- Wolf C, Schroeder DG, Young M. Effect of improved housing conditions on illness in children under 5 years old in northern Malawi: Cross-sectional study. *BMJ*. 2001; 322:1209–1212. [PubMed: 11358772]
- WHO. World Health Organization: International Statistical Classification of Diseases and Related Health Problems. 10th ed.. Geneva: WHO; 1992.
- Xavier R, Braubach M, Moissoner B, Monolbaev K, Robbel N. Housing and health in Europe: Preliminary results of a pan-European study. *Am J Pub Health*. 2003; 93(9):1559–1563. [PubMed: 12948980]

Table I

Domestic built environment indices, Urban Health Survey 2002.

<i>Infrastructure and services index</i>
Unavailability of drinking water
Inadequacy of drinking water
Problems in sewage disposal
Problems in garbage disposal (method and frequency)
Problems in the timing of garbage collection
Cuts of more than 4 hours per day in the electrical power
Problems with the reliability of electrical power (low or high voltage)
Flooding from rainwater
Evacuation due to flooding from rainwater
<i>Housing conditions index</i>
Presence of rats
Presence of mice
Presence of cockroaches
Lack of adequate sunlight in living rooms
Lack of adequate sunlight in bedrooms
Poor ventilation
Presence of humidity
Presence of a main source of heating
Presence of cracks in the ceiling
Presence of cracks in the wall
Presence of seepage in ceiling
Presence of seepage in walls
Presence of water overflow from floor drains
Presence of broken windows
Presence of uncovered electric wires
<i>Crowding index</i>
Number of members in the household
Number of rooms in the house except the kitchen, the unclosed balconies, the garage and the bathrooms

Table II

Household characteristics of residents in Burj Barajneh camp, in Beirut, Lebanon, Urban Health Survey 2002 ($n = 860$).

Household characteristics	Frequency (n)	Percentage (%)
<i>Type of household</i>		
One individual	51	5.9
Nuclear	700	81.4
Extended	109	12.7
<i>Size of household (members)</i>		
1 - 3	283	32.9
4 - 6	423	49.2
>6	154	17.9
<i>Age groups (household members, n = 3924)</i>		
<1 - 14 years	1416	36.08
15 - 59 years	2219	56.54
60 years	289	7.36
<i>Sex head of household</i>		
Male	722	84.0
Female	1385	16.0
<i>Highest educational level (attained by head of household)</i>		
Less than elementary	123	14.3
Elementary	245	28.5
Intermediate/vocational	260	30.2
Secondary and above	232	27.0
<i>Total monthly income of household (In 1000 Lebanese pounds)</i>		
<300	341	39.6
300 - 499	194	22.5
500 - 749	121	14.1
750 - 999	48	5.6
1000	54	6.3
Missing	102	11.9
Mean	423.2	
Median	308.3	
<i>Occupation of head of household (ILO classification)</i>		
Economically active	595	69.18
<i>Crafts and related trades</i>	273	31.7
<i>Services and sales</i>	91	10.58
<i>Elementary occupations</i>	91	10.58
<i>Professionals</i>	47	5.46
<i>Plant and machine operation</i>	54	6.27
<i>Clerks and technicians</i>	39	4.53
Missing	3	0.35

Household characteristics	Frequency (<i>n</i>)	Percentage (%)
Economically inactive	262	30.46
<i>Presence of illness</i>		
Yes	598	69.5
<i>Only one reported illness</i>	184	30.76
<i>More than one reported illness</i>	414	69.23
No	262	30.5

Table III

Frequency distribution of the measures and indices of the domestic built environment in Burj Barajneh camp in Beirut, Lebanon, Urban Health Survey 2002 ($n = 860$).

Measures of the domestic built environment	Frequency (n)	Percentage (%)
Measures of infrastructure and services		
<i>Problems in timing of garbage collection</i>	772	89.8
<i>Problems in garbage disposal</i>	753	87.6
<i>Problems in sewage disposal</i>	741	87.5
<i>Problems with the reliability of electrical power</i>	552	64.2
<i>Flooding from rainwater</i>	184	21.4
<i>Cuts in electrical power for more than 4 hours/day</i>	28	3.3
<i>Evacuation due to rainwater flooding</i>	34	3.2
<i>Inadequacy of drinking water</i>	8	0.9
<i>Unavailability of drinking water</i>	0	0
Measures of housing conditions		
<i>Cockroach infestation</i>	716	83.3
<i>Poor ventilation</i>	691	80.3
<i>Presence of seepage in walls</i>	634	73.7
<i>Presence of humidity</i>	568	66.0
<i>Presence of cracks in walls</i>	541	62.9
<i>Presence of seepage in ceiling</i>	522	60.7
<i>Lack of adequate lighting in living room</i>	430	50.0
<i>Presence of cracks in ceiling</i>	414	48.1
<i>Presence of water overflow from floor drains</i>	352	45.3
<i>Always</i>	116	13.5
<i>Most of the time</i>	29	3.4
<i>Sometimes</i>	207	24.1
<i>Lack of adequate lighting in bedroom</i>	379	44.1
<i>Absence of a main source of heating</i>	284	33.0
<i>Mice infestation</i>	281	32.7
<i>Presence of broken windows</i>	215	25.4
<i>Presence of exposed electrical wires</i>	215	25.0
<i>Rat infestation</i>	176	20.5
Domestic built environment indices		
<i>Infrastructure and services index</i>		
0 - 1 problem	154	17.9
2 - 3 problems	297	34.5
4 - 9 problems	409	47.6
<i>Housing conditions index</i>		
0 - 4 problems	188	22.0
5 - 7 problems	472	55.3
8 - 15 problems	194	22.7

Measures of the domestic built environment	Frequency (n)	Percentage (%)
<i>Crowding index</i>		
1 person/room	257	29.9
2 - 3 persons/room	528	61.4
4 persons/room	75	8.4

Table IV

Type of reported illnesses by household members in Burj Barajneh camp ($n = 860$) in Beirut, Lebanon, according to WHO-ICD 10 classification, Urban Health Survey 2002.

Type of reported illnesses	Frequency (n)	Percentage (%)
<i>Diseases of the circulatory system</i>	340	21.5
Hypertensive diseases	226	14.29
Ischemic heart diseases	35	2.21
Heart attack	37	2.34
Diseases of arteries, arterioles and capillaries	26	1.64
Diseases of veins, vessels and lymph nodes	7	0.44
Other diseases not specified	9	0.57
<i>Diseases of the musculoskeletal system</i>	298	18.84
Arthropathies	252	15.94
Osteopathies	43	2.72
Soft tissues disorders	3	0.19
<i>Diseases of the respiratory system</i>	240	15.18
Chronic lower respiratory diseases	204	12.90
Acute upper respiratory diseases	20	1.27
Other diseases not specified	16	1.01
<i>Endocrine, nutritional and metabolic disorders</i>	184	11.6
Diabetes Mellitus	124	7.84
Metabolic disorders	30	1.90
Disorder of endocrine and thyroid glands	30	1.90
<i>Diseases of the nervous system</i>	109	7.0
Episodic and paroxysmal disorders (epilepsy, convulsions, migraine, stroke)	87	5.5
Nerve, nerve root and disorders	15	0.94
Inflammatory diseases of the central nervous system	7	0.44
<i>Diseases of the genitourinary system</i>	79	5.19
Disorders of kidney and ureter	60	4.0
Diseases of male genital organs	9	0.56
Diseases of female genital organs	10	0.63
<i>Diseases of the digestive system</i>	73	4.61
Diseases of oesophagus, stomach and duodenum	40	2.5
Diseases of gall bladder, liver and hernia	19	1.20
Diseases of enteritis and colitis	9	0.56
<i>Diseases of blood and certain disorders involving the immune mechanism</i>	44	2.80
Certain disorders involving the immune mechanism	21	1.32
Anaemia	17	1.08
Coagulation defects and other hemorrhagic conditions	6	0.38
<i>Diseases of the skin</i>	43	2.72
Dermatitis and eczema	30	1.90
Infection of the skin	13	0.82

Type of reported illnesses	Frequency (n)	Percentage (%)
<i>Mental and behavioral disorders</i>	15	0.95
<i>Symptoms, signs not elsewhere classified</i>	62	3.92
Total cases of illnesses	1581	

Table V

Adjusted odds (OR) for the presence of illness among household members in Burj Barajneh camp in Beirut, Lebanon, Urban Health Survey 2002 ($n = 860$).

Independent variables	Adjusted Odds Ratios (95% CI) for presence of illness
<i>Education of head of household</i>	
None - Elementary	1
Primary - Intermediate	0.38 (0.26 - 0.56)
Intermediate - Secondary +	0.28 (0.19 - 0.40)
<i>Monthly Income of household, LBP[*]</i>	
Low	1
Medium low	0.98 (0.70 - 1.38)
Medium high	1.66 (1.04 - 2.62)
<i>Infrastructure and services index</i>	
0 - 1 problem	1
2 - 3 problems	1.38 (0.96 - 2.00)
4 - 9 problems	1.41 (0.92 - 2.23)
<i>Housing conditions index</i>	
0 - 4 problems	1
5 - 7 problems	1.53 (1.02 - 2.29)
8 - 15 problems	2.08 (1.40 - 3.11)
<i>Crowding index</i>	
1 person/room	1
2 - 3 persons/room	1 (0.71 - 1.39)
4 persons/room	1.35 (0.72 - 2.50)

^{*} 1 US dollar = 1500 Lebanese pounds (LBP). Cut-off values between tertiles closest to their respective frequency distribution. Low (<460,000 LBP), Medium low (460,000 - 700,000 LBP), Medium high (>700,000 LBP).