

THE IMPACT OF THE PHYSICAL ENVIRONMENT ON RESIDENTS' SELF-RATED HEALTH: A CASE STUDY IN PENANG, MALAYSIA

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ABSTRACT

There is continuous debate on the impact of house quality on residents' health and well-being. Good living environment improves health, and fear of crime is recognised as a mediator in the relationship between physical environment and health. Since minimal studies have investigated the relationship, this study aims to examine the impact of the house quality on fear of crime and health. A total of 230 households from a residential neighbourhood in Malaysia participated in the study. Using structural equation modelling, the findings indicate that housing quality and fear of crime can account for a proportion of the variance in residents' self-rated health. However, there is no significant relationship between housing quality and fear of crime. Results also show that fear of crime does not mediate the relationship between housing quality and health. This study suggests that the environment-fear relationship should be re-examined theoretically.

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INTRODUCTION

During the last decade, there has been an increasing interest in the impact of neighbourhood attributes on health. The World Health Organisation (WHO, 1948, p.100) defined human health as “a state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity”. Based on this definition, health has three interrelated dimensions including physical, mental and social. Although these three dimensions are interrelated and influence each other greatly, one can examine the impact of other variables on each of these dimensions separately. Besides, although physical health is important, mental health is one of the key dimensions of health that forms personal and social relationships.

Evidence suggests that living in disadvantaged neighbourhoods has negative impacts on mental and physical health (Wallace, 2012). Stemming largely from the previous work on fear of crime and urban environment, it is clearly that the physical characteristics of the living environment could be related to perceived safety and security among residents (Hedayati-Marzbali, Abdullah, Razak, & Tilaki et al., 2012). The neighbourhood is one of the several spaces that provide social and physical space for interactions between residents, which lead to greater sense of community.

The recent increase in research on the effect of neighbourhood conditions on health indicates a rediscovery of the indirect manners in which neighbourhoods may have affected an individual's health. It is proposed that a person's health is influenced by a number of factors including the built environment and perceived neighbourhood safety (Lorenc et al., 2012). While neighbourhoods are regarded by policy makers as important social determinants of health (Browne-Yung, Ziersch, & Baum, 2016), the mechanisms linking neighbourhoods to health outcomes remain unclear. Despite the growth in neighbourhood-health studies, the impact of neighbourhood environmental quality on health related factors has received relatively little empirical research, especially in developing countries like Malaysia. While there are many factors that can influence personal health, this study focuses on the effects associated with visual signs in the neighbourhood environment. Studies of neighbourhood effects on health outcomes are predominant in Western settings, and are rarely done in developing countries (Hedayati-Marzbali, Abdullah, & Tilaki, 2016a).

The purpose of this study is to examine the impact of house quality, as a neighbourhood environmental attribute, on neighbourhood health. Furthermore, the current study seeks to determine the mediating effect of fear of crime on the relationship between house quality and self-rated health. The study will address the extent in which the relationship between house quality and self-rated health varies based on perceived fear of crime. It emphasises on how residents perceive neighbourhood visual quality and consequently, the positive impacts of high quality on residents' health and well-being.

LITERATURE REVIEW

There is an increasing recognition that built environment may affect individual's health. The broken windows theory, as originated by Wilson and Kelling in 1982, offers insight to public health. Wilson and Kelling (1982) pointed out the possibility of a specific neighbourhood having more unpleasant appearances created by signs of incivilities compared with other neighbourhoods. They further proposed that healthy places need to be well-designed, well-built and functional. Broken windows are a signal that no one cares (Wilson & Kelling, 1982). The relationships between the study variables are explained in the following subsections.

House Quality and Health

The quality of the home environment has a pervasive effect on the individual's quality of life (Garcia, 2000). The surrounding environment of the home is also a vital indicator for people's health and their meaningful interaction within the environment. Austin, Furr, and Spine (2002) found that housing quality has positive and significant relationship with resident's perception of safety, while there is a negative relationship between victimisation and housing quality. The underlying assumption is the existence of positive impact of housing quality on residents' perception of safety. Research further indicated that neighbourhood disorder is negatively associated with negative health outcomes (Hill, Ross, & Angel, 2005). Even though, Hill et al. (2005) examined the effect of disorder on health, the operationalisation of disorder scale is exclusively derived from items of reference social disorder. These items are good in indicating physical

disorder. However, these approaches may not always be appropriate in explaining items on health and well-being.

Yet despite the continued academic interest of the broken windows thesis, this theory itself has received relatively little empirical research (Abdullah, Hedayati-Marzbali, Bahauddin, & Tilaki, 2015). The results of a study in the UK context contradict the broken windows thesis. This indicates that Wilson and Kelling's hypothesis is not fully applied in the UK context (Stafford et al., 2005). Their findings highlight the influence of the residential environment on women's health (Stafford et al., 2005).

The Built Environment, Fear of Crime and Health

Fear of crime is a significant urban stressor that has harmful psychological effects on individuals. The effects of the built environment on individual's fear of crime is not new. Shaw and McKay (1942) were among the first to point out the deleterious effects on individuals caused by signs of disorder. Wilson (1975) proposed that people were not troubled by crime only, but they can be affected by deteriorated conditions surrounding them. Studies also suggested that there is a link between physical design features and fear of crime (Hunter, 1987; Newman, 1972).

Fear of crime is an important issue not only for individuals but also for neighbourhoods and wider societies because it affects community health (Abdullah et al., 2015). It restricts personal activities in the neighbourhood, increases dissatisfaction with the neighbourhood and reduces the overall quality of life (McCrea et al., 2005). The proponents of crime prevention by design strategies believe that physical factors diminish residents' fear of crime. This strategy shows the impact of neighbourhood factors on individuals' behaviour in protecting their households.

There is no doubt that the built environment plays a significant role in facilitating both social and physical activities within the neighbourhood area. Poor neighbourhood conditions may contribute to physical inactivity and health disorders (Mathis, Rooks, & Kruger, 2016). However, recent studies have been inconsistent in establishing a casual pathway between fear of crime and health outcomes.

Research Hypotheses

The above discussions suggest that fear of crime is an important predictor of an individual's health. The fear of crime may cause mental and physical health problems (Lorenc et al., 2012). Conversely, mental health problems may increase fear of crime (Jackson & Stafford, 2009). Meanwhile, the fear of crime may be influenced by factors in the built environment. The impact of built environment on crime and fear have been a focus of Crime Prevention Through Environmental Design (CPTED) (Abdullah et al., 2013; Lorenc et al., 2013), which emphasises natural surveillance, access control and maintenance as environmental attributes. Combining these pathways, it seems that fear may mediate the effects of environment on individual's health (Lorenc et al., 2013). These discussions lead to the following research hypotheses, as shown in Figure 1.

- H1. There is a significant relationship between house quality and fear of crime.
- H2. There is a significant relationship between house quality and health.
- H3. There is a significant relationship between fear of crime and health.
- H4. Fear of crime mediates the relationship between house quality and health.

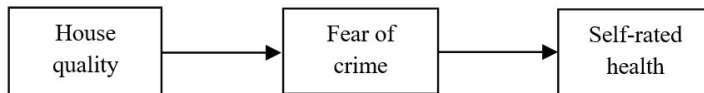


Figure 1: The Conceptual Pathway between the Study Variables

METHODS

Study Context

This article constitutes a portion of a larger study, which examined the physical characteristics of neighbourhoods and wellbeing of residents. This study was conducted in Penang, Malaysia, specifically in the southern region of Penang which has the highest level of residential burglary compared to other area in the island (Hedayati-Marzbali et al., 2011). Penang is the second largest city in the country and has the second highest density of

inhabitants per square kilometer. According to the Department of Statistics Malaysia (2010), the state of Penang has the density of 1,524 persons per square kilometer, but the Island part of the state (as the study area) has a density of 2,780 persons per square kilometer. Penang has experienced a rapid urbanization over the last decades. This rapid urbanization is linked to social and environmental concerns, especially on health and well-being. Therefore, the impact of physical and social aspects on health of citizens in such rapid growth of urban area needs to be examined.

According to the Overseas Security Advisory Council (OSAC, 2016), the overall crime rate in Malaysia is designated as 'medium' in 2014 to 'high' in 2016 as compared to the U.S. national average. Based on OSAC (2016), there continued to be a noticeable increase in crime, including reported assaults and robberies, sometimes involving weapons, in Kuala Lumpur in 2015. Although violent crime against expatriates is relatively uncommon, petty crime is fairly common and residential break-ins do occur and are becoming more frequent in landed houses (OSAC, 2016).

This study utilises probability sampling based on a systematic sampling with random start method to select samples from the population. A team of interview staff was selected and trained to administer the field survey and walked between houses and conducted face-to-face interviews. Eligibility criteria for the study survey included: (1) residence in terraced houses, (2) length of residence at least one year, and (3) age of at least 18 years. The survey response rate was 65%. The sample size for this study was 230 samples from the total population of 1179 households. Table 1 shows the demographic characteristics of the respondents. The survey illustrated that 45.2% of the respondents were Malay, 43.5% Chinese, 10.4% Indian and almost 1% other races.

Table 1: Demographic Characteristics of Respondents (N = 230)

Characteristic	Description	Frequency	Percentage
Gender	Female	134	58.3
	Male	96	41.7

Race	Malay	104	45.2
	Chinese	100	43.5
	Indian	24	10.4
	Others	2	0.9
Age	18-29 years	7	3
	30-39 years	34	14.8
	40-49 years	33	14.3
	50-59 years	73	31.7
	60 and over	83	36.1
Marital status	Single, widowed or separated	24	10.4
	Married and living as married	206	89.6
Ownership	Owner	205	89.1
	Tenant/others	25	10.9

Design and Data Collection

The data for this study were collected through a cross-sectional survey. A questionnaire was distributed to administer the field survey. A sampling framework was developed from the list of all of the properties in the study area through on-site observation. In addition to providing details about themselves, respondents were required to indicate their level of agreement with the statements, on a 5-point and 7-point scales, for the questions that measured the key constructs.

Fear of crime is the central concept for examining neighbourhood dynamics (Hedayati-Marzbali et al., 2016b). In this study, we measured fear of crime to examine its mediation role on the relationship between housing quality and health. This variable was derived from the question: in your everyday life, how worried are you about the following situations? The items were: (1) getting burglarised; (2) yourself or someone in your family getting assaulted; (3) having your car stolen; (4) having things stolen from your car in this neighbourhood; (5) being robbed or mugged on the street; and (6) having your property damaged by vandals (Foster et al., 2010; Hedayati-Marzbali et al., 2016a). The response categories ranged from 1,

‘extremely not worried’, to 7, ‘extremely worried’. The Cronbach’s alpha of the six items was 0.954, indicating good reliability.

In operationalising the built environment in residential areas, studies have considered house quality as one of the main dimensions, that is also known as image and maintenance. The items employed in the study to measure house quality were adapted and modified based on Wilson and Kelling’s (1989) Broken Windows Theory (Hedayati-Marzbali et al. (2016b); Austin et al., 2002). There are six items measuring house quality based on a five-point Likert scale ranging from 1 (low quality) to 5 (high quality). The Cronbach’s alpha of the seven items was 0.897, indicating good reliability.

Health was assessed using three general health questions. Three questions based on the work of Baum et al. (2009), Hedayati-Marzbali et al. (2016a), and Wallace (2012), were used to measure the self-rated health variable. The scale was constructed based on a 5-point Likert scale (1=very poor; 5=excellent). Self-rated health was measured by asking the respondents three following questions: (1) ‘Would you say that your mental health is poor, fair, good, very good or excellent?’; (1) ‘Would you say that your physical health is poor, fair, good, very good or excellent?’, and (3) ‘How would you describe your overall quality of life?’. The Cronbach’s alpha of the three items was 0.608, indicating acceptable reliability.

RESULTS AND FINDINGS

Outer Model Analysis

The proposed model and hypothesis testing were conducted using Partial Least Squares (PLS) analysis with the SmartPLS M2 software (Ringle, Wende, & Will, 2005). Nonparametric bootstrapping (Wetzels, Odekerken-Schröder, & van Oppen, 2009) with 1,000 replications was applied to test the significance of the path coefficient between latent variables as well as between the latent variables and respective manifest variables. PLS makes no distributional assumptions, thus only non-parametric tests can be used to examine the explanatory power of the model (Chin, 1998).

Construct validity consists of convergent and discriminant validity. The convergent validity of the constructs was supported because factor loadings were above the 0.7 threshold (Hair et al., 2010). As such, more than 50% of the variance in the observed variable could be explained by the underlying construct (Hulland, 1999). The bootstrap test indicated that all loadings were significant at the bootstrap-based empirical 95% confidence interval suggesting that all indicators significantly reflect their underlying constructs.

The average variance extracted (AVE) is suggested to have a value of 0.5 and above, which indicates adequate convergence. Because AVE exceeded the required 0.5 threshold, the constructs captured more than 50% of the indicators' variance. CR estimates the degree to which the respective indicators reflect the latent construct. A value of 0.7 and above is suggested for composite reliability and represents good reliability (Hair et al., 2010; Kline, 2010). With respect to discriminant validity, the root of AVE should surpass the correlation coefficient of the construct with every other construct in the model (Fornell & Larcker, 1981) and this was the case in our model. The results further show that none of the items has multiple cross-loadings, which suggest preliminary discriminant validity. Results show that the values were above the recommended value points, thus ensuring achievement of construct validity. Therefore, each construct shares more variance with its own block of indicators than with another latent variable representing a different block of indicators. In sum, these results provide support for the overall quality of the reflective constructs' measures.

The discriminant validity was examined using the criterion suggested by Fornell and Larcker (1981). The result shows that the square root of the AVE exceeded the inter-correlations of the constructs in the model. This result suggests that the measure had adequate discriminant validity.

Path Estimates and Hypotheses Testing

In the next stage, path analysis was performed to test the four hypotheses generated for this study. Since the outer model evaluation provided evidence of reliability and validity, the inner model estimates were examined to assess the hypothesised relationships among the constructs in the conceptual model. The standardised path coefficients and significance levels provide evidence of the inner model's quality (Hair et al., 2012) and allow researchers to test their proposed model. House quality was positively

related to health ($\beta = 0.232, p < 0.01$). Consistent with other studies conducted on the relationship between neighbourhood environmental conditions and health, the findings of the current study support the notion that enhancing exterior house maintenance and quality of the surrounding environment in residential areas would increase residents' self-rated health (e.g. Jackson & Stafford, 2009; Wallace, 2012).

As shown in Figure 2, a negative relationship was found between fear of crime and self-rated health ($\beta = -0.340, p < 0.01$). However, the relationship between house quality and fear of crime ($\beta = -0.029, p > 0.05$) was insignificant in this study. The results indicate support for H2 and H3 but not for H1, as shown in Figure 3. The results also reveal that approximately 17% of the variance in health is explained by house quality and fear of crime ($R^2 = 0.174$). According to Chin (1998), based on the R^2 index, the explanatory power is weak.

The results further indicates that individuals who perceived high fear of crime in the residential environment, reported their personal health lower than those reported low fear of crime. This is consistent with the findings of other studies (Chandola, 2001; Hedayati-Marzbali et al., 2016a). It was also hypothesised that when residents perceive themselves in an untended area, local control fails and fear of crime increases. However, contrary to what was expected, first hypothesis, that established a negative relationship between house quality and fear of crime was not supported. This suggests that the relationship between house quality and fear of crime in the study area remains unclear.

In addition to direct relationships, this paper estimates the indirect relationship between house quality and self-rated health as shown in Figure 2. To estimate the significance of the indirect effect, many researchers employed the Sobel test (Sobel, 1982). One limitation of the Sobel test is that it requires a normal sampling distribution of the indirect effect (Hayes, 2009), whereas the indirect effect (ab) sampling distribution tends to be asymmetric with non-zero values for skewness and kurtosis (Stone & Sobel, 1990).

Hayes (2009) suggests the use of bootstrapping procedure as an approach to test the indirect effects. The t values for both direct and indirect

effects were computed through a bootstrapping procedure with 230 cases and 1000 samples. It should be noted that the t values for indirect effects are obtained by dividing the ab by the standard error (SE) of the indirect effect. The SE is the standard deviation of the repeated bootstrap estimates of the indirect effect. The result showed that the t value of indirect effect ($t=0.248$) is less than 1.960 and insignificant at the 0.05 level. Therefore, the result does not support H4.

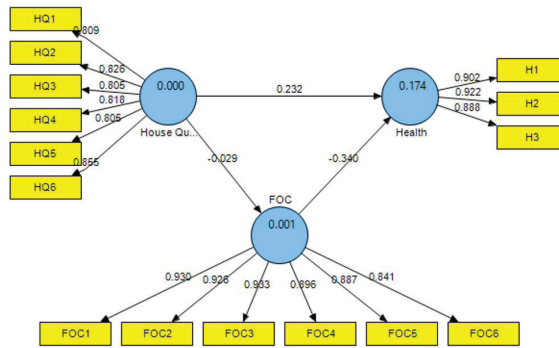


Figure 2: The Parameter Estimates of the PLS Analysis (β)

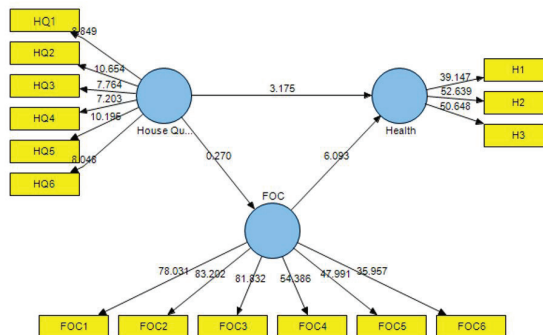


Figure 3: The Parameter Estimates of The PLS Analysis (t value)

CONCLUSIONS

Historically, health-related concern was one of the major planning initiatives all over the world. Despite the continued interest and the influence of neighbourhood social and physical conditions on criminological literature, the indirect pathway between the neighbourhood conditions and health

through fear of crime has not received empirical support, and most of the existing studies have been criticised for their methodological shortcomings. Until recently, this area of research was understudied in criminological literature. In 2001, Chandola attempted to uncover the impact of area differences in health outcomes across the UK and found the significant role of fear in health outcomes. To fill this gap, the current study examined the mediation effect of fear of crime on the relationship between house quality and self-rated health.

This empirical paper examined the relationships between house quality, fear of crime and health in a Malaysian city, an important strength of the study, given the predominance of the U.S. and some European contexts, but little research is done on the topic, using SEM to test a mediation model. A field survey of a systematic random sample of Penang residents in a residential neighbourhood was used to examine the indirect relationship between house quality and health. It is obvious that interventions involving changes to the neighbourhood physical environment may be a promising way to address fear of crime in residential settings, and the broader health and well-being outcomes. The notion is that environmental changes can contribute to addressing the macro-level determinants of health behaviours, not only in deleterious areas, but also across all settings (Lorenc et al., 2013). However, this area of research has received less attention in the field of place-based crime prevention.

The current work suggests that tangible benefits to residents in the form of improved environmental conditions are possible which may create safer communities to play, work and live and improved health and well-being. A safe community is a liveable community, where residents can go about their routine activities in an environment without fear. Without denying the importance of physical health, positive mental health is increasingly recognised as an important aspect of public health and may be affected by good living environment. While some researchers examine how physical or mental health is independently related to fear of crime, most studies focus on both categories. The current study measured both physical and mental health on the basis of self-rated health. However, contrary to the expectations, fear of crime does not mediate the relationship between environmental conditions and health outcomes (e.g. Chandola, 2001; Lorenc et al., 2013). The findings of this study contradict stereotypes presented

in previous studies which may refer to mixed-racial composition of the study samples. This is in agreement with the social disorganisation theory, which suggests that neighbourhood structure and social processes have greater impact on crime and fear, and consequently on health outcomes. The results of the study influence community planning and design decision makers. Additionally, disorder signs send a message to residents that things are getting out of control. Therefore, the physical upkeep and maintenance of the individual private properties may enhance the potential for physical activities within an area, which help increase social contact.

Limitations and Strengths

Although the present work extends prior neighbourhood-health studies, some important limitations are worth noting. Firstly, the study focuses on the relationship among house quality, fear of crime and health and does not address the effect of environmental conditions at the neighbourhood level. The study would be useful for future work that includes testing the mediating role of fear of crime at both household and neighbourhood levels.

Many factors such as physical and social vulnerabilities notably influence the perceived fear of crime, and consequently health outcomes. In addition, failure to control age and gender as physical vulnerabilities is the second limitation of this study. On the one hand, a stream of research focusing on fear of crime seeks to indicate that women and the elderly are more physically vulnerable and more likely to report higher levels of fear of crime than their counterparts. On the other hand, social vulnerabilities such as the poor, less-educated people and ethnic minorities may perceive higher levels of fear than other counterparts (Taylor & Hale, 1986). These factors are important because finding from a previous study showed the influence of the residential environment on women's health but not for men (Stafford et al., 2005).

The empirical illustration of the present study on the use of PLS path modelling constitutes only a single study with limited generalisability. However, the main point of the study is health and well-being could be enhanced, as one urban policy of the day, by manipulating the physical environment. Meanwhile, fear of crime may be a barrier to improve individual's health in residential settings. Therefore, policy makers and

practitioners should support fear-reduction initiatives through design manipulation.

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