Received: 3 March 2019 | Revised: 17 July 2019 | Accepted: 25 July 2019

DOI: 10.1111/spol.12535

SPECIAL ISSUE

WILEY

The impacts of housing factors on deprivation in a world city: The case of Hong Kong

Hung Wong | **Siu-ming Chan**

Department of Social Work, The Chinese University of Hong Kong, Shatin, Hong Kong

Correspondence
Hung Wong, Department of Social Work, The Chinese University of Hong Kong, Shatin, New Territories, Hong Kong.
Email: hwong@cuhk.edu.hk

Funding information
Strategic Public Policy Research Grant, Central Policy Unit of the Government of the Hong Kong Special Administrative Region and the Research Grants Council of the Hong Kong Special Administrative Region, China, Grant/Award Number: 4003-SPPR-11

Abstract

Hong Kong is a typical example of a world city that faces escalating poverty and housing problems. Problems related to housing are crucial in determining deprivation. By means of hierarchical linear regression on a representative survey of Hong Kong residents in 2014, this study examines the impacts of household income and housing factors on the deprivation of residents in Hong Kong. The study indicates that income level has a crucial effect on the deprivation level of households; whereas housing cost per capita, living area per capita, and living quarter problems significantly influence deprivation. A small interacting effect exists between household income and housing factors, which do not influence the independent effects of living area per capita and living quarter problems on deprivation. For the public rental housing residents, only the effect of living quarter problem on deprivation is significant, whereas for private rental housing residents, living area per capita and living quarter problem have a significant effect. Among all the models, housing expense per capita is a significant factor only in model for overcrowded households. The study recommends that improving the maintenance and renovation schemes for public and private housing with poor living environment is a good strategy to improve housing conditions and deprivation. The study suggests that anti-poverty policies must consider strategies and measures that can improve the housing factors, including housing expenses, living density and living quarter maintenance problems, especially for

those residents with high living density, such as those living in bed spaces, cubicles, and subdivided flats.

KEYWORDS
deprivation, Hong Kong, housing expense, income poverty, living density, living quarter problems

1 | INTRODUCTION

Poverty is exacerbated by globalization in most developed countries or cities (Milanovic, 2016; Nissanke & Thorbecke, 2006; Therborn, 2013). Hong Kong is a typical example of a world city that faces escalating poverty and housing problems. The rapid flow of labour and capital under globalization has severely affected the labour and housing markets of Hong Kong. The livelihoods of workers have been marginalized by economic restructuring (Lee & Wong, 2004; Lee, Wong, & Law, 2007), and financialization and worsening global economic conditions have tremendously increased the rent and housing costs in Hong Kong (Smart & Lee, 2003; Yiu, Yu, & Jin, 2013). In addition, housing financialization has created an unstable society and enjoyment of the right to adequate housing (Boyer, 2000; Fernandez & Aalbers, 2016; Rolnik, 2013; Smart & Lee, 2003).

In response to poverty problems, the Hong Kong government established an official poverty line in 2013 by using 50% of the median monthly household income as the threshold to monitor the result of various poverty alleviation policies. A total of 1.38 million people, which accounted for 20.1% of poverty rate, were identified to be living below this poverty line before the policy intervention; this rate nearly stayed the same over the past years (HKSAR, 2018). Other dimensions of poverty, such as deprivation, have been mostly ignored in discussions related to poverty alleviation policies.

Housing has been a long-time primary concern for residents and policymakers in Hong Kong (Goodstadt, 2013). The costs of housing and rent in Hong Kong have sharply increased over the past years, with the private housing rent index increasing from 73.6 in 2003 to 182.6 in 2017. The housing costs even increased by about five times since the onset of the Asian financial crisis in 2003. In 2015, poor households spent 39.7% and 31.4% of their money on housing and food, respectively, with both of these proportions higher than those reported for the general population (HKSAR, 2016). The extreme crowdedness of living spaces in Hong Kong poses another problem for the residents. In 2016, each household residing in public houses only had a living area per capita of 11.5 m^2 on average, whereas those residing in private-owned houses had a living area per capita of 18 m^2 on average (Census and Statistical Department, 2017).

Housing is a life necessity that affects all aspects of human well-being. Problems related to housing are also crucial in determining the different dimensions of social disadvantages, including deprivation. It contributes to the well-being of humans by satisfying their basic needs and promoting positive social relationships and it accounts for the majority of the expenses of the urban poor. Housing problems have a greater effect on the poor and the socially disadvantaged than on other social classes. Particularly, the increasing housing costs have reduced the disposable income of the working poor and welfare recipients, whose daily and social activities are considerably limited by their overcrowded and substandard living environments. Despite the essential role of housing, only a few empirical studies in Hong Kong have examined the specific influences of housing factors on poverty and deprivation of vulnerable groups in Hong Kong. This study intends to fill this empirical gap.

After this brief introduction, the next section reviews the concept of deprivation and housing and their relationship. The methodology, data description, and measurement are introduced in the third section, followed by the descriptive result and regression analysis models. Discussion of findings and policy implication, as well as limitation and conclusion can be found in the last section.

2 | LITERATURE REVIEW

2.1 | Deprivation

Deprivation is a dimension of poverty that poses an observable disadvantage for the local community or the society (Townsend, 1962). People are considered deprived if they lack the socially perceived necessities (Bradshaw & Finch, 2003). Deprivation can be divided into material and social aspects (Townsend, 1987). In comparison with the income measurement approach, which has its own limitations (Ringen, 1988), the deprivation approach can vastly broaden one's conceptualization of well-being.

For operationalization purposes, several measurements of deprivation have been proposed since the 1980s (Gordon & Pantazis, 1997; Mack & Lansley, 1985). In Hong Kong, Saunders, Wong, and Wong (2014) applied the deprivation approach to measure the poverty situation and reported an 18.2% deprivation rate in 2014.

2.2 | Housing and deprivation

Housing is correlated with and can lead to deprivation. Housing is not only a human necessity but also influences nearly all aspects of the human life (Stone, 1993). Given the vast influence of housing on the well-being of individuals and families, the social dimensions and economic functions that formulate diverse nature of housing cannot be ignored. Physically, housing provides people with privacy and safety. Different house sizes and facilities profoundly affect the livelihood and deprivation levels of families. The physical elements of houses, including roofs, windows, and doors, protect the residents from disasters, diseases, and danger. These structures also promote a sense of belongingness and offer social support to household members. They can also serve as places for building or sustaining interpersonal relationships (King, 2015). People's residence can also influence their access to their workplace, school, and social services. Convenient transportation can also promote social networking and relationship building (Malpass & Murie, 1999). In addition to physical qualities and neighbourhood conditions, the other important housing features, including housing cost, mobility, crowdedness, and availability of housing assistance, must be considered (Shuey, Leventhal, & Coley, 2016). A report from the United Kingdom indicated that low-cost and decent-quality housing located in an area with an attractive job market can help households increase their disposable income, avoid material deprivation, and maintain work incentives (Tunstall et al., 2013). In East Asia, the widespread commodification of housing and the long-term inflation in house prices have turned housing into a platform for wealth accumulation. Housing can also influence the social participation and access of households to products and services (Izuhara & Forrest, 2013).

Some empirical studies have explored the relationship between housing situation and deprivation. Lee (1994) measured the deprivation index (DI) of different urban areas in the United Kingdom and found that housing and space play a crucial role in promoting spatial deprivation. Meanwhile, a study from the United Kingdom reported a high level of deprivation in inner cities and clusters located far away from the city centre (Markkanen & Harrison, 2013). In addition, the characteristics of dwellings, such as lack of lighting, leaking roofs, damp walls and floors, and availability of an indoor toilet or bathroom, can be used to measure housing conditions. Data from the EU Statistics on Income and Living Conditions indicate a high correlation between material deprivation and housing conditions (Guio & Maquet, 2007) and a negative association between the extensive rental housing market and the housing deprivation in Europe (Borg, 2015).

2.3 | Housing quality and deprivation

Research in Australia showed that household well-being is significantly affected by housing cost. A household may spend less on housing but sacrifice in terms of housing quality and location and further influence their well-being, such as health, neighbourhood quality, and financial deprivation level. For those with higher housing

cost burden, they may live with better housing quality but also with worse health level. Meanwhile, those who spend less on housing cost live with worse housing quality with poorer well-being level (Rowley & Ong, 2012).

Studies in Europe have also supported that housing quality is closely related with material deprivation, and those with poorer housing quality had higher risk of being poverty. (Napiorkowska-Baryla & Witkowska-Dabrowska, 2018).

The overcrowding level, lack of housing facilities, inadequate access of light, and indoor housing problems are commonly used as indicators of poor housing quality (Filali, 2012; Nolan & Winston, 2011; Streimikiene, 2015; Watson & Williams, 2003).

2.4 | Housing cost and deprivation

Streimikiene's (2015) research also supported that the housing quality, housing environment, and housing cost burden show significant impact on the quality of life. Adequate housing is essential for people to satisfy their basic needs. Israel (2016) argued that in-kind benefits, such as housing benefits, is crucial for reducing the deprivation level of households compared with cash transfer. Lowering the housing cost of households can increase the purchasing power of families and lower the risk of deprivation.

2.5 | Local studies in Hong Kong

Some studies in Hong Kong have examined the influence of housing on quality of life, deprivation, and poverty. Gou, Xie, and Lu (2018) found that housing environment is the most influential factor and has a negative effect on the overall quality of life for public rental housing residents. Wang, Huang, Zhang, Wong, and Huang (2018) reported that the influence of housing environment on chronic diseases is more sensitive for low-income group than the entire population. Forrest, LaGrange, and Yip (2004) argued that the relationship between the concentration of deprivation and spatial location is not statistically significant. However, by conducting a finer-level spatial analysis, Gou et al. (2018) found that public housing concentration has a significantly positive association with poverty. Another previous study also indicated that a high housing density negatively affects the quality of living spaces (Chan, Tang, & Wong, 2002).

2.6 | Research gaps and hypotheses

The above literature review suggests that high housing costs and poor living conditions are identified as risk factors of deprivation; however, the impacts of other housing factors, such as housing type, remain unclear. Therefore, these factors can be examined to determine which housing factor has the greatest influence on deprivation and for which group of residents.

As one of the most capitalized and globalized cities in the world, Hong Kong faces serious problems in its deprivation and housing, and housing factors may provide an explanation for the territory's deprivation situation. By finding such an explanation, this study may contribute to the development of an innovative policy agenda for anti-poverty initiatives for other world cities.

This study addresses three main questions as follows: (a) Do housing factors significantly affect the deprivation in Hong Kong? (b) If so, which housing factors show the greatest influences on deprivation and for which groups of residents? (c) What are the implications of these findings for the anti-poverty policies of Hong Kong?

To answer these questions, three major hypotheses are proposed. First, poor housing situations (e.g., high housing costs, crowded living spaces, and problems with living quarters) are associated with high deprivation level. Second, each housing factor has a different degree of impact on deprivation for residents in different housing types. Third, housing factors show a significant effect on deprivation for those residents living in a quarter with a high density.

3 | METHODS

3.1 | Research design

The data used in this study were collected from a large-scale project entitled "Trends and implications of poverty and social disadvantages in Hong Kong: A multi-disciplinary and longitudinal study." Face-to-face interviews were performed in the households of the respondents under the guidance of professionally trained interviewers. The study sample was meticulously designed to represent all household adults aged above 18 years in Hong Kong. The two-stage stratified random sampling method was applied to select the target respondents. The time 1 data set, which contains data from June 2014 to August 2015, was used in this study. First, 25,000 addresses with 200 segments were collected from the Census and Statistics Department of Hong Kong. Second, the sample was stratified in two stages, namely, by the living locations of residents (by district council division) and by types of living quarters. Third, the residents of the sampled living quarters were invited for an interview. In each household, a member aged 18 years or above was interviewed face-to-face.

3.2 | Data and sample

A total of 3,791 valid cases were obtained from 4,947 addresses. Among these cases, 2,282 adult respondents were successfully interviewed, thereby yielding a 60.2% response rate. Among these respondents, 301 were randomly selected to confirm the importance of measuring deprivation. Meanwhile, the other 1,981 were asked to answer questions related to deprivation, and they were used as the sample in this study.

3.3 | Measurement

The necessary data of the respondents, including their background information, socio-economic status, deprivation and housing circumstances, were collected by distributing a structured questionnaire. The major variables used in the analysis are measured as follows.

3.3.1 | Background and socio-economic status

The background and demographic information of the respondents, including their age, sex, education level, occupation and marital status, were collected for the analysis. Education level was divided into seven groups, ranging from "primary and below" to "master or above"; occupation was divided into "working full time," "working part time," and "not working/economically inactive"; and marital status was divided into "married", "cohabiting," "widowed," "divorced," "separated," or "never married."

The household income of the respondents was transformed into "equivalized housing income" (EHI) by dividing the household income by the square root of the number of people living in the same household. This measure could facilitate the comparison of the economic status of households with different numbers of family members. Socio-economic status was used as a control variable in the regression analysis.

3.3.2 | Deprivation

To measure deprivation, 301 respondents were given a list of items and were asked to check which of these items they deem necessary in their daily lives. These items were selected from a previous study (Saunders et al., 2014), of which 21 were identified as "necessary" by 50% or more respondents. The 21 items, which covered the aspects of

clothing, food, medical and dental care, household facilities, and family life, were then used to construct the "deprivation index" (DI). The DI score ranged from 0 to 21, whereas its Cronbach's α was .832, which suggested the high measurement reliability of this index.

3.3.3 | Housing factors

Housing factors comprise several dimensions, including the situation inside and outside the living quarters and at the community and neighbourhood levels. This study specifically focuses on four housing factors, namely, living area per capita, housing cost per capita, living quarter problems, and housing type.

Although spatial location is an important factor of housing, the number of samples in a locality cannot sufficiently provide meaningful analysis in this survey. Hence, spatial location cannot be included as one of the housing factors in this analysis.

Living area per capita

For the question, "How large is your living space?," the respondents were given a set of 10 options ranging from "smaller than 20 m^2" to "100.0 m^2 or above." The absolute living area was estimated as the midpoint of the answer to be calculated as a continuous variable. The lower and upper limits of the living area were set to 15 and 105 m^2, respectively. Living area per capita was obtained by dividing the living area by the number of household members.

Housing cost per capita

The respondents either owned or rented their houses. Housing cost was defined as the mortgage payment of homeowners or the monthly rent paid by house renters. The housing cost also included government rates, management fees, and electricity and water fees. The housing cost per capita was computed by dividing the housing cost by the number of household members.

Living quarter problem index (LQPI)

The respondents were asked whether they faced certain problems with their accommodation, such as lack of privacy, poor lighting, uncomfortable temperature, damp walls or ceilings, poor ventilation, and pests. The answers of these respondents to nine questions were used to construct the **LQPI**. LQPI ranges from 0 to 9 and has a Cronbach's α of .736, which implies its relatively high measurement reliability.

Housing type

On the basis of the type of quarters and the tenure of accommodation, respondents' housing was classified into four types, namely, public rental housing, subsidized home ownership housing, private rental housing, and private owned housing. They have distinct housing characteristics and resident composition.

3.4 | Analysis process

Weighting was performed on the basis of the distribution of age and sex as recorded in the census data for mid-2014 to enhance the representativeness of the sample. After removing the missing data, 1,978 respondents were included in the analysis. The descriptive results were initially presented, including the background information, poverty situation, and housing characteristics of the respondents. One-way analysis of variance (one-way ANOVA) test was then performed to assess the difference of deprivation level among residents in the four housing types.

Afterwards, four hierarchical linear regression models that target the dependent variable (DV), namely, deprivation, were applied. These variables were hierarchically inputted into the model based on theory. The control variables used in these regression models included demographic and socio-economic factors. The housing factors were used as independent variables (IVs) in different models to measure their explanatory power for deprivation.

Model 1 is a general model of the impacts of housing factors on deprivation for all respondents. Model 2 tests the interacting effect among household incomes and various housing factors. Model 3 splits the respondents into four housing types and examines the impacts of housing factors on deprivation for public and private rental housing groups. Lastly, Model 4 splits the respondents into two housing crowdedness group, namely, overcrowded and non-overcrowded households.

4 | DESCRIPTIVE RESULTS

4.1 | Demographic background of respondents

All results reported here were obtained after the aforementioned weighting process. In the sample, males accounted for 45.3%, whereas females accounted for 54.7%. In terms of age, young adults (aged 18 to 40 years), adults (aged 41 to 59 years), and old adults (aged 60 years or above) comprised 40.2%, 35.2%, and 24.5% of the sample, respectively. More than half of the respondents finished secondary education (55.1%), whereas 25.1% finished primary education. In terms of occupation, 43.5% of the respondents were engaged in full-time work, whereas 47.7% were economically inactive or not working (Table 1).

4.2 | Income and deprivation

EHI and DI were used as two crucial variables for measuring the economic status and deprivation situation of the respondents. The mean values of these indices were 14,215 HKD (*SD* = 9562) and 0.774 (*SD* = 1.864), respectively (Table 2).

TABLE 1 Demographic information of respondents

Personal background		Weighted %	*N*
Sex (*N* = 1,978)	Male	45.3	896
	Female	54.7	1,082
Age (*N* = 1,978)	18–40	40.2	796
	41–59	35.2	697
	≥60	24.5	485
Educational attainment (*N* = 1,966)	Primary	25.1	493
	Secondary	55.1	1,083
	Tertiary or above	19.9	391
Occupation (*N* = 1,977)	Full-time work	43.5	860
	Part-time work	8.8	175
	Not working/economic inactive	47.7	943
Marital status (*N* = 1,975)	Married/cohabit	62.4	1,232
	Single/separated/divorces/widowed	37.6	743

TABLE 2 Descriptive statistics of equivalized household income and deprivation index

Variables	*N*	Mean	Standard deviation
Equivalized household income (EHI)	1,839	14,215 HKD	9,562 HKD
Deprivation index (DI)	1,977	0.774	1.864

4.3 | Housing characteristics

The respondents lived in four types of housing, including public rental housing (51.4%), subsidized home ownership housing (18.2%), private rental permanent housing (10.5%), and private owned housing (19.9%; Table 3).

Housing expense was computed as the amount of mortgage (for homeowners) or rent (for renters), rates, management fee, and water/electricity/gas charges. The average housing expense of the respondents was 2,629 HKD, whereas the average housing cost per capita was 937 HKD. For the responding households, their average living area was 44 m^2 and their average living area per capita was 14.96 m^2, with a mean LQPI score of 1.317 (Table 3).

4.4 | One-way ANOVA

One-way ANOVA test was performed to assess the difference of deprivation level among residents living in various housing types. The mean score of DI for residents in public rental housing was 0.986, 0.424 for subsidized home ownership housing; 1.176 for private rental housing; and 0.304 for private owned housing (Table 4). Residents in private and public rental housing had higher level of deprivation than the other two housing type residents.

The comparison of the mean difference of deprivation level using post hoc test (LSD) showed a significant difference of deprivation level between the group of rental and owned housing. The public and private rental housing showed significantly higher level of deprivation than the subsidized home ownership and private owned housing (Table 5). On the basis of these results, analysis will be focused on the impacts of housing factors on deprivation in private and public rental housing, which was considerably higher than the other two housing types in Model 2 of the hierarchical linear regression analysis.

TABLE 3 Housing characteristics of respondents

Housing type (*N* = 1,964)			**%**	***N***
Public rental housing			51.4	1,011
Subsidized home ownership housing			18.2	357
Private rental permanent housing			10.5	206
Private owned permanent housing			19.9	390
Housing characteristics	***N***	**Mean**		***SD***
Housing Expense (Mortgage/rent + rates + manage fee + water, electricity & gas) (in HKD)	1965	2,629.10		3,162.21
Housing expense per capita (in HKD)	1965	936.63		1,307.13
Living area (in m^2)	1975	44		20
Living area per capita (in m^2)	1975	14.9633		9.105
Living Quarter Problem Index (LQPI)	1978	1.317		1.765

TABLE 4 One-way ANOVA test: Mean score of deprivation level by housing types

Housing type	***N***	**Mean**	**Standard deviation**	**Standard error**
Public rental housing	1,011	0.9861	2.06482	.06495
Subsidized home ownership housing	356	0.4238	1.16526	.06177
Private rental housing	206	1.1755	2.51069	.17481
Private owned housing	390	0.3042	1.09558	.05547
Total	1,963	0.7685	1.85567	.04189

TABLE 5 Post hoc test: Mean difference of deprivation level by housing types

(I) Housing type	(J) Housing type	Mean difference (I-J)	Standard error	Significance
Public rental housing	Subsidized home ownership housing	.56229	.11271	.000
	Private rental housing	−.18944	.13971	.175
	Private owned housing	.68192	.10900	.000
Subsidized home ownership housing	Public rental housing	−.56229	.11271	.000
	Private rental housing	−.75173	.16001	.000
	Private owned housing	.11963	.13404	.372
Private rental housing	Public rental housing	.18944	.13971	.175
	Subsidized home ownership housing	.75173	.16001	.000
	Private owned housing	.87136	.15742	.000
Private owned housing	Public rental housing	−.68192	.10900	.000
	Subsidized home ownership housing	−.11963	.13404	.372
	Private rental housing	−.87136	.15742	.000

5 | HIERARCHICAL LINEAR REGRESSION ANALYSIS

5.1 | Regression Model 1 (impacts of housing factors on deprivation)

The hierarchical linear regression Model 1 tested the impacts of different housing factors on deprivation. In Model 1, DI was used as the DV, whereas the IVs were inputted hierarchically based on logical and theoretical considerations. First, the sociodemographic background variables, including age, sex, education level, occupation, and marital status, were inputted as control variables. Second, EHI, which theoretically influences the DVs, was controlled. Third, the housing factors were inputted into the subsequent models on the basis of the normal sequential practice of residents, their housing costs and problems related to living space and quarters to delineate the influences of different housing situations.

The five IVs in Model 1 accounted for approximately 14.5% of the variance in deprivation (R^2 = .145). Level 1 (control level) comprised five demographic variables, including sex, age, education, occupation, and marital status, and showed a significant effect, $F_{5,\ 1,804}$ = 24.241, p < .01, R^2 = .063. Age, education, occupation, and marital status were significantly correlated with deprivation. In Level 2, EHI was inputted into Model 1 and demonstrated a significant effect, $F_{6,\ 1,803}$ = 33.071, p < .01, R^2 = .099). The change in R^2 was .036 and was significantly related to deprivation (Table 6).

Housing factors, including housing expense per capita, living area per capita, and LQPI were sequentially inputted into Levels 3–5, respectively. All three housing factors showed significant effect on deprivation. The effect of housing expense per capita was mild, $F_{7,\ 1,802}$ = 29.123, p < .01, ΔR^2 = .002, compared with living area per capita, $F_{8,\ 1,801}$ = 28.462, p < .01, ΔR^2 = .011. Among all housing factors, LQPI showed the greatest influence on deprivation, $F_{9,\ 1,800}$ = 33.918, p < .01, ΔR^2 = .033). The standardized coefficients (beta) of EHI and LQPI were −0.194 and 0.187, respectively, which suggested that these factors had comparable and greatest influences on deprivation. Meanwhile, the standardized beta of housing expense per capita was .074, whereas that of living area per capita was −.086; this result indicated that although these factors significantly influence deprivation, their influences were relatively small (Table 6).

TABLE 6 Regression Model 1: Impacts of housing factors on deprivation

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)	Level 1				
Sex	Level 1				.000
Age	Level 1	.251	.063	.063***	.139***
Education	Level 1				−.050
Occupation	Level 1				.071**
Marital status	Level 1				.110***
Equivalized Household Income (EHI)	Level 2	.315	.099	.036***	−.194***
Housing expense per capita	Level 3	.319	.102	.002*	.074**
Living area per capita	Level 4	.335	.112	.011***	−.086**
Living Quarter Problem Index (LQPI)	Level 5	.381	.145	.033***	.187***

*p < .05**p < .01***p < .001.

5.2 | Regression Model 2 (impacts of housing factors on deprivation with interacting effect)

Model 2 was constructed to test the interacting effect between household income and housing factors. EHI was the most significant factor on DV, and an interacting effect theoretically exists among household income and housing factors. On this basis, three interacting variables were constructed, namely, "EHI × housing expense per capita," "EHI × living area per capita," and "EHI × LQPI," which were inputted into Levels 6–8, respectively. The EHI × living area per capita, $F_{11,\ 1{,}798}$ = 32.592, p < .01, ΔR^2 = .020, and EHI × LQPI, $F_{12,\ 1{,}797}$ = 31.813, p < .01, ΔR^2 = .009, showed significant effect on deprivation, whereas the effect of EHI × housing expense per capita was insignificant. Although these models showed part of the interacting effect between income and housing factors, the interaction effects are small and did not influence the independent effect of the living area per capita (β = −.204, p < .001) and LQPI (β = .341, p < .001) in Model 2. In the subsequent models, household income and housing factors will be treated as independent from each other on their effect to deprivation (Table 7).

TABLE 7 Regression Model 2: Impacts of housing factors and deprivation (with interacting effect)

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)	Level 1				
Sex	Level 1				.013
Age	Level 1				.155***
Education	Level 1	.251	.063	.063***	−.035
Occupation	Level 1				.053*
Marital status	Level 1				.124***
Equivalized household income (EHI)	Level 2	.315	.099	.036***	−.327***
Housing expense per capita	Level 3	.319	.102	.002*	.0034
Living area per capita	Level 4	.335	.112	.011***	−.0204***
LQPI	Level 5	.381	.145	.033***	.341***
EHI × Housing expense per capita	Level 6	.383	.147	.002	.026
EHI × Living area per capita	Level 7	.408	.166	.020***	.273***
EHI × LQPI	Level 8	.419	.175	.009***	−.193***

*p < .05**p < .01***p < .001

5.3 | Regression Models 3a and 3b (impacts of housing factors on deprivation by housing type)

Models 3a and 3b modified Model 1 by splitting the analysis into two housing type groups, namely, public and private rental housing. The sociodemographic variables and EHI were inputted in Levels 1 and 2, respectively. Housing factors, including housing expense per capita, living area per capita and LQPI, were sequentially inputted into the Levels 3–5, respectively.

For Model 3a for public rental housing, the five IVs accounted for approximately 18.5% of the variance in deprivation (R^2 = .184). Level 1 (control level), which comprised five demographic variables, showed a significant effect (p < .001, ΔR^2 = .106). In Level 2, EHI demonstrated a significant effect (p < .01, ΔR^2 = .051). Among the three housing factors, only LQPI showed a significant effect on deprivation. The effects of housing expense per capita and living area per capita were insignificant (p > .05). The impact of LQPI on deprivation was significant (p < .001, ΔR^2 = .025, β = .164). The results showed that for public rental housing residents, only the living quarter problem affected deprivation, whereas housing expenses per capita and living area per capita did not (Table 8).

For Model 3b (private rental housing), the five IVs accounted for approximately 30.0% of the variance in deprivation (R^2 = .300). Level 1 (control level), which comprised five demographic variables, showed a significant effect (p < .01, ΔR^2 = .080). In Level 2, EHI demonstrated a significant effect (p < .001, ΔR^2 = .079).

Among the three housing factors, living area per capita and LQPI showed significant effect on deprivation. The effect of housing expense per capita was insignificant (p > .05). The impact of living area per capita on deprivation was significant (p < .001, ΔR^2 = .058, β = −.256). The effect of LQPI on deprivation was significant (p < .001, ΔR^2 = .081, β = .331). These results showed that for private rental housing residents, living area per capita and living quarter problem affected deprivation. (Table 9).

5.4 | Regression Models 4a and 4b (impacts of housing factors on deprivation by living density)

Given the assumption that housing factors may indicate the different degrees of effect of living density on deprivation level, the sample was divided into overcrowded and non-overcrowded groups. The overcrowding criteria of the Housing Authority of Hong Kong were adopted for the classification, and 7 m^2 per capita was used as the division line of overcrowding. In the hierarchical linear regression Model 4, the data were split into two sets on the basis of

TABLE 8 Regression Model 3a: Impacts of housing factors on deprivation (public rental housing)

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)	Level 1				
Sex	Level 1				.012
Age	Level 1	.325	.106	.106***	.147***
Education	Level 1				−.055
Occupation	Level 1				.087*
Marital status	Level 1				.110**
Equivalized household income (EHI)	Level 2	.395	.156	.051***	−.244***
Housing expense per capita	Level 3	.399	.160	.003	−.047
Living area per capita	Level 4	.400	.160	.000	.050
Living Quarter Problem Index (LQPI)	Level 5	.429	.184	.025***	.164***

*p < .05,**p < .01,***p < .001.

TABLE 9 Regression Model 3b: Impacts of housing factors on deprivation (private rental housing)

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)	Level 1				
Sex	Level 1				.058
Age	Level 1	.283	.080	.080**	.267***
Education	Level 1				.064
Occupation	Level 1				−.037
Marital status	Level 1				.180**
Equivalized household income (EHI)	Level 2	.399	.159	.079***	−.169*
Housing expense per capita	Level 3	.401	.161	.002	.143
Living area per capita	Level 4	.468	.219	.058***	−.256**
Living Quarter Problem Index (LQPI)	Level 5	.548	.300	.081***	.331***

*$p < .05$,**$p < .01$,***$p < .001$.

living area per capita. Model 4a included households living in quarters with an area of less than or equal to 7 m^2 per capita (Table 10), whereas Model 4b included those households living in quarters with an area of larger than 7 m^2 per capita (Table 11).

For Model 4a, the same variables and hierarchical order in Model 1 were used, and the total R^2 was .375; this result explained the 37.5% of the variance in deprivation for those living in overcrowded living quarters, which was the largest in all models. Hence, Model 4a had the most explanatory power than all the other models. The demographic factors ($p < .01$, $\Delta R^2 = .115$) and EHI ($p < .001$, $\Delta R^2 = .127$) significantly influenced deprivation. For the housing factors, housing expense per capita ($p < .01$, $\Delta R^2 = .061$, $\beta = .191$) and LQPI ($p < .001$, $\Delta R^2 = .043$, $\beta = .239$) showed significant effect on deprivation. However, in this overcrowded household group, the variance of their living area per capita was small; thus, it did not have a significant influence on deprivation ($p > .05$).

For Model 4b, the total R^2 was .118, which suggested that this model had a less explanatory power compared with Model 1 ($R^2 = .145$). Among all housing factors, only LQPI ($p < .01$, $\Delta R^2 = .015$, $\beta = .126$) showed significant effect on deprivation. Housing expense per capita and living area per capita showed insignificant effect ($p > .05$) in Model 4b.

The standardized coefficients (β) of EHI were −.332 in Model 4a and −.183 in Model 4b. This finding implied that in addition to the control factors, EHI showed the greatest influence on deprivation in both models. Living quarter

TABLE 10 Regression Model 4a: Impacts of housing factors on deprivation (overcrowded households)

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)					
Sex					−.068
Age					.283***
Education	Level 1	.340	.115	.115**	−.002
Occupation					−.037
Marital status					.131
Equivalized Household Income (EHI)	Level 2	.492	.242	.127***	−.332***
Housing expense per capita	Level 3	.551	.303	.061***	.191**
Living area per capita	Level 4	.576	.332	.29**	−.080
Living quarter problem index	Level 5	.612	.375	.043***	.239***

*$p < .05$**$p < .01$***$p < .001$.

problems also obtained a relatively large beta in Models 4a (.239) and 4b (.126). The standardized coefficients of housing expense per capita obviously differed between Model 4a (.191) and Model 4b (.052), which highlighted the significance of housing expense per capita for households living in overcrowded quarters (Tables 10 and 11).

6 | DISCUSSION

By means of hierarchical linear regression, this study examines the impacts of household income and housing factors, including housing expense per capita, living area per capita, and living quarter problems, on the deprivation of residents in Hong Kong and residents in different housing types and crowdedness. This study uses a representative survey of Hong Kong residents in 2014.

For the impacts on deprivation, Model 1 shows that EHI has a significant effect amongst all factors in all regression models. This finding is consistent with that of previous studies, which indicate that income level has a crucial effect on the deprivation level of households (Saunders et al., 2014). In Model 1, after the sociodemographic variables and household income are controlled, the findings confirm that housing cost per capita, living area per capita, and living quarter problems significantly influence deprivation.

In Model 2, the interaction effect of household income and housing factors on deprivation was examined. A small interacting effect exists between household income and housing factors. The interaction effects do not influence the independent effects of living area per capita and LQPI on deprivation. We assume that household income and housing factors are independent from each other on their effect to deprivation.

The one-way ANOVA test shows that the deprivation levels of residents in public and private rental housing groups are significantly higher than those of the subsidized home ownership housing and private owned housing groups. The results of regression Models 3a and 3b show that the influences of housing factors on deprivation are more significant in private rental housing groups than that of private rental housing groups.

The analysis of Model 3a shows that among the public rental housing residents, only the effect of LQPI on deprivation is significant but not the other two housing factors. Nevertheless, the analysis of Model 3b indicates that for private rental housing residents, living area per capita and living quarter problem have a significant effect on deprivation.

For private rental housing residents, improvement in the living area per capita will improve the deprivation situation, which supports the recent initiatives of the social housing and transitional housing projects of NGOs and the government.

TABLE 11 Regression Model 4b: Impacts of housing factors on deprivation (non-over-crowded households)

Variable	Level	R	R^2	ΔR^2	Standardized beta
(constant)	Level 1				
Sex	Level 1				.017
Age	Level 1	.262	.069	.069***	.117**
Education	Level 1				−.049
Occupation	Level 1				.090**
Marital status	Level 1				.109***
Equivalized Household Income (EHI)	Level 2	.313	.098	.029***	−.183***
Housing expense per capita	Level 3	.315	.099	.001	.052*
Living area per capita	Level 4	.320	.102	.003*	−.051
Living quarter problem index	Level 5	.343	.118	.015***	.126***

*$p < .05$ **$p < .01$ ***$p < .001$.

Although the influence of housing cost in Model 1 is relatively small, the analyses of Models 4a and 4b provide a reasonable explanation for this observation. For the overcrowded living quarter group (≤7 m^2 per capita), the total R^2 of Model 4a has sharply increased to .404, whereas the housing factors show a considerably greater impact on deprivation in Model 4a than in Models 1 and 4b. The most important result is that housing expense per capita becomes a significant factor due to its impact on deprivation ($p < .001$, $\Delta R^2 = 0.061$, $\beta = .191$). Among all the models in this study, housing expense per capita is a significant factor only in Model 4a for overcrowded households. The result indicates that housing cost per capita is a significant factor of deprivation for residents living in overcrowded quarters.

Our finding highlights the importance of supporting households that are living in overcrowded quarters. However, despite being an important influencing factor of deprivation, overcrowding has been usually ignored in the formulation of anti-poverty policies. A minimum standard of living density for public housing exists; thus, those who face overcrowding problems (≤7 m^2 per capita) are possibly living in private rental housing. This condition may reflect that of the subdivided flat residents in Hong Kong. The number of people living in subdivided flats has been increasing in recent years. Thus, this study provides empirical support for the critical influence of housing factors, namely, housing expenses per capita, living area per capita, and living quarter problems, on deprivation, especially for people living in subdivided flats.

7 | CONCLUSION

This study confirms the research hypothesis that poor housing circumstances, including high housing costs, overcrowding, and living quarter problems, significantly influence the deprivation level of residents. Amongst the three housing factors, living quarter problems have a deeper and wider influence on deprivation for Hong Kong citizens. Its effect on deprivation is the highest among the three housing factors (Model 1, $\beta = .187$). Moreover, living quarter problems significantly affect public and private rental housing residents. The results imply that improving the current maintenance and renovation schemes for public and private housing with poor living environment is a good strategy to improve housing conditions and the deprivation situation of the residents.

In addition to living quarter problem, the other influencing factor on deprivation for private rental housing residents is living area per capita (Model 3b, $\beta = -.256$). To further understand the influence of housing factors for households living in overcrowded quarters, the study indicates that housing cost demonstrates significant influence on the deprivation level of households living in small and overcrowded quarters.

In Hong Kong, the conceptualization and measurement of poverty situation are dominated by the income approach. Most poverty relief measures focus on cash subsidy or allowance rather than providing direct goods or services, such as social housing and low-cost rental housing. However, in a world city greatly affected by globalization, the housing situation continues to worsen, which affects the daily lives of residents and make them feel deprived. Our study suggests that anti-poverty policies must consider strategies and measures that can improve the housing factors, including housing expenses, living density, and living quarter maintenance problems. This study also reminds that poverty relief policies should exert effort on residents with high living density, such as those living in bed spaces, cubicles, and subdivided flats.

The policy implication of the aforementioned findings is that the government may enhance the current "rent assistance scheme" in the public rental housing for those households living in overcrowded quarters (≤7 m^2 per capita) and reintroduce "living subsidy for non-public housing and non-CSSA households" in private rental housing of the Community Care Fund to households living in overcrowded quarters (≤7 m^2 per capita). These targeted measures can reduce the housing expense burden of households residing in overcrowded quarters, which will be an effective policy to alleviate deprivation situation of these households.

The recommendations of this study may also be relevant to those world cities with growing housing cost and worsening poverty situation. The findings suggest that cash benefit approach of poverty relief is inadequate to solve

the deprivation problems in world cities. Rather, policies for improving housing conditions and circumstances may be effective alternative policies.

7.1 | Limitations

This work has several limitations that must be considered when interpreting its findings. First, the data set was cross-sectional, which limits the capacity of the study to establish causal relationships among the variables. However, the findings highlight a significant association between housing factors and deprivation. Further longitudinal or qualitative studies must be conducted to establish causal relationships. Second, we cannot analyse the housing location and its related neighbourhood effect on deprivation due to the problem of sample size. Future studies may stratify their samples into smaller geographical units, such as tertiary planning units, to provide data about location and neighbourhood effects. Lastly, poverty and housing situation are interrelated, and this study focuses on the influences of housing factors on poverty situation. However, a further investigation into the opposite direction of this relationship is warranted.

CONFLICT OF INTEREST

No potential conflict of interest was found.

ACKNOWLEDGEMENT

The work described in this article was fully supported by a grant from the Central Policy Unit of the Government of the Hong Kong Special Administrative Region and the Research Grants Council of the Hong Kong Special Administrative Region, China (Project 4003-SPPR-11).

ORCID

Hung Wong https://orcid.org/0000-0001-8326-9766
Siu-ming Chan https://orcid.org/0000-0003-0580-289X

REFERENCES

Borg, I. (2015). Housing deprivation in Europe: On the role of rental tenure types. *Housing, Theory and Society*, *32*(1), 73–93. https://doi.org/10.1080/14036096.2014.969443

Boyer, R. (2000). Is a Finance-led growth regime a viable alternative to Fordism? A preliminary analysis. *Economy and Society*, *29*(1), 111–145. https://doi.org/10.1080/030851400360587

Bradshaw, J., & Finch, N. (2003). Overlaps in Dimensions of Poverty. *Journal of Social Policy*, *32*(4), 513–525.

Census and Statistical Department. (2017). Hong Kong Edited by-census 2016 result, Retrieved January15, 2017, from http://www.bycensus2016.gov.hk/

Chan, E. H. W., Tang, B. S., & Wong, W. S. (2002). Density control and the quality of living space: A case study of private housing development in Hong Kong. *Habitat International*, *26*, 159–175. https://doi.org/10.1016/S0197-3975(01)00041-8

Fernandez, R., & Aalbers, M. B. (2016). Financialization and housing: Between globalization and varieties of capitalism. *Competition and Change*, *20*(2), 71–88. https://doi.org/10.1177/1024529415623916

Filali, R. (2012). Housing conditions in Tunisia: The quantity-quality mismatch. *Journal of Housing and the Built Enviromnet*, *27*, 317–347. https://doi.org/10.1007/s10901-012-9271-z

Forrest, R., LaGrange, A., & Yip, N. M. (2004). Hong Kong as a global city? Social distance and spatial differentiation. *Urban Studies*, *41*, 207–227. https://doi.org/10.1080/0042098032000155759

Goodstadt, L. F. (2013). *Poverty in the midst of affluence: How Hong Kong mismanaged its prosperity*. Hong Kong: Hong Kong University Press. https://doi.org/10.5790/hongkong/9789888208210.001.0001

Gordon, D., & Pantazis, C. (Eds.) (1997). *Breadline Britain in the 1990s*. Bristol: Ashgate.

Gou, Z., Xie, X., & Lu, Y. (2018). Quality of Life (QoL) survey in Hong Kong: Understanding the importance of housing environment and needs of residents from different housing sectors. *International Environment Research and Public Health*, *15*, 219. https://doi.org/10.3390/ijerph15020219

Guio, A. C., & Maquet, I. E. (2007). Material deprivation and poor housing, comparative EU statistics on income and living conditions: Issues and challenge, In Proceedings of the EU-SILC conference.

Hong Kong Special Administration Region (HKSAR) Government (2016). *Supplementary poverty line analysis: Expenditure patterns of poor households in 2015*. Hong Kong: HKSAR Government.

Hong Kong Special Administration Region (HKSAR) Government (2018). *Hong Kong poverty situation report 2017*. Hong Kong: HKSAR Government.

Israel, S. (2016). More than cash: Societal influences on the risk of material deprivation. *Social Indicators Research*, *129*, 619–637. https://doi.org/10.1007/s11205-015-1138-8

Izuhara, M., & Forrest, R. (2013). "Active Families": Familization, housing and welfare across generations in East Asia. *Social Policy and Administration*, *47*, 520–541. https://doi.org/10.1111/spol.12002

King, P. (2015). *The principles of housing*. London: Routledge.

Lee, K. M., & Wong, H. (2004). Marginalized workers in postindustrial Hong Kong. *The Journal of Comparative Asian Development*, *3*, 249–280. https://doi.org/10.1080/15339114.2004.9678402

Lee, K. M., Wong, H., & Law, K. Y. (2007). Social polarisation and poverty in the global city: The case of Hong Kong. *China Report*, *43*(1), 1–30. https://doi.org/10.1177/000944550604300101

Lee, P. (1994). Housing and spatial deprivation: Relocating the underclass and the new urban poor. *Urban Studies*, *31*, 1191–1209. https://doi.org/10.1080/00420989420081021

Mack, J., & Lansley, S. (1985). *Poor Britain*. London: George Allen & Unwin.

Malpass, P., & Murie, A. (1999). *Housing policy and practice*. Basingstoke: Macmillan. https://doi.org/10.1007/978-1-349-27443-7

Markkanen, S., & Harrison, M. (2013). "Race", deprivation and the research agenda: Revisiting housing, ethnicity and neighbourhoods. *Housing Studies*, *28*, 409–428. https://doi.org/10.1080/02673037.2013.759180

Milanovic, B. (2016). Introduction. In *Global inequality: A new approach for the age of globalization* (pp. 1–9). London: Cambridge University Press. https://doi.org/10.4159/9780674969797-002

Napiorkowska-Baryla, A., & Witkowska-Dabrowska, M. (2018). Housing deprivation in Poland—A regional approach. In *2018 Baltic Geodetic Congress* (pp. 221–225).

Nissanke, M., & Thorbecke, E. (2006). Channels and policy debate in the globalization inequality- poverty nexus. *World Development*, *34*(8), 1338–1360.

Nolan, B., & Winston, N. (2011). Dimensions of housing deprivation for older people in Ireland. *Social Indicators Research*, *104*, 369–385. https://doi.org/10.1007/s11205-010-9748-7

Ringen, S. (1988). Direct and indirect measures of poverty. *Journal of Social Policy*, *17*, 351–365. https://doi.org/10.1017/S0047279400016858

Rolnik, R. (2013). Late Neoliberalism: The financialization of homeownership and housing right. *International Journal of Urban and Regional Research*, *37*, 1058–1066. https://doi.org/10.1111/1468-2427.12062

Rowley, S., & Ong, R. (2012). *Housing affordability, housing stress and household wellbeing in Australia.* AHURI Final Report No. 192. Melbourne: Australian Housing and Urban Research Institute Limited. Retrieved at https://www.ahuri.edu.au/research/final-reports/192.

Saunders, P., Wong, H., & Wong, W. P. (2014). Deprivation and poverty in Hong Kong. *Social Policy and Administration*, *48*, 556–575. https://doi.org/10.1111/spol.12042

Shuey, E. A., Leventhal, T., & Coley, R. L. (2016). Housing characteristics over time: Identifying patterns for low-income families. *Journal of Poverty*, *20*(1), 102–125. https://doi.org/10.1080/10875549.2015.1094763

Smart, A., & Lee, J. (2003). Housing and regulation theory. In R. Forrest, & J. Lee (Eds.), *Housing and social change: East-west perspectives* (pp. 87–107). New York: Routledge.

Stone, M. (1993). *Shelter poverty: New ideas on housing affordability*. Philadelphia: Temple University Press.

Streimikiene, D. (2015). Quality of life and housing. *International Journal of Information and Education Technology*, *5*(2), 140–145. https://doi.org/10.7763/IJIET.2015.V5.491

Therborn, G. (2013). *The killing fields of inequality*. Cambridge: Polity.

Townsend, P. (1962). The meaning of poverty. *The British Journal of Sociology*, *13*(3), 210–227. https://doi.org/10.2307/587266

Townsend, P. (1987). Deprivation. *Journal of Social Policy*, *16*(2), 125–146. https://doi.org/10.1017/S0047279400020341

Tunstall, R., Bevan, M., Bradshaw, J., Croucher, K., Duffy, S., Hunter, C., … Wilcox, S. (2013). *The links between housing and poverty: An evidence review*, *JRF report*. Homestead: Joseph Rowntree Foundation.

Wang, J., Huang, B., Zhang, T., Wong, H., & Huang, Y. (2018). Impact of housing and community conditions on multi-dimensional health among middle- and low-income groups in Hong Kong. *International Journal of Environmental Research and Public Health*, *15*(6), E1132. https://doi.org/10.3390/ijerph15061132

Watson, D., & Williams, J. (2003). *Irish national survey of housing quality 2001–2002*. Dublin: The Economic and Social Research Institute.

Yiu, M. S., Yu, J., & Jin, L. (2013). Detecting bubbles in Hong Kong residential property market. *Journal of Asian Economics*, *28*, 115–124. https://doi.org/10.1016/j.asieco.2013.04.005

How to cite this article: Wong H, Chan S. The impacts of housing factors on deprivation in a world city: The case of Hong Kong. *Soc Policy Admin*. 2019;53:872–888. https://doi.org/10.1111/spol.12535