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## Personal Factors Influencing the Perception of Quality of Life in Hong Kong – A Classification Tree Approach

Chien-Tat Low<sup>a</sup>, Poh-Chin Lai<sup>a,\*</sup>

<sup>a</sup>*Department of Geography, The University of Hong Kong, Pokfulam, Hong Kong*

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### Abstract

This study explores the interplay between multiple personal factors (i.e. demographic, social, economic, housing, and health) in the perceived quality of life (QOL) in Hong Kong. A classification tree approach was employed to infer the importance of individual attributes in the QOL scores measured on the 5-point Likert scale (1= very dissatisfied to 5= very satisfied; 3= neither dissatisfied nor satisfied). The study included 1163 participants who had completed a postal or an online questionnaire survey between July and August 2015. The majority of respondents (43.5%) expressed satisfied and very satisfied on their perceived QOL, while only 15.5 percent of respondents gave dissatisfied and very dissatisfied ratings. 41 percent of respondents were neutral in their assessment of QOL. None of demographic and social characteristics was important in the prediction of QOL. Monthly household income, tenure of accommodation, housing type and size, and health status were among key factors in determining the QOL. The findings suggested that apart from health status, residents of Hong Kong perceived QOL to highly associate with housing and economic characteristics that reflected their standards of living or personal wealth status. Future studies shall evaluate how personal, social or cultural, and environmental factors contribute towards the perception of QOL.

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### 1. Introduction

Contemporary studies about quality of life (QOL) are conducted in response to concerns about growing impacts of urbanization on the well-being of its residents. A QOL index is a complex measure that indicates the overall life

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\* Corresponding author. Tel.: +852-3917-2830; fax: +852-2559-8994.

E-mail address: [pclai@hku.hk](mailto:pclai@hku.hk)

satisfaction of a current state. It includes a wide range of component indicators covering physical, mental, socio-economic, political, cultural, and living or environmental conditions. Some indicators (such as air quality or median household income or number of schools) can be measured or obtained from official sources for objective comparisons. Indicators about the cultural aspect or landscape aesthetics are judgmental and subjective in nature. Recent works have attempted to integrate both objective and subjective approaches in evaluating QOL.

QOL perceived by individuals is highly subjective because of variations in personal background, sentimental attachment to a place, and other influencing factors. Research has shown that Hong Kong residents have a great desire for materialistic attainment which may have a role in their perception of QOL (Sing 2009). With an extremely high cost of living, Hong Kong was ranked one of the least affordable cities to buy a home based on Demographia's (2016) survey over the past 11 years. This study aims to investigate key personal factors from among demographic, social, economic, housing, and health categories that may contribute towards the perception of QOL by employing the method of classification and regression tree (CART) (Breiman et al. 1984).

## 2. Data and Method

### 2.1. Data

The study population included 1163 participants recruited by stratified random sampling conducted by the HKUPOP (The University of Hong Kong Public Opinion Programme) to ensure a representative sample. Participants were asked to complete a postal or online questionnaire survey between July and August 2015. An item that represents the perceived QOL was recorded as an ordinal variable (1= very dissatisfied to 5= very satisfied, 3= neither dissatisfied nor satisfied). A 43.5 percent majority gave satisfactory ratings (satisfied to very satisfied) on the perceived QOL, against to those minority 15.5 percent giving unsatisfactory ratings (dissatisfied to very dissatisfied). 41 percent of respondents expressed impartiality on the perceived QOL. This study employed a total of 19 independent variables reflecting demographic, social, economic, housing and health characteristics of participants, as outlined in Table 1.

Table 1: Independent variables used in this study

Variables				
<u>Demographic</u>	<u>Social</u>	<u>Economic</u>	<u>Housing</u>	<u>Health</u>
1. Age group	3. Marital status	9. Monthly household income	13. Housing type	16. Health status
2. Gender	4. Number of children	10. Expenses for accommodation	14. Housing size	17. Disability
	5. Number of household member	11. Type of occupation	15. Tenure of accommodation	18. Chronic disease
	6. Highest education attainment	12. Nature of occupation		19. Doing exercises
	7. Own a car			
	8. Time spent for voluntary work			

### 2.2. Method of Analysis

CART is an alternative to many traditional statistical techniques such as multiple regression, logistic regression, analysis of variance, for exploring patterns in complicated datasets failed to be uncovered by linear models (De'ah and Fabricius 2001; Frisman et al. 2008). As a non-parametric approach without distributional assumptions, CART can handle datasets containing variables of categorical, scale, and ordinal measurement types. It can also handle missing and unbalanced values in both response and explanatory variables. The method is easy to construct using IBM SPSS version 20.0 and the result is robust and easy to interpret.

The CART module in IBM SPSS will generate a decision tree to illustrate the complex relationships between independent and dependent variables. Based on values of a single independent variable, the procedure recursively splits original cases into significant subgroups or homogenous nodes by maximizing within node-homogeneity. The decision tree will continue to split until a terminal node has reached its purity (i.e. all cases having the same value for the dependent variable). To avoid an overly large tree, variables with an improvement of smaller than 0.01 will

be pruned. A ten-fold cross-validation of the sample will divide the data into ten mutually exclusive subsets and drop off each subset in turn. The remaining subsets will be used to build a tree to predict response for the omitted subset. This step will be repeated 10 times and the tree with the smallest estimated error rate will be selected.

### 3. Results and Discussions

The CART yielded a decision tree comprising of four levels, seven nodes, and four terminal nodes (Fig.1a). It began with a “Parent” node (Node 0) containing the entire sample of 1163 participants with an overall QOL score of 3.288, which is slightly better than the neutral class (3 on the 5-point scale). The parent node would then split into two “Child” nodes (Node 1 and Node 2) according to the variable “tenure of accommodation”. Participants labeled as sole-tenants were grouped together on the left branch of the tree and they registered a lower score (QOL=3.033) compared to the group of owner occupiers or subsidized tenants on the right branch of the tree (QOL=3.431). Node 2 was further split according to the variable named “monthly household income” into two child nodes. The group with a monthly household income less than \$80000 scored lower than those earning more than \$80000, or retired, or supported by children. Participants in Node 4 meeting the condition of Node 2 and earning more than \$80000 had a QOL score of 3.784. Node 3 was split into two child nodes based on “health status”. Those with a better health status of >3.5 in Node 6 had a higher QOL score. Indeed, the decision tree indicates that participants who either owned or had housing subsistence (Node 2) and with less than \$80,000 in monthly household income (Node 3) would improve their QOL score from 3.343 to 3.559 with a better health status (Node 6). Nodes 1, 4, 5, and 6 are also called terminal nodes because splitting stops at these nodes.

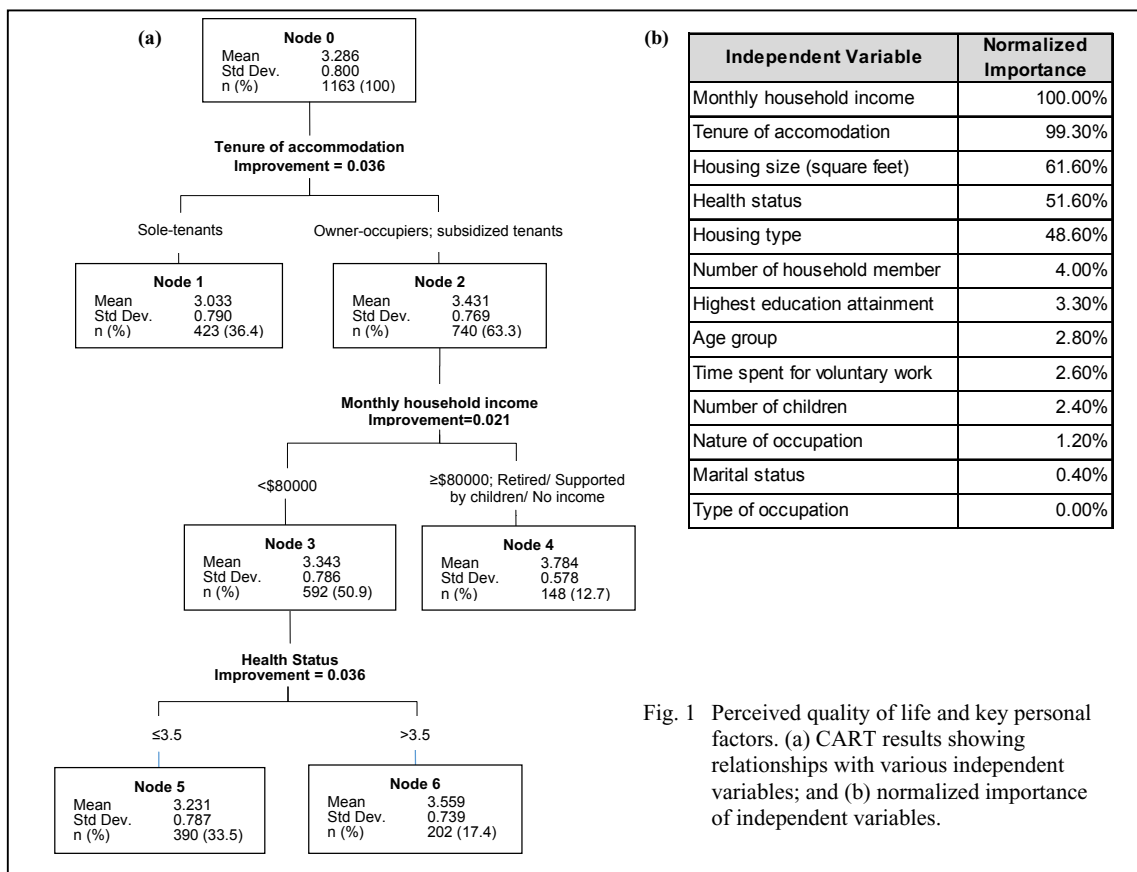


Fig. 1 Perceived quality of life and key personal factors. (a) CART results showing relationships with various independent variables; and (b) normalized importance of independent variables.

Our study showed that only 11.3 percent of participants (out of 12.7 percent of combined group in Node 4) earned more than \$80000 per month in household income. The result suggested that study participants in this income category had better perceived QOL on average than those in other income categories. Regrettably, the median monthly household income of Hong Kong ranged between \$25000 and 30000 (non-active and active households) whereas more than half of all households in Hong Kong earned less than \$80000 per month (Hong Kong Census and Statistics 2015a). It was also reported that 45.2 percent of households in Hong Kong remained as sole-tenants (Hong Kong Census and Statistics 2015b) which was higher than our sample of 36.4 percent. Hong Kong's expensive housing markets also meant that tenants had to bear a heavier burden for rent. With income-to-rental ratio increasing to more than 40 percent while the per capita living area falling to below 50 square feet (Knowledge Transfer at CUHK 2015), it is not surprising to see that sole-tenants had a lower perceived QOL than owner-occupiers or those receiving housing subsistence.

Another merit of the CART method is the option to arrange independent variables based on their normalized importance (Kashani and Mohaymany, 2011). Fig 1(b) shows the standardized importance, in decreasing order, of each independent variable in the model that reflects the relative importance of these life attributes in accounting for perceptual differences in QOL by residents of Hong Kong. It is apparent that monthly household income, tenure of accommodation, housing size, health status, and housing type are substantially more important than the remaining variables in explaining perceived QOL. These ratings are indicative of the overriding concerns for the people of Hong Kong in their pursuit for better QOL.

#### 4. Conclusion

This study demonstrated the use of CART in exploring the importance of multiple personal indicators pertinent to the perceived QOL among Hong Kong people. Our results suggested economic and housing factors closely related to the standards of living - such as monthly household income, tenure of accommodation, and housing type and size - were highly important in influencing the perception of QOL. Apart from the above factors, self-rated health status also played a significant role in perceived QOL. Demographic and educational or occupational attributes did not appear to be as influential. These findings are reflective of the Hong Kong situation that may not be applicable to other cities although the method of analysis remains relevant. It would be interesting to include natural and built environmental indicators (such as greenery and transport) to investigate their respective contribution towards perceived QOL to identify intrinsic values of Hong Kong people that can guide urban planning directions.

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