

Analysis of Life Satisfaction in Slum Rehabilitation Housing Projects: A Decision Tree Approach

April Ann TIGULO ^a, Varun VARGHESE ^b, Makoto CHIKARAISHI ^c

^{a,b,c} Graduate School for International Development and Cooperation, Hiroshima University, Hiroshima, 739-8529, Japan

^a E-mail: aprilanntigulo@gmail.com

^b E-mail: varunv@hiroshima-u.ac.jp

^c E-mail: chikaraishim@hiroshima-u.ac.jp

Abstract: This study aims to characterize the life satisfaction among Slum Rehabilitation Housing (SRH) residents in Mumbai related to the changes in economic and travel attributes after they relocated from slum areas. A retrospective survey was conducted among 495 SRH dwellers across 23 locations. Decision tree analysis was undertaken to identify factors affecting overall life satisfaction. Results show that the change in transportation satisfaction is a significant influence on life satisfaction, followed by occupation, change in housing satisfaction, age, household size, travel mode to work, and education. These may have policy implications in incorporating transportation in planning for sustainable slum rehabilitation programs to ensure people's links to opportunities that allow them to transition from poverty.

Keywords: satisfaction, slum development, decision trees, Mumbai, transportation equity

1. INTRODUCTION

India is one of the top three rapidly urbanizing countries expected to account for 35% of the global urban population increase between 2018 and 2050 (UN DESA, 2018). This points to the urgency of addressing the challenges faced by the growing slum population of the country. It is now widely accepted that “poverty is multidimensional” (Ferreira & Lugo, 2012). Hence, apart from the provision of housing, foremost is the need to ensure the links between people and opportunities that allow them to transition from poverty (Booth *et al.*, 2000).

The opportunities available to people are fundamentally linked with housing and its conditions (Varghese & Jana, 2018). The fast-paced urbanization of Indian towns and cities bundled with its steady economic growth have added to an already existing housing crisis, significantly affecting the quality of life of people living in them (Roy, 2009). Slums, as defined by the Census of India (2011) are settlements which are unfit for human habitation and can be characterized by “dilapidation, overcrowding, faulty arrangements and designs of such buildings, narrowness or faulty arrangement of streets, lack of ventilation, light, sanitation facilities or any combination of these factors which are detrimental to safety, health and morals.”

In Mumbai, nearly half of its population live in slums or similar low rent, poor quality tenements known as *chawls*. Since independence, Government authorities and policymakers have come up with several different policies to tackle the housing crisis. However, most of these policies had adopted a top-down approach and rarely involved the people living slums, the direct stakeholders in their decision-making process (Bardhan *et al.*, 2015).

This paper focuses on one such policy known as the slum rehabilitation scheme,

which was established in 1995. The Government established the slum rehabilitation authority (SRA) to develop slum rehabilitation housing (SRH). Under the scheme, three different types of housing were developed, namely, in situ, project affected people, and permanent transit tenement. The Government funded these developments by allowing a high percentage of the slum land (usually around 70%) to be sold in the normal market and by providing transferable development rights to the private developers. Therefore, this policy's success depended on the private developer and the area in which the SRH was constructed. Patel (1996) highlighted the dichotomy of the policy and argued that it is simultaneously both admirable and dubious, as a lot relied on the market. The literature on the impact of SRH in Mumbai further highlights this dichotomy. Nijman (2008) presented a successful case study of one particular slum while being skeptical of the entire policy. He concluded that the new houses were relatively more comfortable, safe, had private toilets, and electricity and water connections primarily because its inhabitants “assumed the role of the developer” which is generally not the case in other slum redevelopment projects in India.

Meanwhile, Chikaraishi *et al.* (2017) and Varghese *et al.* (2017) also found empirical evidence concerning SRH being slightly better off in comparison to slum housing with respect to income, travel, and activity participation related variables. However, there have been some studies which have highlighted the negative aspects of the housing scheme. Sunikka-Blank *et al.* (2019) argued that the poor design of SRH buildings has led to a reduction in social capital and opportunities for the people residing in them, especially women. Meanwhile, Debnath (2018) cited improper ventilation, lack of access to daylight, and air pollution in SRH buildings as significant causes of diseases among its residents. Most studies so far, which have analyzed the impact of SRH schemes have mostly concentrated on the short-term impacts, using cross-section data. There is a significant gap existing in how such housing schemes fair in the longer run. There is not much known about their long-term impacts.

The relationship between satisfaction and residential choice have received a significant focus in the literature. Ge and Hokao (2006) in their study of Japanese cities, established significant relationships between residential preference and residential satisfaction. Meanwhile, Abe and Kato (2017) observed that larger lot size and shorter travel time to the nearest bus stop in Jakarta, Indonesia had significant positive relationships with satisfaction. Also, a study of new-suburbanites in Tallinn, Estonia by Kährik *et al.* (2012) identified housing adjustment moves to be more prevalent than induced moves due to life-course events. They observed that the sampled people were more satisfied with housing and neighborhood conditions and less satisfied with the provision of local services. The literature establishes that voluntary housing decisions have strong linkages with satisfaction levels. However, the evidence on involuntary residential relocation on satisfaction levels is relatively sparse. Studies by Day and Cervero (2010) and Day (2013) have evaluated the impact of involuntary residential relocation on satisfaction levels among residents of Shanghai, China and they observed that residents who moved involuntarily were, in general, less satisfied. However, a similar study by Danquah *et al.* (2014) in the resettlement towns of Keta basin, Ghana showcased that people, in general, were satisfied with the housing conditions and length of stay had a positive relationship with residential satisfaction. Also, Alam and Matsuyuki (2018) evaluated the effect of socio-economic characteristics, SRH physical features, SRH management variables, and social relationships on satisfaction. They conducted a cross-sectional survey across three SRH complexes in Mumbai and observed that in general, households were satisfied in the SRH complexes. Moreover, they observed that the effect of management related variables was higher than the physical features of SRH.

There exist significant research gaps which need urgent attention. Firstly, there is not much evidence on the long-term effects of slum rehabilitation. In addition, as discussed

earlier, most studies have evaluated the effects of voluntary residential choice, but the impact of involuntary movements needs further investigation. A thorough investigation on both the short and long-term effects of relocation on various socio-economic and travel-related factors and subsequently on satisfaction is yet to be extensively carried out. This study is an effort to address these gaps.

This article aims to apply the decision tree approach to characterize the life satisfaction among SRH residents related to the changes in economic and travel attributes after they were relocated and according to socioeconomic characteristics. This paper also aims to quantify the economic and work trip changes of the SRH beneficiaries that occurred after their relocation from the slums through the conduct of a basic analysis from data generated through a retrospective survey.

Moreover, the study will benefit policymakers and urban planners to identify factors that influence satisfaction. Most policy interventions are designed from the suppliers' perspective; however, the users' perspective is worthy to consider helping ensure the sustainability of these programs. SRH often witness a rebound phenomenon (Sunikka-Blank *et al.*, 2019), where people move back to slums, either by selling their house or by renting it out. The findings of this study hope to highlight the need to include transportation issues in planning for slum rehabilitation programs. This paper aims to contribute to the "wellbeing agenda," particularly for developing nations concerning the sustainability of policy interventions which are currently in practice in developed nations (Reardon & Bache, 2015). This study may also serve as a starting point for transportation studies related to the optimization of public transport. By characterizing the users of these housing projects in relation to their work trips, inclusive transport infrastructure is possible through proper targeting of hard and soft transport infrastructure projects.

The introduction section is followed by a description of the data and the data collection methodology in section 2. Section 3 discusses the results. A sub-section of this section is dedicated to describing the research methodology. Finally, the article is concluded in section 4 by highlighting the key contributions of this research, policy implications, and the way forward for future research.

2. DATA COLLECTION AND DESCRIPTION

2.1 Data Collection

A structured questionnaire was developed, comprising three sections. The first section collected the current basic household and individual socioeconomic information such as age, sex, marital status, household members, vehicle ownership, and the number of years of stay in Mumbai. *Table 1* provides a summary of the socio-demographic characteristics and other attributes of the sample.

The second section asked respondents on their life before and after relocation in terms of average employment and work-related travel attributes for five time points, which included: (1) current year, (2) one year after relocation, (3) on the year of relocation, (4) one year before relocation, and (5) two years before relocation. This section also asked about the approximate distances of basic social services from their dwellings before and after the relocation.

Finally, the third section asked residents to rate how satisfied they were on various domains of their life on two time points before and after relocation on a 5-point Likert scale (1: Very dissatisfied, 2: Somewhat dissatisfied, 3: Neutral, 4: Somewhat satisfied, 5: Very

satisfied). Some of the domains enumerated in the questionnaire were based on Michalos (2005). Other domains were added based on what was deemed relevant to the living conditions in India. The said domains were as follows: job opportunity, transportation, sanitation, public security, house, education access, market access, medical access, relations in the community, household income, air quality, and overall quality of life. For this article, the analysis shall focus on the economic, housing, and transportation domains.

The study is of a cross-sectional and non-randomized pretest-posttest design where the treatment group is the SRH beneficiaries, and the control group is the slum dwellers. Because this article is part of a broader research, data of the control group were not included in the discussion of this paper.

The central principle in sample selection is to create adequate variability in travel and household accessibility variables. With this, around 20 to 30 respondents were interviewed in each of the 23 SRH project locations. *Figure 1* shows the location of survey respondents. The SRH projects chosen for the survey were based on the criteria that they were implemented at most, seven years ago i.e., no SRH project built before seven years were chosen. This was set to minimize the error of memory recall that is inherent in retrospective surveys.

The survey was administered among 495 SRH households in Mumbai, India from August to September 2018. Surveys were mostly conducted after regular working hours and on weekends to gather firsthand and accurate information from the primary income earners. Considering the substantial length of the questionnaire and the level of education of the respondents, the survey was done door-to-door and in Hindi language wherein the interviewer explained the purpose of the study and the questions.

Pilot testing was done to improve the layout and clarity of the questionnaire. Eight households were selected from SRH projects and were assigned to a trained interviewer. After which, the survey instrument was enhanced so that questions and options which were misunderstood were rephrased, and topics that respondents deemed too sensitive to answer were removed.

2.2 Data Description

Around 57.1% of the SRH residents expressed that the quality of their life remained the same after moving into their new housing, while 23.5% felt that they were better off than they were in the slums. Around 19.4% of the respondents stated that they are now worse off than they were in the slum.

This paper also aims to quantify the economic and work trip changes of the SRH beneficiaries that occurred after their relocation. As shown in *Table 1*, the socio-demographic changes column, minimal variation occurred throughout the five time points between two years before relocation and the current year. In terms of work hours, 44.9% of the respondents said it remains unchanged, while 29.4% revealed that it increased. Majority of the respondents' income and travel time to work, at 71.7% and 62.3% respectively, also did not change. Additionally, as illustrated in *Figure 2*, at any point in the five-year period, almost all of the respondents (86.5%) never changed their jobs, and 69.5% said their incomes did not change. As can be gleaned from the lower histograms, the distances to their jobs and corresponding travel time to work remain unchanged at 60.6% and 48.9%, respectively. *Figure 3* shows that the income earners maintained using public transport followed by walking and biking for their work trips throughout the five time-periods before and after the relocation.

On the quality of the data, not much variability turned up in terms of economic and travel attributes across the five time points (in years). This could be because it may take a

longer time for impacts on livelihood and travel behavior to take place. Another reason could be the memory recall errors owing to the retrospective element of the survey. According to Goulias (1999), "...it has been widely agreed that individuals' activity and travel behavior is influenced by various factors such as household socioeconomics, transportation network characteristics and other unobserved and unobservable factors. Changes in some of these factors may take place only within longer time frames."

There is abundant literature on measuring life satisfaction or well-being. A significant number of studies assert that an individual's life satisfaction is influenced by many concrete areas of life, which are correspondingly narrowed down into a few main domains of life (Rojas, 2006). Easterlin and Sawangfa (2007) maintain that "no single domain is invariably the key to happiness." They added that overall life satisfaction is positively correlated with socioeconomic status and can be predicted by looking at the mean satisfaction people report with each of four domains on finances, family life, work, and health.

The target variable used in this study is the change in life satisfaction between before and after being relocated to the SRH. From their subjective responses ranging from "Very satisfied" to "Very dissatisfied" before and after moving, respondents were then coded as either "Better off," "Worse off" or "Unchanged." The explanatory variables used in this study and its corresponding potential responses are shown in *Table 2*.

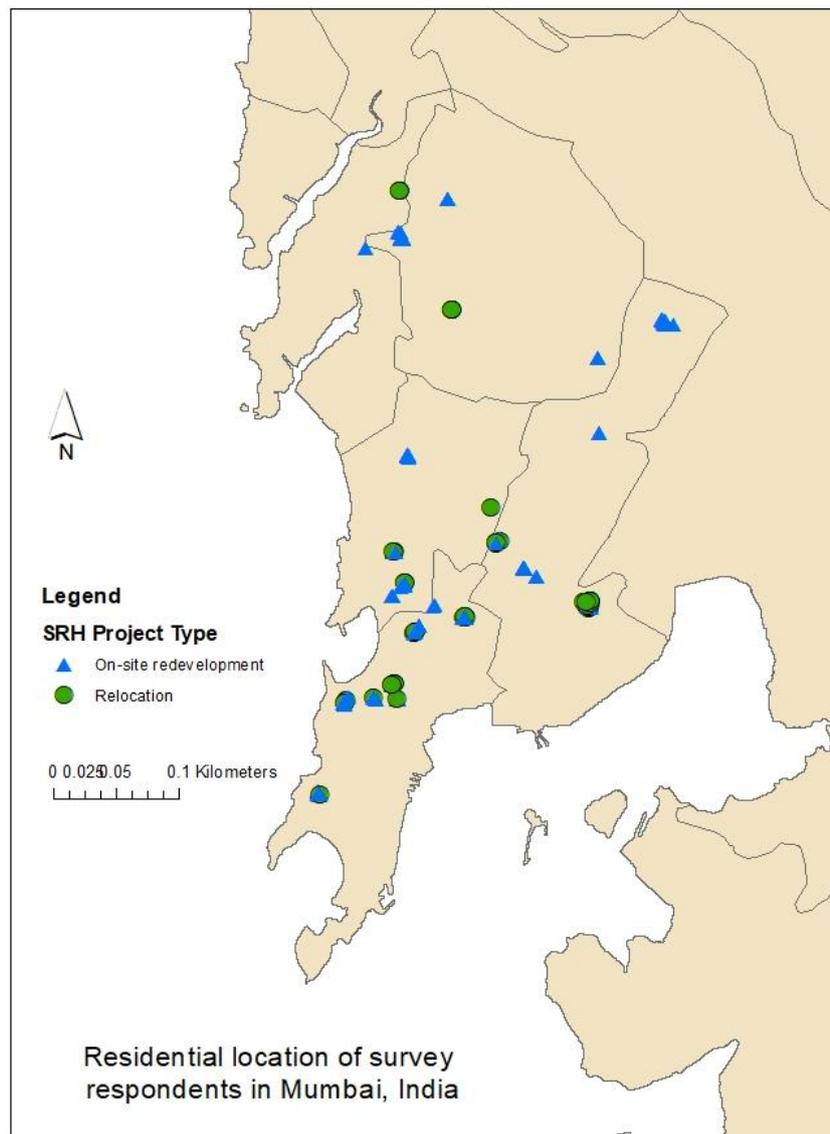


Figure 1. Residential location of survey respondents in Mumbai, India

Table 1. Socio-economic characteristics of the sample

Socio-demographics	2018		Socio-demographic changes	Changes between before and after SRH	
	Frequency	%		Frequency	%
Female	199	40.3			
Born in Mumbai	433	87.7			
<i>Vehicle ownership</i>					
Bicycle	15	3.0			
Electric bike, scooter, motorcycle	109	22.1			
Rickshaw	4	0.8			
Car	4	0.8			
Taxi	5	1.0			
Not applicable	357	72.3			
<i>Employment status</i>					
Working part-time (<30 hours per week)	30	6.1	Unchanged	222	44.9

Socio-demographics	2018		Socio-demographic changes	Changes between before and after SRH	
	Frequency	%		Frequency	%
Working full time (>30 hours per week)	461	93.3	Working time increased	145	29.4
Missing	3	0.6	Working time decreased	121	24.5
<i>Level of education</i>					
No formal education	41	8.3			
Up to high school	355	71.9			
Bachelor and above	98	19.8			
<i>Average monthly household income (INR)</i>					
Less than 5000	24	4.9	Unchanged	354	71.7
5000-30000	440	89.1	Income increased	133	26.9
30000-50000	12	2.4	Income decreased	3	0.6
Greater than 50000	18	3.6			
<i>Average one-way daily door-to-door travel time to work</i>					
Less than 5 minutes	46	9.3	Unchanged	308	62.3
5-20 minutes	118	23.9	Travel time increased	73	14.8
20-60 minutes	142	28.7	Travel time decreased	104	21.1
Greater than 1 hour	174	35.2			
None	14	2.8			
Average age	38.5	12.23 ¹			
Average household size	4.99	2.01 ²			
N	495				

Table 2. Variables used in decision tree analysis

Variable	Code in decision tree	Potential response
<i>Change in life satisfaction</i>	CLS	Better off, worse off, no change
<i>Socioeconomic attributes</i>		
Age	Age	Discrete
Sex		Male, female
Born in Mumbai		I was born here, migrant
Community involvement		Yes, no
Household size	HHMembers	Discrete
Distance to nearest transport service (e.g. bus stop, train station)		No fixed location, less than 1 km from residence, 1-2 km, 3-4 km, 5-6 km, 7-8 km, greater than 8 km, I don't know
Education of primary income earner		High education, low education, no education
Job type of primary income earner	JT	Government service, private service,

¹ Standard deviation of the sample.

² Standard deviation of the sample.

Variable	Code in decision tree	Potential response
		business / self-employed, skilled labor, unskilled labor, domestic work, daily wage earner, shopkeeper, street vending, driver
Change in working hours		Increased, decreased, no change
Change in satisfaction on housing	CSH	Improved, worsened, no change
<i>Work-trip attributes</i>		
Primary mode		Four wheels, two wheels, public, active, others
Change in satisfaction on transportation	CST	Improved, worsened, no change
Change in job location		Changed, unchanged
Change in travel cost		Increased, decreased, no change
Change in travel time		Increased, decreased, no change

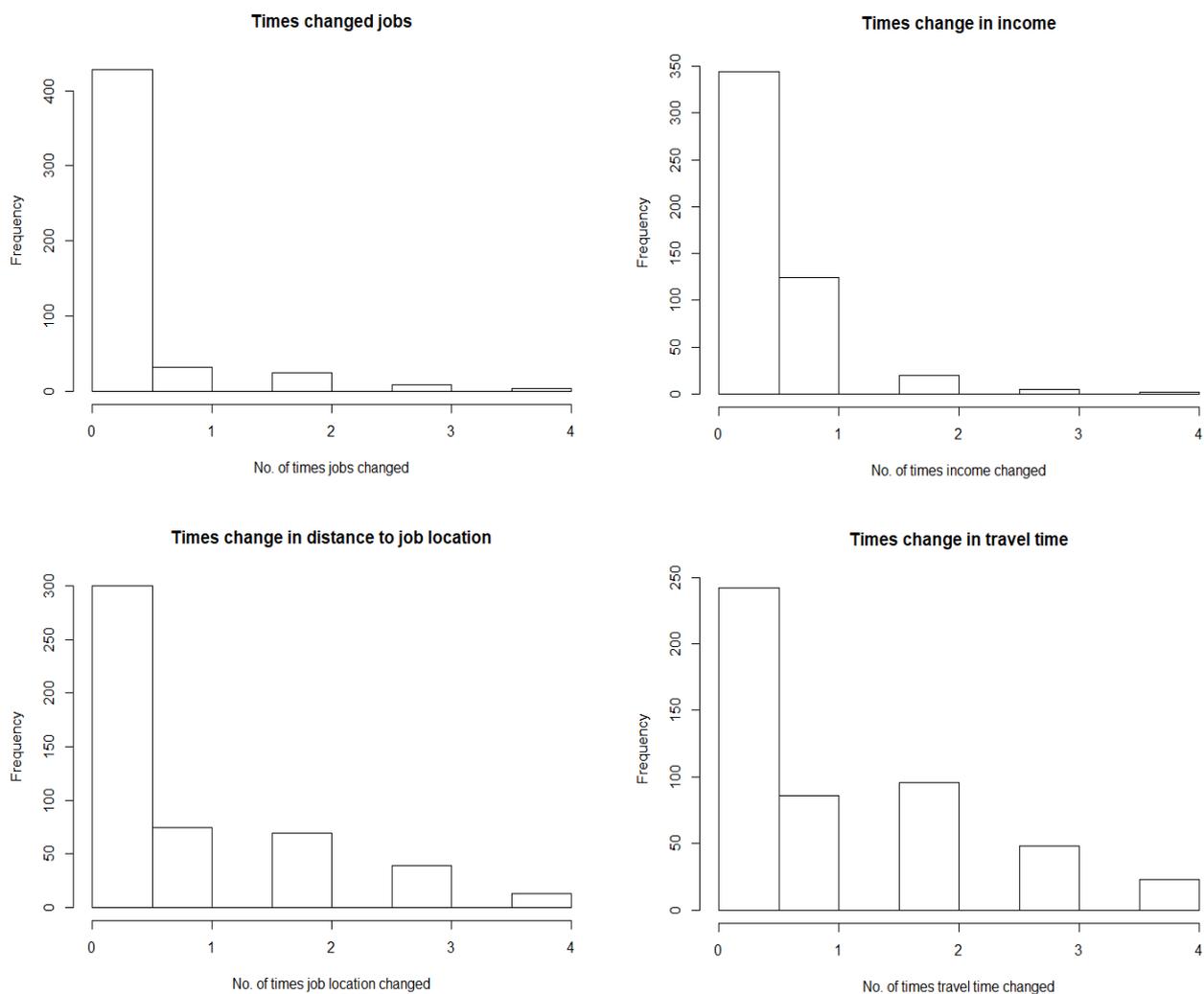


Figure 2. Histogram of times change in job and work-trips before and after relocation

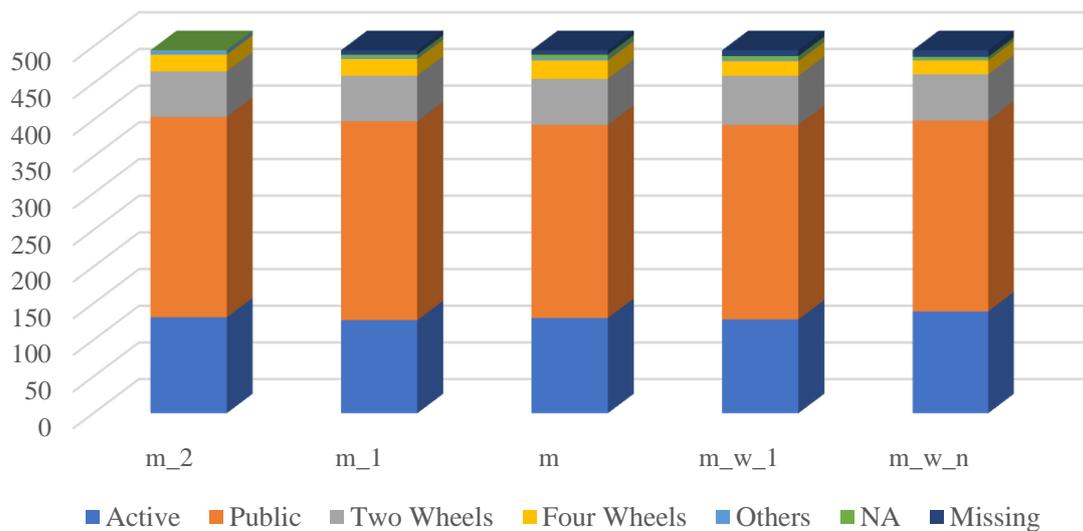


Figure 3. Five-year mode choice before and after relocation. (m_2: Current year; m_1: 1 year after relocation; m: year of relocation; m_w_1: 1 year before relocation; m_w_n: 2 years before relocation)

3. RESULTS AND DISCUSSION

3.1 Methodology

The Decision Tree (DT) is an Exploratory Multivariate Data Analysis (EMDA) technique that creates a simple representation for the existing relationship between the dependent variable and independent variable within a dataset. It is a sequential partitioning of the dataset, considering the individual variables. Tree models are fitted by successively splitting the data to form homogeneous subsets. The result is a hierarchical tree of decision rules useful for prediction or classification (Breiman *et al.*, 1984 and Pitombo *et al.*, 2011). The decision-tree (DT) approach has been used in the analysis of residential satisfaction as well. The decision tree can be a powerful tool to measure the impacts and contribution of various variables on satisfaction levels especially while analyzing long-term impacts as showcased in Zhang (2014), where he evaluated the effect of life-term choices on residential self-selection.

For this study, the R software package ‘rpart’ (Therneau *et al.*, 2018) was employed for undertaking the Classification and Regression Tree (CART) algorithm. The study sample was divided into training (70%) and validation (30%) data sets. The training data set was used to build a decision tree model, and the validation dataset was used to select the appropriate tree size with the highest prediction accuracy.

3.2 Results of Decision Tree Analysis

The main point of interest of the Decision Tree illustrated in *Figure 4* is to classify the SRH inhabitants according to their life satisfaction related to sociodemographic characteristics and changes in economic and work-trip attributes after their relocation. The endpoint which is life satisfaction takes on the value of “BO” for “Better off” if their perception of their current condition is better than their life in the slums; the value “WO” for “Worse off” if they perceive their current life as worse than their life in the slums, and “NC” for “No change” if they did not feel any changes in their life before and after relocating to the SRH. A short description of each of the variables is listed in *Table 1* *Table 2*.

The tree was generated from a sample of 346 respondents with a prediction accuracy of 70.9%. Hence, about 70.9% of the respondents were classified accurately on split nodes. The target variable, which is the change in life satisfaction adopted at least seven observations for each leaf node. The CART algorithm chose five explanatory variables for the DT, in order of importance: change in transportation satisfaction (57.9%), job type (12.2%), change in housing satisfaction (9.2%), age (6.2%), and household size (4.7%). Other variables not included in the tree but had variable importance value higher than 1.0% are current travel mode to work and education. “An overall measure of variable importance is the sum of the goodness of split measures for each split for which it was the primary variable, plus goodness * (adjusted agreement) for all splits in which it was a surrogate. In the printout, these are scaled to sum to 100, and the rounded values are shown, omitting any variable whose proportion is less than 1% (Therneau *et al.*, 2018).” CART calculates the variable importance score by examining “the improvement measure attributable to each variable in its role as a either a primary or a surrogate splitter. The values of ALL these improvements are summed over each node and totaled, and are then scaled relative to the best performing variable. The variable with the highest sum of improvements is scored 100, and all other variables will have lower scores ranging downwards toward zero. A variable can obtain an importance score of zero in CART only if it never appears as either a primary or a surrogate splitter. Because such a variable plays no role anywhere in the tree, eliminating it from the data set should make no difference to the results” (“What is the Variable Importance Measure? - Dan Steinberg’s Blog,” n.d.).

After generating the DT, an interesting finding is that the most crucial variable identified for explaining the life satisfaction of SRH dwellers was the change in transportation satisfaction (CST). From the root, the tree split into two: (a) individuals who experienced either a positive or no change in transportation satisfaction (branch 1) and (b) individuals who experienced negative changes in transportation satisfaction (branch 2).

Branch 1 corresponds to the individuals who experienced either a positive or no change in transportation satisfaction further partitions due to the second most important variable: job type (JT). Two more groups are formed: (a) individuals who are in business/self-employed (BSE), daily wage earners (DWE), working for private service (PS), and skilled laborers (SL); and (b) individuals who are working as domestic workers (DW), in government service (GS), shopkeepers (SK), street vendors (SV), and unskilled laborers (UL). Branch 2 corresponding to the individuals who felt negative changes in transportation satisfaction also subdivides due to the same explanatory variable. The CART algorithm selected other explanatory variables at the splitting procedure.

To the end of the segregation of the data, 10 terminal nodes were found. Ten groups of individuals were characterized as “homogeneous” with respect to the target variable. Through the data segmentation, one can observe the influence of different explanatory variables on life satisfaction (branching tree): change in transportation satisfaction (1st), job type (2nd), change in housing satisfaction (3rd), age (4th), and household size (5th).

The change in transportation satisfaction was found to be the most important factor for life satisfaction. It is noteworthy that the most substantial proportion of respondents (45.9%) who felt no improvements in both their housing and transportation domains perceived no changes in their overall wellbeing. This is consistent with the findings of Reardon and Bache (2015) that improving journey quality is a factor influencing well-being. This result hopes to highlight the significant contribution of transportation to well-being among the urban poor. To the best of our knowledge, this is not yet explored empirically. However, the results are similar to studies linking transportation and life satisfaction among the elderly in the USA by Cutler (1975) and among households in Canada by McCarthy & Habib (2018).

The second most important explanatory variable for life satisfaction is the job type. This supports the considerable body of research linking occupation and job satisfaction with well-being (Rice *et al.*, 1980; Bamundo & Kopelman, 1980; Grün *et al.*, 2010; Law *et al.*, 1998). *Figure 4* provides a general trend that individuals who have their own business and are in skilled labor see themselves better off than before compared to those doing unskilled labor.

Housing satisfaction as the third most critical variable affecting the overall life satisfaction of the SRH dwellers was highly expected due to the wealth of literature that security of tenure and the physical improvement of housing would lead to higher morale and well-being especially among low-income households (Rohe & Stegman, 1994; Peck and Stewart, 1985; Carp, 1975).

Finally, household size and age also influence the overall life satisfaction. Easterlin and Sawangfa (2007) state that in the United States happiness is positively correlated with socioeconomic status and “is fairly constant over time; rises to midlife and then declines; and is lower among younger than older birth cohorts. These four patterns of mean happiness can be predicted rather closely from the mean satisfaction people report with each of four domains – finances, family life, work, and health. The importance of any given domain depends on the happiness relation under study (by socio-economic status, time, age or birth cohort).”

4. CONCLUSION

The Comprehensive Mobility Plan for Greater Mumbai outlines several strategies including the improvement of the public transport system and the widening of existing roads to address current issues on the decreasing public transport share and decreasing ridership on bus system (MCGM, 2016). The massive investments on transport infrastructure coupled with the ambitious vision of the government of Mumbai to be a “world-class city” (“Mumbai’s quest for ‘world city’ status,” n.d.) highlight the need to look into sustainability measures of its various programs and projects. This is to avoid the failures of urban development policies in the developed nations. Grengs (2000) highlighted the critical connection between social justice and transportation by affirming that the failure of transportation policy to provide adequate access to jobs and other services is among the reasons for the social conflicts arising from urban renewal programs in the USA.

The Organization for Economic Co-operation and Development (OECD) advocates for the measurement of happiness and wellbeing to complement objective information in evaluating the quality of life between nations (OECD, 2011). This study aims to contribute to the well-being agenda for policy evaluation, particularly in developing nations, to ensure the sustainability of policy interventions (Reardon & Bache, 2015). Understanding the factors that affect the life satisfaction of inhabitants before and after living in slum rehabilitation projects helps guarantee the success of these programs; where complementary interventions that reflect the needs of communities are provided to propel upward mobility.

Decision trees present data graphically making it a convenient data-driven tool that is easily interpretable. It also allows for the identification of the most critical factors influencing life satisfaction. The decision tree model generated in this study shows that the satisfaction on the transportation domain is the most critical variable explaining differences between inhabitants who feel satisfied in their life or not. A noteworthy finding is that the most significant proportion of respondents (45.9%) who felt no improvements in both their housing and transportation domains perceived no changes in their overall wellbeing. Other significant factors that were found to be relevant in differentiating residents are occupation, change in satisfaction on housing, age, household size, travel mode to work, and education. These findings are in line with earlier studies on the relationships between life satisfaction and satisfaction in other life domains of an individual.

The importance of transportation in the lives of people who live in SRH gets highlighted in this study. In order to capitalize on the gains of providing security of tenure and improved physical conditions to former slum dwellers, the establishment of infrastructure particularly for transportation is needed to ensure the unrestrained connections between the people and to economic and social opportunities.

This study highlights the need to improve mass transport and walkability with the end in mind of equitable allocation of urban road space. Moreover, the design of future slum rehabilitation housing projects can be linked with satisfaction and quality of life indicators to ensure that the projects are inclusive (e.g., keeping in mind the accessibility to schools, tram stations, and cultural and religious facilities) and minimize the barriers to ensure upward mobility. This study may also serve as a starting point for transportation studies related to the optimization of public transport. By characterizing the users of these housing projects in relation to their work trips, inclusive transport infrastructure is possible through proper targeting of hard and soft transport infrastructure projects.

However, it should also be noted that the study had its fair share of limitations. The analysis is limited by the collected data. First, the focus on only newer SRH buildings does not consider older buildings which usually have more inadequate living conditions. Second,

we did not investigate specific conditions of accessibility to transportation infrastructure in said projects. Third, all inherent limitations related to recalling old memories in a retrospective survey does limit the scope of analysis. Finally, considering other unobserved variables such as life-course events would have benefitted the analysis.

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REFERENCES

- (OECD), O. for E. C. and D. (2011). *How's Life?* OECD. <https://doi.org/10.1787/9789264121164-en>
- Abe, R., & Kato, H. (2017). Built Environment, Travel, and Residential Satisfaction in a Developing City: Can Residents under Rapid Urbanization Agree with a Sustainable Urban Form? *Asian Transport Studies*, 4(3), 481–498.
- Alam, S. S. B., & Matsuyuki, M. (2018). Dwellers' Satisfaction on Slum Rehabilitation Scheme and its Affecting Factors in Mumbai, India. *Urban and Regional Planning Review*, 5, 67–86.
- Bamundo, P. J., & Kopelman, R. E. (1980). The moderating effects of occupation, age, and urbanization on the relationship between job satisfaction and life satisfaction. *Journal of Vocational Behavior*, 17(1), 106–123. [https://doi.org/10.1016/0001-8791\(80\)90020-2](https://doi.org/10.1016/0001-8791(80)90020-2)
- Bardhan, R., Sarkar, S., Jana, A., & Velaga, N. R. (2015). Mumbai slums since independence: Evaluating policy outcomes. *Habitat International*. <https://doi.org/http://dx.doi.org/10.1016/j.habitatint.2015.07.009>
- Booth, D., Hanmer, L., & Lovell, E. (2000). *Poverty and Transport A report prepared for the World Bank in collaboration with DFID*. Retrieved from <https://www.odi.org/sites/odi.org.uk/files/odi-assets/publications-opinion-files/3554.pdf>
- Breiman, L.; Friedman, J. H.; Olshen, R. A.; Stone, C. J. (1984). *Classification and Regression Trees*. California. Retrieved from <https://rafalab.github.io/pages/649/section-11.pdf>
- Carp, F. M. (1975). Impact of Improved Housing on Morale and Life Satisfaction. *The Gerontologist*, 15(6), 511–515. <https://doi.org/10.1093/geront/15.6.511>
- Census of India. (2011). Primary Census Abstract for Slum. (I. Office of the Registrar General & Census Commissioner, Ed.). New Delhi.
- Chikaraishi, M., Jana, A., Bardhan, R., Varghese, V., & Fujiwara, A. (2017). A framework to analyze capability and travel in formal and informal urban settings: A case from Mumbai. *Journal of Transport Geography*, 65, 101–110. <https://doi.org/https://doi.org/10.1016/j.jtrangeo.2017.09.001>
- Cutler, S. J. (1975). Transportation and Changes in Life Satisfaction. *The Gerontologist*, 15(2), 155–159. <https://doi.org/10.1093/geront/15.2.155>
- Danquah, J. A., Attippoe, J. A., & Ankrah, J. S. (2014). Assessment of residential

- satisfaction in the resettlement towns of the Keta basin in Ghana. *International Journal Civil Engineering, Construction and Estate Management*, 2(3), 26–45.
- Day, J. (2013). Effects of involuntary residential relocation on household satisfaction in Shanghai, China. *Urban Policy and Research*, 31(1), 93–117.
- Day, J., & Cervero, R. (2010). Effects of residential relocation on household and commuting expenditures in Shanghai, China. *International Journal of Urban and Regional Research*, 34(4), 762–788.
- Debnath, R. (2018). Slum Rehabilitation: Putting the ‘Home’ into ‘Homeostasis.’ *Bluesci: Cambridge University Science Magazine*.
- Easterlin, R. A., & Sawangfa, O. (2007). *Happiness and Domain Satisfaction: Theory and Evidence*. Retrieved from <http://ftp.iza.org/dp2584.pdf>
- Ferreira, F. H. G., & Lugo, M. A. (2012). *Multidimensional Poverty Analysis Looking for a Middle Ground*. Retrieved from <http://econ.worldbank.org>.
- Ge, J., & Hokao, K. (2006). Research on residential lifestyles in Japanese cities from the viewpoints of residential preference, residential choice and residential satisfaction. *Landscape and Urban Planning*, 78(3), 165–178. <https://doi.org/https://doi.org/10.1016/j.landurbplan.2005.07.004>
- Goulias, K. G. (1999). *Longitudinal analysis of activity and travel pattern dynamics using generalized mixed Markov latent class models. Transportation Research Part B: Methodological* (Vol. 33). [https://doi.org/10.1016/S0191-2615\(99\)00005-3](https://doi.org/10.1016/S0191-2615(99)00005-3)
- Grengs, J. (2000). *Advancing Social Equity Analysis in Transportation with the Concept of Accessibility*. Retrieved from <https://www.psc.isr.umich.edu/pubs/pdf/rr15-848.pdf>
- Grün, C., Hauser, W., & Rhein, T. (2010). Is Any Job Better than No Job? Life Satisfaction and Re-employment. *Journal of Labor Research*, 31(3), 285–306. <https://doi.org/10.1007/s12122-010-9093-2>
- Independent Evaluation Group Sustainable Development. (2016). *Project Performance Assessment Report: India Mumbai Urban Transport Project*. Retrieved from www.worldbank.org
- Kährik, A., Leetmaa, K., & Tammaru, T. (2012). Residential decision-making and satisfaction among new suburbanites in the Tallinn urban region, Estonia. *Cities*, 29(1), 49–58. <https://doi.org/https://doi.org/10.1016/j.cities.2011.07.005>
- Law, M., Steinwender, S., & Leclair, L. (1998). Occupation, Health and Well-Being. *Canadian Journal of Occupational Therapy*, 65(2), 81–91. <https://doi.org/10.1177/000841749806500204>
- McCarthy, S., & Habib, M. A. (2018). Investigation of life satisfaction, travel, built environment and attitudes. *Journal of Transport & Health*, 11, 15–24. <https://doi.org/10.1016/J.JTH.2018.09.007>
- MCGM. (2016). Preparation of Comprehensive Mobility Plan (CMP) for Greater Mumbai: Draft Final Report.
- Michalos, A. C. (ed. . (2005). *Citation Classics from Social Indicators Research*. Netherlands. Retrieved from <https://link.springer.com/content/pdf/10.1007%2F1-4020-3742-2.pdf>
- Mumbai’s quest for “world city” status. (n.d.). In *Asia-Pacific Ministerial Conference on Housing and Human Settlements*. New Delhi, India. Retrieved from www.unhabitat.org
- Nijman, J. (2008). Against the odds: Slum rehabilitation in neoliberal Mumbai. *Cities*, 25(2), 73–85. <https://doi.org/10.1016/J.CITIES.2008.01.003>
- Patel, S. B. (1996). Slum rehabilitation in Mumbai: possible if done differently. *Economic and Political Weekly*, 1047–1050.

- Peck, C., & Kay Stewart, K. (1985). Satisfaction with Housing and Quality of Life. *Home Economics Research Journal*, 13(4), 363–372. <https://doi.org/10.1177/1077727X8501300403>
- Pitombo, C. S., Kawamoto, E., & Sousa, A. J. (2011). An exploratory analysis of relationships between socioeconomic, land use, activity participation variables and travel patterns. *Transport Policy*, 18, 347–357. <https://doi.org/10.1016/j.tranpol.2010.10.010>
- Reardon, L., & Bache, I. (2015). The Wellbeing Agenda: Implications for Policy. The Wellbeing Agenda: Implications for Policy. *East-West Institute for Advanced Studies (EWIAS) Viewpoints Journal*, 2. Retrieved from <http://eprints.whiterose.ac.uk/86761/>
- Rice, R. W., Near, J. P., & Hunt, R. G. (1980). The Job-Satisfaction/ Life-Satisfaction Relationship: A Review of Empirical Research. *Basic and Applied Social Psychology*, 1(1), 37–64. https://doi.org/10.1207/s15324834basp0101_4
- Rohe, W. M., & Stegman, M. A. (1994). The Effects of Homeownership: on the Self-Esteem, Perceived Control and Life Satisfaction of Low-Income People. *Journal of the American Planning Association*, 60(2), 173–184. <https://doi.org/10.1080/01944369408975571>
- Rojas, M. (2006). Life satisfaction and satisfaction in domains of life: Is it a simple relationship? *Journal of Happiness Studies*, 7(4), 467–497. <https://doi.org/10.1007/s10902-006-9009-2>
- Roy, A. (2009). Why India Cannot Plan Its Cities: Informality, Insurgence and the Idiom of Urbanization. *Planning Theory*, 8(1), 76–87. <https://doi.org/10.1177/1473095208099299>
- Sunikka-Blank, M., Bardhan, R., & Haque, A. N. (2019). Gender, domestic energy and design of inclusive low-income habitats: A case of slum rehabilitation housing in Mumbai, India. *Energy Research & Social Science*, 49, 53–67. <https://doi.org/https://doi.org/10.1016/j.erss.2018.10.020>
- Therneau, T. M., Atkinson, E. J., & Foundation, M. (2018). *An Introduction to Recursive Partitioning Using the RPART Routines*. Retrieved from <https://cran.r-project.org/web/packages/rpart/vignettes/longintro.pdf>
- UN DESA. (2018). *World Urbanization Prospects: The 2018 Revision*. United Nations, Department of Economic and Social Affairs, Population Division. [https://doi.org/\(ST/ESA/SER.A/366\)](https://doi.org/(ST/ESA/SER.A/366))
- Varghese, V., & Jana, A. (2018). Interrelationships between ICT, social disadvantage, and activity participation behaviour: A case of Mumbai, India. *Transportation Research Part A: Policy and Practice*. <https://doi.org/https://doi.org/10.1016/j.tra.2018.06.009>
- Varghese, V., Sarkar, S., & Jana, A. (2017). Analysing Disparities and their Impact on Time Use Behaviour: Evidences from Mumbai, India. *Journal of the Eastern Asia Society for Transportation Studies*, 12, 35–56. <https://doi.org/10.11175/easts.12.35>
- What is the Variable Importance Measure? - Dan Steinberg's Blog. (n.d.). Retrieved June 13, 2019, from <https://www.salford-systems.com/blog/dan-steinberg/what-is-the-variable-importance-measure>
- Zhang, J. (2014). Revisiting residential self-selection issues A life-oriented approach. *Journal of Transport and Land Use*, 7(3), 29–45. <https://doi.org/10.5198/jtlu.v7i3.460>

