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A need for policy revision to reach the intended beneficiaries: a learning from middle-income group housing models in Kolkata, India

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Abstract

West Bengal Housing Board initiated two group housing models for catering to the increased demand of affordable housing amongst low-income and middle-income groups. A sole government venture and a joint venture under Public–Private Partnership (PPP). Hence assessing the satisfaction level of group housing residents "with cost" incurred is crucial in making policy decisions. The present study focuses on MIG owing to the challenging housing requirement of this group based on sociological and financial constraints. Selecting MIG group housings from Kolkata, India, satisfaction level was assessed at three discrete domains -"within premises", "at neighbourhood" and "with cost" incurred and holistically by evaluating overall level of satisfaction "with location". Measuring this phenomenon developing a Composite Satisfaction Index (CSI) as a weighted average is also intended in this paper. Primary survey was conducted using structured questionnaires and data were collected on a five-point Likert scale. Data being ordinal in nature a two step approach was adopted: initially through exploratory factor analysis contributing attributes were identified and later a Generalised Ordered Logit Model was fitted in STATA. Mean satisfaction scores were computed and validated with savings calculated as a difference of actual expenditure and recommended expenditure towards housing. Attribute "with cost" contributed significantly towards overall level of satisfaction "with location" in both the models. Higher income leading to high affordability, high satisfaction domain wise led to high satisfaction level and CSI for the PPP residents. Lower income leading to low affordability, moderate satisfaction domain wise led to moderate satisfaction level and CSI for the residents of government group housings. Computed CSI values complied with overall findings indicating the reliability of the index in similar contexts. Affordability variations hamper the successful outreach of implemented government policies to the intended beneficiaries hinting at a need for policy revision.

Keywords Middle-income group · Government group housing model · Public–private partnership model · Composite satisfaction index · Partial proportional odds model

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Table 1 National Criteria for defining MIG category in India. *Source*: *Ministry of Housing and Urban Poverty Alleviation, Government of India (2011)
**National Council of Applied Economic Research (2005)

Criteria	Value
Size of dwelling unit*	Maximum of 80 square meter carpet area
Cost of dwelling unit*	Not exceeding 5 times household gross annual income
EMI/Rent payable*	Not exceeding 40% of gross monthly income
Annual Income*	INR 200,000 to INR 1,000,000
MIG sub-categories**	"Seekers" (annual income of INR 200,000–INR 500,000)
	"Strivers" (annual income of INR 500,000–INR 1,000,000)

1 Introduction and background of the study

The Indian subcontinent is urbanising at a fast pace. The total urban population in the Indian context was 31.16% in the year 2011 (Census of India). The Planning Commission forecasted a rise of above 40% by 2020 in the urban population (Chadchan and Shankar 2012). Consequently, demand for basic services is augmented by increased population for basic services which are not fulfilled amongst the Low-Income and Middle-Income Groups. The present study specifically focuses on the housing shortage encountered by the Middle-Income Groups (MIG) as they comprise of 19% of the total Indian population and is the fastest growing section (Kannan and Raveendran 2011). The housing requirement of this group is also a challenge owing to the sociological constraints of residing in substandard living condition and lack of affordability which captivates them from owning a house. The national criteria for defining a MIG category in India are presented in Table 1. To overcome the affordable housing dearth amongst these groups, the government agencies have played a key role. Amongst the different measures adopted the provision of group housings was one such step. Group housings refer to "housing for more than one dwelling unit where land is owned jointly and the construction is undertaken by one agency" (National Building Code of India 2005). Group housings provide dwelling unit with different amenities within its boundaries considering buyers' financial capacity. Moreover shared and reduced burden of initial investments and later maintenance costs make these a desirable alternative for MIG. Hence the present study focuses on the MIG residents of group housings.

West Bengal state also encountered a similar situation where increased demand for affordable housing was posed by the new job seekers following the urbanisation. To cater to this rising demand, West Bengal Housing Board (WBHB) since its inception in 1972, emerged as the sole government agency responsible for dealing with the situation. Provision of group housings incorporating all the income groups within the same boundaries was adopted by WBHB, which is still a practised model. Further resource constraint and augmented housing demand led to the implementation of the Public–Private Partnership (PPP) model-an arrangement between both the parties with the aim to harness the advantages of each of them. WBHB first adopted this model since 1993 to address the cleavage between the demand and supply of housing (Sengupta 2006). It had a mandatory cross subsidy approach to accommodate the Low-income and MIG within the group housings. There were also prescribed standards set by the government agencies for the income, price, size, location of such dwelling units, the construction quality, provision of attributes within premises (Sengupta 2006). Two models of affordable housing delivery: sole

government model and joint venture model are operational in Kolkata where provision of group housings was adopted to overcome the housing shortage considering the buyers' cost constraints. But so far no statistical analysis has been conducted to examine the satisfaction level of the residents of both the housing models. Thus the present study aims at assessing and comparing the satisfaction level of the MIG residents considering their sociological and monetary constraints by selecting group housings which are comparable. Satisfaction level has been assessed twofold: individually at discrete domains of "within premises", "at neighbourhood" and "with cost" and holistically by evaluating overall level of satisfaction "with location". This gives an understanding that which model is more successful in its outreach to the intended beneficiaries.

The research objectives are as follows:

1. To identify the significant attributes contributing towards residents overall satisfaction level from "within premises", "at neighbourhood" and "with cost".
2. To assess the satisfaction level of the residents "with cost" based on satisfaction scores computed from reported satisfaction values and validation using the savings components.
3. To devise a Composite Satisfaction Index (CSI) as a weighted sum of location and cost attributes to assess the satisfaction level of MIG group housings.

Satisfaction on attribute "within premises" has been assessed as these are group housings where required attributes like water supply, sanitation services, parking, community facilities are provided within the boundaries. Assessment of residents satisfaction level outside premises has been conducted "at neighbourhood" domain as most of the human interactions take place at this scale (Lawhon 2009; Karuppannan and Sivam 2011) considering attributes related to infrastructure like hospital, school, market. A distance of one kilometre from the group housing is identified as the neighbourhood. The overall level of satisfaction "with location" has been assessed as these individual satisfaction levels play an important role in affecting it in totality. Assessment of satisfaction "with cost" attributes helps to identify the satisfaction level with the component which is a limitation for this group. Attributes were considered after comprehensive literature search discussed in Sect. 2. The present study focuses on the satisfaction level with the physical presence of infrastructural attributes at each of the domains. The unit level details are beyond the scope of the study. Further, the mean satisfaction scores for attributes available and costs incurred were computed from reported satisfaction values. The satisfaction scores "with cost" attributes were validated with the savings components from housings derived as deviations of the actual expenditure from the recommended expenditure (40% of monthly income). Subsequently, a CSI for assessing satisfaction level of MIG group housings was evolved.

2 Literature review

2.1 Identification of attributes considered by the researchers

Identification of varied attributes considered by the researchers in their respective studies for assessing satisfaction level in different urban settings was crucial. Hence a literature review was conducted to identify the same. Selection of attributes has been done considering the individual scope of the studies which were mostly related to residential

Table 2 Attributes considered by the researchers in their respective studies. *Source*: Compiled by the authors from literature review

Sl. No.	Author's name	Year of Publication	Study area	Physical	Social	Socio-Economic	Household	Cultural/ Racial	Cost*
1	Lee T.	1968	Cambridge						
2	Fernandez R.M., Kulik J.C.	1981	United States						
3	Sulaiman H., Yahaya N.	1987	Malaysia						
4	Vrbka S.J., Combs E.R.	1993	United States						
5	Ukoha O.M., Beamish J.O.	1997	Nigeria						
6	Djebarni R., Al-Abed A.	2000	Yemen						
7	Sirgy M.J., Cornwell T.	2002	Virginia						
8	Shields M., Wooden. M.	2003	Australia						
9	Chapman D. W., Lombard J. R.	2006	United States						
10	Adriaanse C. C. M.	2007	Dutch Residents						
11	Anderson H.S.	2008	Denmark						
12	Howley P., Scott M., Redmond D.	2009	Dublin city						
13	Lovejoy K., Handy S., Mokhtarian P.	2010	California						
14	Mohit M.A., Ibrahim M., Rashid Y.R.	2010	Malaysia						
15	Dekker K., Vos, S.D., Musterd, S., Kempen, R.V.	2011	European Cities						
16	Hong T.T.	2011	Malaysia						
17	Aulia D.W., Ismail A. M.	2013	Medan City						
18	Bekleyen A., Kormaz N.M.	2013	Mass housing settlement Turkey						
19	Addo I A.	2016	Accra Region of Ghana						
20	Mohit M.A., Ali M.S.	2016	Malaysia						
21	Wang D., Wang F.	2016	China						
22	Ghasrodashti R.E., Majedi H., Paydar M.	2017	Iran						
23	Milic J., Zhou J.	2017	Serbia						
24	Ren H., Folmer H.,	2017	China						

*Cost components have been highlighted in a darker shade of "Grey colour" to signify that these have been considered by few of the researchers in their satisfaction studies

satisfaction, housing satisfaction, neighbourhood satisfaction, life satisfaction conducted at different scales like unit level, neighbourhood level, community level, city level and even at regional level. Some studies are general, some are specific to low cost communities, public housing, private housing, gated communities. However, the commonality of the attributes considered reveals that they can be categorised under physical, social, socio-economic attributes along with design related attributes at the unit level. Cost-related attributes have been scarcely addressed though attribute "with cost" is one of the domains of this research. The accessibility pattern in the neighbourhood, availability of public services, distance from the CBD, closeness to work, shopping centres, entertainment, local facilities, nearby schools etc were clubbed under the physical attributes. The level of social interactions with neighbours, safety, crime rates in the neighbourhood consisted of the major social components. Amongst the socio-economic attributes, the important ones included those of family composition, gender, educational level, family income. The ownership status, length of stay, race and culture comprised the major household-level attributes. Property-related costs and house value in the neighbourhood were the important cost-related attributes. The major attributes considered in the different studies has been categorised under the above mentioned heads and these are presented in Table 2.

From the literature review conducted it is evident that the role of cost attributes has been less stressed upon. Few researchers had considered property-related costs in affecting satisfaction level. Fernandez and Kulik (1981) in a study of USA considered neighbourhood estimated cost of living and estimated income inequality within the neighbourhood. Interalia attribute 'home value' in the neighbourhood was stressed upon by Sirgy and Cornwell (2002) in a study of south-west Virginia. In a study conducted by Hong (2011) in Malaysian neighbourhoods, property value in the neighbourhood was considered as an important determinant of satisfaction level. Mohit and Ali (2016) in assessing the relationship between neighbourhood satisfaction and quality of urban life in middle-income terrace housing of Malaysia, found that the value of the house and estimated cost of living affected the satisfaction level most.

2.2 Attribute selection relevant to the study

The attributes selected at each of the domains in the present study were initially identified through literature review. Residential satisfaction studies so far were not specific to MIG group housing. The studies mostly considered the physical, social, socio-economic, household-level attributes in an integrated level while evaluation. Assessing the satisfaction level considering cost attributes was rarely observed in earlier studies which are included in the present study. Believing a high urban population growth of MIG section in the Indian context (Benihocker et al. 2007) the authors identify the MIG government and PPP group housings of Kolkata in a nearby location for in-depth study. Assessment has been conducted "within premises", "at neighbourhood", "with location" and "with cost" considering attributes listed in Table 3. The attributes "within premises" were related to physical and social infrastructural facilities provided within the boundary of the housing focusing on the local area conditions. The housings mostly depend on city level service for fire, waste disposal etc. The housings are not upgraded with the present day sustainable features like use of solar energy, rain water harvesting, use of grey water. Most of the housings included similar basic amenities against reasonable maintenance charge making it affordable to all. Attributes "at neighbourhood" were similar to those considered by the earlier researchers available within a distance of one kilometre radius like education, market, healthcare, bus/auto stand and others. The present study emphasises on assessing satisfaction "with cost" as these will help to capture the limitation of a MIG who neither can reside in substandard condition nor have the affluence to choose a high-end living. This is a novelty in this study pertaining to MIG residents of group housings as no attempts have been done in similar line. Researchers in the previous studies mostly focussed on property related costs, stamp and registration duty charges, tax base. However due to limited access to such financial data in context of Indian housing scenario, the present study considered regular travel costs, maintenance costs and property related costs quantified in terms of initial investment made or monthly rent and EMI payable under the head of "with cost" attributes. Finally the CSI has been computed specifically for MIG group housings as a weighted sum of attribute "with location" (measured with the attributes available "within premises" and "at neighbourhood") and "with cost" which is a constraint for the MIG residents.

3 Methodology

Segregation of attributes in each of the domains, acquiring resident's satisfaction under each category was the first step towards achieving the objectives. Questionnaires were prepared accordingly for data collection and household survey was conducted.

Table 3 List of attributes considered for the present study. *Source*: Compiled by authors from the literature review

Domain	List of attributes considered
"Within premises"	*Availability of*
	Water supply
	Electricity
	Generator set
	Drainage
	Garbage disposal
	Security system
	Fire fighting system
	Street lighting
	Parking
	Children' park
	Community services
	Community space
	Gymnasium and swimming Pool
"At neighbourhood"	*Availability of*
	Market
	Educational facilities
	Bus stand/auto stand
	Health facilities
	Bank and ATM
	Recreational facilities
	Other utilities such as postal and courier service, eateries etc.
"With cost"	*Travel costs incurred for travel to*
	Workplace
	Educational institute
	Regular shopping/ corner shop
	Other utilities such as bank/ATM, postal and courier service, recreation, health care
	Maintenance/service costs
	Maintenance of common areas and services "within premises"
	Property related costs
	Initial investment made
	EMI payable
	Monthly rent

Identifying the attributes contributing to the satisfaction in each domain forms the next step. Further, mean satisfaction scores were computed from reported satisfaction values and validated with the savings from the housing. Obtaining experts opinion to give weights to each of the above aspects led to the conduct of expert opinion survey to compute the CSI. Comparisons could be drawn between the two housing models based on the CSI.

3.1 Study area, questionnaire design and conduct of the survey

Group housings provided under both the models were chosen in nearby location from Kolkata. The household survey was conducted randomly depending upon the restricted access to site, availability and willingness of the respondents by the first author. Responses were collected from one adult respondent of each sample household (preferably household head) by direct interview. This ensured completeness and avoid misinterpretation. A total of 75 and 76 houses were surveyed from the government and PPP group housings respectively. The structured questionnaires initially comprised of a section focusing on the preliminary socio-economic profile of households such as age, sex, household size, income, vehicular possession, length of stay, tenure status. Based on the tenure status, questions related to attributes "with cost" towards enjoying the property were also framed. It was followed by a set of questions on the availability and satisfaction level for each of the attributes "within premises" and "at neighbourhood". Satisfaction "with cost" for availing those attributes was also recorded. All satisfaction responses were recorded on a five-point Likert scale varying from 1 (Poor) to 5 (Very Good). Finally, the question on the overall level of satisfaction "with location" was also recorded on a five-point Likert scale which also varied from 1 (Not at all satisfied) to 5 (Extremely satisfied).

3.2 Identification of the significant attributes

Data being ordinal in nature and large in number a two-step approach was adopted for identifying the significant attributes affecting the dependent variable. For ordinal variables, non-parametric techniques of analysis like Proportional Odds Model and Partial Proportional Odds Model are appropriate (Gadermann et al. 2012; Peterson and Harrell 1990). In the current case, data reduction for arriving at the factors was carried out initially by conducting exploratory factor analysis in STATA (V13.0) using Polychoric correlation. Polychoric correlation is a measure of association for ordinal variables (Ekstrom 2011). The factor scores obtained subsequently from factor analysis were further analysed in the second step. Studies of Yakubu et al. (2009), Eyduran et al. (2010) and Sakar et al. (2011) had implemented factor scores for further analysis as relevant to their individual studies. However for the Ordered Logit Model (Proportional Odds Model) to hold good the assumption of "proportional odds" or "parallel line" should be met (Williams 2016). The assumption if met indicates that all regression coefficients and Odds Ratios (OR) will be same across the different logistic regressions. This is tested using Brant's test (Williams 2016). However, if defeated, Generalised Ordered Logit Model (Partial Proportional Odds Model) should be used as this gives results that are less restrictive than Ordered Logit but are more parsimonious than non-ordinal alternatives, such as Multinomial Logit (Williams 2005). The Partial Proportional Odds Model has been applied in the studies of Wang and Abdel-Aty (2008), Ziraba et al. (2009), Quddus et al. (2010) and Ochako et al. (2011). The Ordered Logit Model was first used in the present study. However, "parallel line" assumption was defeated. Hence using the factor scores so obtained, a Generalised Ordered Logit Model was applied in the present study using STATA command "gologit2, autofit" as the "autofit" option adjusts the coefficients for the variables violating the "parallel line" assumption (Abreu et al. 2009). A series of Wald's test on all the explanatory variables and a global Wald's test with constrained versus the original unconstrained model, where the insignificant test statistic indicated that the model follows the "parallel line" assumption confirmed

the overall model fit (Williams 2006). Hence the significant factors affecting the dependent variable were identified.

3.3 Computation of satisfaction scores and validation using savings

Mean satisfaction scores were computed from reported satisfaction values on Likert scale with attributes available and "with cost" incurred at each domain along with investment made towards housing (for owners) /rent paid (for renters). Computed satisfaction scores "with cost" were validated by the savings generated from housing worked out as the difference of the actual expenditure incurred from the expected expenditure standard. The actual expenditure incurred on housing was calculated as a summation of monthly maintenance, monthly Uniform Annual Equivalent Cost (UAEC),[1] Equated Monthly Instalment (EMI) (for owners) or monthly rent (for renters). For computation of the expected expenditure initially, the average income for MIG household was identified from the study of Sengupta (2006) where the stated income range for a MIG household during the year 2000 was INR 5000–9999. The average income for a MIG household is projected in the present study from the then average of INR 7500. The present value (PV) of this income (as in the year 2000) was calculated till 2010 using an average Consumer Price Index (CPI) [2] decadal inflation rate of 6.1%. The value was further multiplied by the Dearness Allowance (DA) [3] factor of 1.86 announced for West Bengal in the Fifth Pay Commission (2009) (Source: http://timesofindia.indiatimes.com/india/dearness-allowance-cabinet-approves-2-per-cent-hike/articleshow/57653563.cms). The obtained PV for 2010 was again incremented with the revised CPI decadal inflation rate of 7.8% till 2016 when the survey was conducted. The final value in 2016 was INR 42,193, the projected range being INR 28,114.58–INR 56,223.57. A standard value of 40% was calculated (identified from the MoHUPA norms, 2012 in Section 1 Table 1) from this projected income (INR 16,877.15) and that for the range (INR 11,245.83 and INR 22,489.43 respectively) as recommended standard to be incurred on housing. Further computation of the deviations of actual values reflected the savings.

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[1] The Uniform Annual Equivalent Cost (UAEC) is a method of expressing the cost of an investment in annual or periodic terms (Steiner 1992). This is calculated using the present value of the investment made for buying the house and the Present Value Interest Factor for an annuity (PVIFA$_{r,n}$), rate at which the present value of an annuity occurs regularly (Chandra 2011).

$$UAEC = \frac{PV}{\left(PVIFA_{r,n}\right)}$$

where PV = Present Value, PVIFA$_{(r, n)}$ = Present Value Interest Factor for an annuity

$$(\mathbf{PVIFA}_{r,n}) = \frac{1 - \frac{1}{(1+r)^n}}{r}$$

where r = Average decadal Consumer Price Index (CPI) inflation rate of 4%, n = Expected Age of building (60 years).

[2] http://www.inflation.eu/inflation-rates/india/historic-inflation/cpi-inflation-india-2000.aspx.

[3] Dearness Allowance is the relief provided to the employees and pensioners to neutralise the impact of inflation on their earnings.
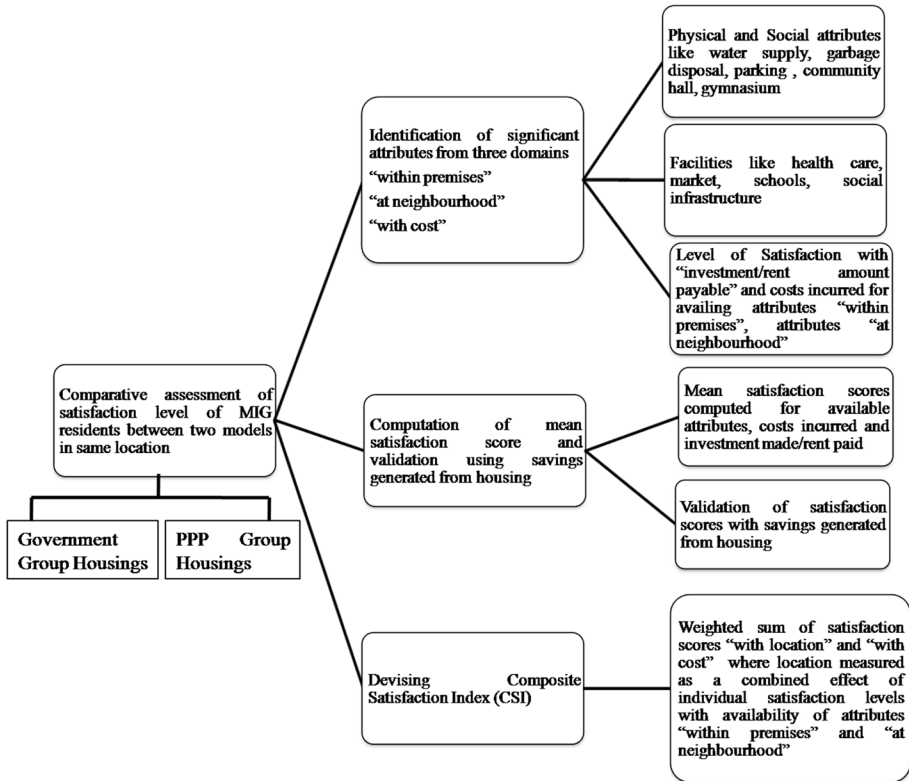
Fig. 1 Methodological framework for assessment of satisfaction level

3.4 Computation of Composite Satisfaction Index (CSI)

A CSI was devised for assessing the satisfaction level of the MIG group housings. It is computed as a weighted sum of satisfaction scores "with location" and "with cost". The locational component is measured considering individual satisfaction levels with attributes available "within premises" and "at neighbourhood". The CSI devised includes satisfaction "with cost": a decision maker on purchase choice for a MIG with affordability limitations. Weights assigned to each component forming the CSI were obtained from unbiased opinion of 16 experts through expert opinion survey which was carried out using Delphi technique (Rowe and Wright 2001). Delphi method is popular in research domains of sociology, planning, management and health which helps on converging at decisions in cases where the number of evidence is less (Verhagen et al. 1998). Amongst the pool of experts, eight experts were selected from real estate and others were selected from WBHB and Housing and Urban Development Corporation. Survey proforma containing questions on weights to be assigned was designed and made available in electronic format explaining the procedure to the experts.

The overall methodological framework adopted for the study is shown in Fig. 1.

Table 4 Rotated factor loadings and unique variances "at neighbourhood" of PPP group housings

Variable	Factor 1	Factor 2	Uniqueness	% variance	Cumulative%	Eigen value
LSB	0.07	**0.78**	0.39	F1: 0.34	0.34	2.12
LSA	**0.90**	0.16	0.17	F2: 0.32	0.66	1.18
LSDM	0.23	**0.58**	0.61			
LSBS	0.12	**0.78**	0.37			
LSDC	**0.91**	0.03	0.17			

Bold indicates the factor loadings greater than 0.5 for the attributes forming the factors

4 Results and discussion

4.1 Resident characteristics

On analysing data it was seen that in case of both the models the household size was three and four. The average monthly income of the households as revealed was INR 25,000 and INR 41,550 in case of government and PPP group housing model respectively who come under the "Seekers" subcategory of the MIG. The common occupation in both the cases was service. Length of stay over 15 years was around 25% in case of PPP group housings. However, the minimum length of stay was over 5 years and up to 10 years in both the models. The average monthly maintenance charges were INR 511 and INR 1270 in case of government and PPP group housings respectively. The dwelling units were majorly owned: 66.7% of the government group housings and 89.5% of the PPP group housings. Rented households were seen more in the government group housings (33.3%) as compared to the PPP group housings (10.5%). The renters of PPP group housings spend a higher percentage of their income (38%) on rent as compared to that of the government group housings (22%). Vehicular possession is around 70%, however residents of PPP group housings possess a higher percentage of four wheelers (63.2%).

4.2 Contributing attributes

4.2.1 First step: results of Exploratory Factor Analysis

The appropriateness of applying factor analysis was first confirmed from the Bartlett Test of Sphericity and Kaiser–Meyer–Olkin (KMO) measure [KMO value of 0.5 and above and p value < 0.05 are considered suitable for factor analysis (Taherdoost et al. 2014)]. For the PPP group housings p value < 0.05 and KMO values of 0.87 "within premises", 0.56 "at neighbourhood" and 0.56 "with cost" confirmed the suitability of factor analysis. A single factor was extracted "within premises", comprising of satisfaction level with water supply, street lighting, parking: two wheeler and four wheeler, and children's park as the significant attributes explaining a variance of 88% (Eigenvalue 4.41).

Two factors were extracted "at neighbourhood" consisting of satisfaction level with the provision of the bank (LSB), ATM (LSA), daily market (LSDM), doctor's chamber (LSDC) and bus stop (LSBS) as the important attributes. The orthogonal varimax rotation was used for better interpretability. Variance explained by the first factor was 34% and that by the

Table 5 Rotated factor loadings and unique variances for "within premises" of government group housings

Variable	Factor 1	Factor 2	Uniqueness	% Variance	Cumulative%	Eigen value
LSWS	0.07	**0.82**	0.32	F1: 0.36	0.36	1.79
LSDRG	0.13	**0.76**	0.41	F2: 0.33	0.69	1.65
LSGD	0.42	**0.61**	0.45			
LSTWP	**0.92**	0.11	0.15			
LSFWP	**0.87**	0.13	0.23			

Bold indicates the factor loadings greater than 0.5 for the attributes forming the factors

second factor was 32%. The final rotated factor loadings and unique variance explained by the two factors extracted "at neighbourhood" is shown in Table 4. A single was also extracted "with cost" attributes comprising of satisfaction with costs incurred for availing attributes at both the domains and investment made towards housing /rent paid explaining a variance of 65% (Eigenvalue 1.95). Factor loadings of 0.5 and above for each attribute in the factor were considered (Costello and Osborne 2005). Further factor scores were predicted for each of the extracted factors which were used for subsequent analysis. For the PPP housings, the factors so obtained were named as Physical attributes (Pppp), Neighbourhood attributes 1 (N1ppp), Neighbourhood attributes 2 (N2ppp) and Cost attributes (Cppp).

For government group housings also, p value < 0.05 and KMO values of 0.63 "within premises", 0.50 "at neighbourhood" and 0.71 "with cost" confirmed the appropriateness of applying factor analysis. For "within premises", in this case, two factors were extracted comprising of satisfaction level with parking: two wheeler parking (LSTWP) and four wheeler parking (LSFWP) as the first factor. Satisfaction level with water supply (LSWS), drainage (LSDRG) and garbage disposal (LSGD) formed the second factor. The orthogonal varimax rotation was conducted for better interpretability in this case also. Variance explained by the first factor was 36% and that by the second factor was 33%. The final rotated factor loadings and unique variance explained by the two factors extracted "within premises" is shown in Table 5.

A single factor was extracted "at neighbourhood" consisting of satisfaction level with the provision of daily market and government hospital as the important attributes. In this case, the explained variance by single factor was 99% (Eigenvalue 1.99). A single factor was also extracted for attribute "with cost" having same attributes as the PPP group housings explaining a variance of 82% (Eigenvalue 2.47). Factor scores were predicted for each of the factors in this case as well. For the government group housings, the factors were named as Physical attributes 1 (P1ghsg), Physical attributes 2 (P2ghsg), Neighbourhood attributes (Nghsg) and Cost attributes (Cghsg). These factors were used for further analysis.

4.2.2 Second step: results of the Partial Proportional Odds Model

The Partial Proportional Odds Model was fitted for the ordinal dependent variable-overall satisfaction level "with location" using the factor scores so obtained in both the cases. The estimations of the model for the PPP group housings are presented in Table 6. All the explanatory variables met the "parallel line" assumption identified from a series of Wald's test (p value > 0.05) (Williams 2005) indicating that all the factors have a significant influence on the dependent variable. Finally, a global Wald's test was done for the final model with where the insignificant test statistic indicated that the

Table 6 Results of Partial Proportional Odds Model using overall level of satisfaction "with location" as a response with four ordered categories* for PPP group housings

Variables	Generalised ordered logit estimates								
	Not at all satisfied versus moderately satisfied			Moderately satisfied versus very satisfied			Very satisfied versus extremely satisfied		
	Coef. β_1	OR_1	p value	Coef. β_2	OR_2	p value	Coef. β_3	OR_3	p value
Physical attributes (Pppp)	0.13	0.84	0.83	0.13	1.33	0.83	0.13	2.03	0.83
Neighbourhood attributes 1 (N1ppp)	2.26	11.17	0.02	2.26	7.92	0.02	2.26	7.90	0.02
Neighbourhood attributes 2 (N2ppp)	3.97	23.47	0.00	3.97	46.42	0.00	3.97	122.45	0.00
Cost attributes (Cppp)	2.51	9.20	0.00	2.51	34.93	0.00	2.51	4.06	0.00
Summary statistics									
Number of observations	76								
Log Likelihood at convergence	60.14								
Pseudo R2	0.36								

Score test for the proportional odds assumption: Chi square $=4.35$, $df=8$, p value $=0.82$

*Four ordered categories as there were no responses in the second category of satisfaction i.e. "Slightly Satisfied"

model follows the "parallel line" assumption (p value $=0.82$). Hence the logit regression coefficients ($\beta_1=0.13$, $\beta_2=2.26$, $\beta_3=3.97$, $\beta_4=2.51$) for all the explanatory variables were same across the thresholds of the dependent variable. The value of the coefficients indicates that the residents have an increased probability of being in the higher category of satisfaction than the current one for one unit increase in the explanatory variables. However, based on p value <0.05 (assuming 5% level of significance) it is seen that attribute "at neighbourhood" and "with cost" significantly affect the dependent variable. Further, OR was also computed which can be interpreted as the change in the odds of being beyond a particular category of satisfaction for a one-unit increase in the explanatory variables (Liu 2016). OR for the neighbourhood attributes $\beta_2=2.26$ are 11.17, 7.92 and 7.90 respectively. This implies that the resident is 11.17 times more likely to be moderately or very satisfied than being not at all satisfied with the increase in the provision of attributes "at neighbourhood" like a bank, daily market and bus stop. Similarly, the second and third value also shows the likelihood of the resident to be towards higher satisfaction categories with the increase in the provision of attributes "at neighbourhood". These are interpreted as this attribute met the "parallel line" assumption. All other OR for the explanatory variables meeting the "parallel line" assumption are interpreted in a similar way.

Hence for the PPP group housings, nearness of bus stop, bank, health facilities and daily market "at neighbourhood" were significantly associated with the overall level of satisfaction "with location". Presence of bus stop is significant as 47.30% of the residents travelled to workplace using public transport. Moreover, availability of bank, ATM and health facilities were also important owing to the use of these facilities on a regular day to day basis. Satisfaction "with cost" attributes is also significantly associated with the overall level of satisfaction "with location" as these residents have a cost constraint hence this factor emerges important.

Table 7 Results of Partial Proportional Odds Model using overall level of satisfaction "with location" as a response with four ordered categories** for government group housings

Variables	Generalised ordered logit estimates								
	Not at all satisfied versus moderately satisfied			Moderately satisfied versus very satisfied			Very satisfied versus extremely satisfied		
	Coef. β_1	OR_1	p value	Coef. β_2	OR_2	p value	Coef. β_3	OR_3	p value
Physical attributes (P1ghsg)	0.09	0.98	0.86	0.09	1.95	0.86	0.09	2.05	0.86
Physical attributes (P2ghsg)	0.97	0.07	0.04	0.97	0.48	0.04	0.97	6.02	0.04
Neighbourhood attributes (Nghsg)	−0.37	1.00	0.59	−0.37	0.97	0.59	−0.37	44.83	0.59
Cost attributes (Cghsg)	3.59	35.68	0.00	3.59	4.28	0.00	3.59	2.65	0.00
Summary statistics									
Number of observations		75							
Log Likelihood at convergence		58.16							
Pseudo R2		0.32							

Score test for the proportional odds assumption: Chi square $= 2.52$, $df = 8$, p value $= 0.96$

**Four ordered categories as there were no responses in the second category of satisfaction i.e. "Slightly Satisfied"

The estimations of the Partial Proportional Odds Model for government group housings are presented in Table 7. In this case, also the factor scores for all the explanatory variables met the "parallel line" assumption identified from a series of Wald's test (p value > 0.05). A global Wald test confirmed the overall model fit by following the "parallel line" assumption (p value $= 0.96$). Hence the logit regression coefficients ($\beta_1 = 0.09$, $\beta_2 = 0.97$, $\beta_3 = -0.37$, $\beta_4 = 3.60$) for all the explanatory variables were same across the thresholds of the dependent variable. This indicates that for one unit increase in these explanatory variables, the residents have increased the probability of being in the higher category of satisfaction than the current one with the respective change in the logit or log-odds. OR for all the explanatory variables is also reported in Table 7. The corresponding values of the OR for each of the explanatory variables indicates the change in the odds of being beyond a particular category of satisfaction level for a one-unit increase in each of the explanatory variables. However negative regression coefficient and OR of attributes "at neighbourhood" indicate vice-versa results.

In this case, based on the p value < 0.05 (assuming 5% level of significance) attributes "within premises" and "with cost" affected the overall level of satisfaction "with location". The satisfaction level with the presence of water supply, garbage disposal and drainage along with satisfaction "with cost" is significantly associated with the dependent variable. The budgetary constraints of these residents restrain them from availing high-end neighbourhood attributes like supermarkets, private healthcare facilities, private schools whereas the PPP residents had the affordability to avail them. This might have contributed towards an insignificant role played by the neighbourhood attributes for residents of government group housings. The significant role of cost attributes in affecting the overall satisfaction level "with location" in both the cases indicates that as these residents have a cost constraint, hence being satisfied "with cost" is most important on their part. Presence of

attributes plays a subsidiary role for them. As the satisfaction "with cost" attributes was significant in both the cases, hence satisfaction scores "with cost" attributes were computed and validated using savings generated from housing for having an in-depth understanding of the satisfaction level.

4.3 Computed satisfaction scores and validation using savings

Computed mean satisfaction scores were validated with savings generated as reported in Table 8. The residents of the PPP group housings have higher satisfaction levels with the attributes available and "with cost", which is also evident on validating their satisfaction scores with the savings component. The residents have higher affordability owning to higher income leading them to spend less than the recommended standard on housing and generation of savings. This contributes towards higher satisfaction level evident from a satisfaction score of 4.45 with investment made towards housing. Moreover, this capability enables them to avail additional attributes "within premises" like gymnasium, swimming pool, green open stretches as well as the high-end supermarkets, private healthcare facilities, private schools "at neighbourhood" leading to higher satisfaction scores "with cost" for availing attributes at each of these domains. In contrast the residents of government group housings have lower income, lesser affordability for which they had opted for subsidised government group housings. Availability of limited attributes "within premises", budgetary constraints for availing high-end neighbourhood attributes, contributed towards moderate satisfaction level. Validation of satisfaction scores with savings reveals less spending than the percentage recommended on housing. However, due to their low income 31.39% of their monthly salary is spent on housing leading to lower saving and the same is reflected from the moderate satisfaction score of 3.43 with investment made towards housing. Renters have reported moderate satisfaction level in both the cases as a high percentage of income (38% and 22% for PPP and government group housings respectively) is spent on rent.

Though attributes "with cost" affect residents satisfaction level in both the housing models, yet PPP residents have higher satisfaction level. This is attributed to higher affordability from the income perspective though they belong to "Seekers" subcategory enabling them to move to subsidised schemes. In contrast, government group housing residents have comparatively lower income leading to moderate affordability and moderate satisfaction levels restraining them from moving towards the high-end living like a PPP resident though belonging to same subcategory. This highlights existence of a discrepancy at national level broadly defining the MIG group though variations exist in affordability conditions at local levels.

4.4 Composite Satisfaction Index (CSI)

Weights assigned by the experts were used to devise the CSI. Two rounds of Delphi were carried out to converge to a common consensus and a feedback report was prepared. More than 80% of the experts did not change their first opinion. Paired t-test was conducted in STATA and was found to be consistent for each item, at 5% level of significance concluding the rounds and working out the results. Only the median values are considered to nullify the effect of extreme values (Rowe and Wright 2001). The computed median weights for the location and costs incurred was 0.5. The locational aspect was measured by attributes available "within premises" and "at neighbourhood", respective weights being 0.55

Table 8 Summary of computed mean satisfaction scores and validation with savings from housing. *Source*: Authors primary survey, 2015–2016

Domain	Government group housings		PPP group housings	
	Satisfaction score (on available attributes)	Satisfaction score ("With Cost" to avail attributes)	Satisfaction score (on available attributes)	Satisfaction score ("With Cost" to avail attributes)
"within premises"	3.61	3.55	4.23	4.23
"at neighbourhood"	3.75	3.62	4.47	4.47
Overall level of satisfaction with location	3.89		4.16	
Actual average income of KMC		25,000		41,550
40% Of actual average income		10,000		16,620
Actual monthly expenditure incurred on housing		7849.84		11,658.08
Savings incurred		2150.16		4961.92
% Of actual income spent on housing		31.39		28.05
Overall level of satisfaction with the investment made towards housing		3.43		4.45
Overall level of satisfaction with rent paid		3.28		3.56

and 0.45. The maximum achievable score being five it forms the divisor. The CSI was computed using Eq. 1.

$$\text{Composite Satisfaction Index} = 0.5 * \frac{0.55 * (\text{SWP}) + 0.45 * (\text{SNL})}{5} + 0.5 * \frac{\text{ASC}}{5}$$

(1)

where SWP = Satisfaction with attributes "within premises", SNL = Satisfaction with attributes "at neighbourhood", ASC = Average of reported satisfaction scores with costs incurred including the investment made towards housing/rent paid and for availing all attributes of both the domains.

The average CSI computed was 0.72 and 0.87 for government and PPP group housings respectively being consistent with the overall findings of the study indicating high satisfaction level of PPP residents in contrast to residents of government group housings. Higher income leading to high affordability, high domain wise satisfaction level led to high CSI for the PPP residents. Lower income leading to low affordability, moderate domain wise satisfaction level led to moderate CSI for the residents of government group housings. Additionally, tenure status, length of stay, affordability to avail high-end neighbourhood attributes, social interaction among the residents, pollution and traffic levels may also lead to varying satisfaction level and CSI. This indicates the importance of working out the CSI as changing effects of satisfaction with the location, attributes available and cost incurred are reflected together.

5 Conclusion

Several residential satisfaction studies conducted worldwide had laid limited emphasis on the role of cost attributes. The present study specifically assesses satisfaction level of MIG residents of group housings in Kolkata not been addressed in prior studies. It highlights that cost factor is the primary determinant of making residential location choice for the MIG residents though cost attributes are addressed scarcely. Attribute "with cost" contributed significantly towards satisfaction level along with attributes available in both the models. The PPP model emerged more successful against higher prices charged and more number of attributes as compared to government housing model. The PPP residents though belong to "Seekers" subcategory yet have higher affordability highlighting that the housings generated through PPP model are enjoyed mostly by the upper end of the "Seekers" leaving the lower end deprived. In contrast moderate satisfaction level of residents of government group housings is attributed to cost constraint, lower affordability and lesser attributes offered in these subsidised prices housings. The reliability of the CSI was also tested by applying it to both the models obtaining consistent results with the overall findings of the study indicating its applicability to any empirical research of similar nature in an urban context. CSI will help in identifying housing locations appropriate for MIG to reside.

Further, it is evident that though the residents of PPP group housings under consideration belong to the same subcategory of "Seekers" yet there are differences in their affordability conditions between the residents of both the housing models. This mismatch is attributed to the broader definition of the MIG offered at the national level hampering the successful outreach of the implemented government policies to the intended beneficiaries. Higher affordability of the residents of PPP group housings enables them to reap the benefits of the implemented policies before it actually reaches the desired group. Honouring

the umbrella of classification at the central level, the government authorities at the state level should be vested with the powers for classifying the MIG into further subcategories in between the strands of the two recognized categories. The variations in the decisions of identifying an intermediate group should be based upon the respective city's profile so as to benefit the beneficiaries at the most. Therefore a relook into further sub-classification of the MIG is necessary as this is an important and rising group of the Indian population and PPP being an adopted model. Issues like the level of social interactions, pollution and traffic level, unit design and orientation which might additionally influence the decision of an individual were not considered being beyond the scope of this study. However, since the "cost" factor remains inevitably bound to this particular income section, the current formulation of the CSI could stand an important measure in similar contexts.

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