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Predicting Future of Senior Housing Markets amid COVID-19 Pandemic in India Using Dependency Models

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Abstract

The COVID-19 pandemic has contributed to a very high percentage of senior deaths in India. Senior citizens constitute about 10% of total population while 73% of deaths during COVID-19 pandemic in India have been of people with co-morbidities such as diabetes, hypertension, heart and respiratory diseases. Amidst this pandemic, the senior housing market is poised for exponential growth despite a low market share as well as slow sales. To inquire as to which factors influence the seniors for not buying into exclusive senior housing communities and whether the decision varies among ages as well as genders; a questionnaire survey was conducted pre-COVID-19 using sales leads of 143 senior respondents from five cities; Delhi, Lavasa, Chennai, Pune and Ahmedabad. These data were tested using binary probit regression models for age and gender. The survey required the respondents to rate decision factors which included; amenities, location, social isolation, wealth, family, urban connect, new relationships, inheritance and moral values - on Likert scale of 1 to 9. The tested model for gender shows that males are dependent on factors of location of the project and fear isolation as compared to females. Males also rated new acquaintances as a discouraging factor as compared to females. The age model shows that older seniors (aged 66-75) do not wish to move to an exclusive senior citizen homes due to factors of distance, fear of social isolation and attachment to urban elements as compared to younger seniors (aged 55-65). An attempt is made to use the results arising from these models to predict the future of senior housing market post-COVID-19 pandemic in India. By integrating new factors such as social distancing, personal hygiene and recreational activities, the existing models can be used to forecast post-COVID-19 senior housing markets in India.

Keywords: Senior housing, real estate, India, COVID-19, binary probit

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1.0 INTRODUCTION

India's projected senior population is around 140 million and growing at a rate of 3.6% per annum in 2020. About 61.7% of the seniors belong to 60-69 age group and 27.4% belong to the 70-79 age group. The national health profile 2019 reported the average life expectancy of Indians as 68.7 years (Moneycontrol, 2020). Mobility is vital to seniors as they go through daily activities such as shopping or socializing. In India, a 2017-18 health survey (NSSO, 2019) reported that 92.4% of seniors were physically active while only 5.5% were confined to homes. Single seniors in the entire country accounted for merely 6% women and 2% men within the urbanized communities, while 20% of men and 12% women lived independently with their partners. As per the data by the Ministry of Health and Family Welfare (MOHFW) in June, 2020, India's COVID-19 fatality rate was at 2.82%, where the senior citizens constituted 50% of the deaths. Currently, In India, senior citizens constitute to about 10% of total population. As per MOHFW, 73% of deaths during COVID-19 pandemic in India have been of people with co-morbidities such as diabetes, hypertension, heart and respiratory diseases.

The middle income population groups have seen healthy growth in wealth and income in last two decades (2000-2019). The idea of retiring with luxury is now being seen as a popular trend, especially for the urban population. In India, luxury housing has always been a privilege to the suburban population. Access to workplace with plethora of lifestyle amenities or a private countryside has been symbolic of luxurious housing in India. The COVID-19 pandemic lockdowns in India pushed the affluent urban families away from the city in their weekend retreat homes, migrant workers back to their farmlands in their villages, and city middle class families to ponder over the idea of space, housing, amenities and access to quality services within their own premises. The future housing trends will need to address the issue of such pandemics and disasters. The impact of COVID-19 on current Indian market is worrisome. As per a popular website; housing.com, "In a survey conducted in collaboration with NARECCO, 53% respondents said they have put their plans to buy a property on hold only for six months and plan to return to the market after that. Nearly 33% respondents in the survey also said they would have to upgrade their homes, in order to work from home. In a renters' survey, 47% respondents said they would like to invest in property if it was rightly priced" (Mishra, 2020). The online work culture in the corporate sector has hit the commercial real estate severely, and the trend is likely to continue for a couple of years as companies find it profitable due to lesser requirement of real estate space by delegating 30-40% of their

workforce to remote/home commuting. Amidst this pandemic the senior housing market is witnessing a slow movement yet is poised for exponential growth. This paper attempts to investigate the core issue of senior choice in housing over their willingness to relocate to a luxurious housing customized to their age and lifestyle; factors which would determine this key decision pre COVID-19 pandemic and predicting a future trend for this market using these results.

■2.0 LITERATURE REVIEW

In late March 2020, India imposed the biggest lockdown in the country, sealing every state border and executing the lockdown in three phases as per the WHO guidelines which lasted close to 9 weeks till 1 June 2020. Several migrant workers were stranded on border camp sites with minimal social distancing and below par food and hygiene level. With less than 25 cases reported on 15 March2020, the country witnessed a flat COVID-19 infection curve till end of lockdowns to 8,300 cases (refer to the website of Ministry of Health and Family Welfare). The phased out unlocks later spiked the COVID-19 curve leading to exponential growth in infections. Delays in testing reduced the ability of people to protect themselves. India had more than 7 million positive cases of COVID-19, but with a recovery of more than 6 Million cases as of 10 October 2020. Unlike other European countries and North American continent, India is still witnessing a long first wave of infections, while most of the big nations are witnessing a second or a third wave. A total of 110,000 deaths have already been reported. The State of Maharashtra leads with highest infections close to 1.5 million (Keelery, 2020).

The COVID-19 situation has raised big concerns over the safety of seniors and their housing needs. Senior housing in India has a significantly low market share compared to traditional housing markets. The size of senior housing market is likely to reach from US$ 1.26 billion in 2016 up to US$ 7.7 billion (PHD Research Bureau, 2017) by year 2030 as a result of improved legal and social framework in India. Financial tools such as reverse mortgage and land security via title insurance is still a problem. Concept communication for reverse mortgage is the key in the future and valuations for the same can be considered critical (Haurin et al., 2017) in coming years. It has only been since last decade (2010-2019) that senior housing projects have gained some marketing thrust for the lifestyle conscious couples and individuals. There has not been a separate product category of luxury senior community before year 2007. Social isolation, loneliness and access to medicine have been top issues concerning seniors in the COVID-19 lockdowns. Generally, seniors have only a close circle of friends and family with whom they routinely interact (Philip & Cherian, 2020) which has affected them further mentally.

Citing global literature; a study on loneliness in three public senior housing communities in the St. Louis area (Taylor et al., 2018) for a sample size of 148 respondents showed that approximately 30.8% of the sample was not lonely, 42.7% was moderately lonely, and 26.6% was severely lonely. In the multivariate analyses, loneliness was primarily associated with depressive symptoms and that the prevalence of loneliness was high in senior housing communities. While loneliness is more of a discrepancy between a person's preferred level of social contact and their actual level of social engagement, social isolation is a conscious decision of having minimal social contact. Loneliness among senior citizens is a subjective, unpleasant feeling (Atwood et al., 2019) seeking companionship; social isolation is an environmental condition due of lack of transportation, minimal contacts, and declining health. A study of panel data from the Health and Retirement Study (2008 and 2012) limited to community-dwelling persons in the United States aged 60 years and older regression results showed (Gerst-Emerson & Jayawardhana, 2015) that chronic loneliness (those lonely both in 2008 and 4 years later) was significantly and positively associated with physician visits and not significantly associated with hospitalizations. A study in publicly subsidized buildings (Castle & Resnick, 2016) for low-income older adults influenced resident outcomes evaluated that SAH (Staying at Home) program; service-enriched housing for elders in 10 high-rise buildings would appear to be beneficial for the senior citizens in terms of occupancy. A key research finding in Netherlands conclude that majority of seniors above the age of 55 do not wish to live among their peers at a distance from services and their social surroundings, and prefer to stay within the city (Smets, 2012). Another study endorses the idea of senior citizens meeting new acquaintances and likeminded people (Van Hoof et al., 2018) as one of the biggest incentives for seniors to move to exclusive senior citizen communities. Senior citizens are emotionally attached to the urban elements in cities with topography and heritage value (Fadda et al., 2010) as city municipalities engage and invest in their mobility within the city core (Pei et al., 2019). Housing amenities are critical as recreational activities and opportunities to learn new skills (Singh & Kiran, 2014) are extremely vital to quality of life for seniors. These cited literatures give key pointers to identifying some of the critical factors that are likely to impact decisions of senior citizens on buying exclusive living spaces in a secluded senior citizen housing project.

In India, the emerging urban concept of nuclear families is pushing (Menezes & Thomas, 2018) seniors into old age homes, which are found to be inappropriate and unsuitable (Prasad, 2017) to their requirement in India. The lack of institutional welfare support in India and changing cultural dynamics of traditional family systems, it is likely that senior citizens will have (Dommaraju, 2016) serious implications in their ageing years. Literature shows that rates of loneliness can be higher in housing communities in comparison to community-dwelling older adults because residents experience higher levels of risk factors associated with loneliness, especially those having lower income, being single (not married or partnered), and having greater physical and mental health vulnerabilities (Shin et al., 2014). This is where senior community housing can help not only ring fence and safeguard against a virus such as COVID-19, but also provide the necessary human interaction and to maintain morale and happiness levels in a time of social distancing (Tellis, 2020).

■3.0 DATA COLLECTION

Nine critical factors were identified from the above cited literature and from an open ended survey sample of 56 seniors. These factors are likely to influence senior decisions for not buying into senior homes; 1) Amenities in the real estate property, 2) Location of the project – distance from the city, 3) Social isolation – need for social activity and Interactions, 4) Wealth and possessions – inability to part wealth and possession, 5) Family ties and social strata – inability to distant from emotional bonds, 6) Urban connect – inability to dislocate from

existing urban setting, 7) New acquaintances – averse to creating a new social circle, 8) Inheritance – complications associated with properties and their rightful heirs, and 9) Moral values– Need to pass on to next generation and grandchildren. These factors are also perceived to be of higher priority with context to cultural conditioning of Indians; same may vary in other countries to their socio-economic context.

A questionnaire survey was carried out with research questions: 1) Why the senior buyers, despite availability of finance do not wish to move to an exclusive luxurious senior housing community?; 2) Which factors are critical to their decision? Does age influence these factors? Do the factors vary among genders? Can answers to these questions help us to predict the future of senior citizen housing post-COVID-19?

The sample survey included 143 cross-sectional data responses from ongoing senior housing project leads in the 5 cities: Ahmedabad, Pune, Delhi-NCR region, Chennai and Lavasa in India where similar projects are being constructed and marketed. All survey respondents had visited the project with an intention to buy the property but had stalled their final decision. The timeline for the surveyed data collection was from Quarter 1, 2016 – Quarter 4, 2019 (pre-COVID-19 pandemic). The survey data included prominent senior housing projects across 5 major cities of India. These 5 cites captured a wide diversity in Indian cultural systems and were also hotspots in COVID-19 infections at varying times during the pandemic. Among these cities, Ahmedabad, Chennai, Delhi-NCR and Pune were major urban cities among top 10 agglomerations in India, while Lavasa is a city specifically designed as an exclusive real estate venture. Sales offices and channel brokers were contacted to assist in lead data for genuine buying inquires in the projects. The final respondent database included only leads of willing sales/broker teams where it was agreed to share data of seniors who had visited the project site, but had turned down or had not decided to proceed with the buying decision after four to six months of follow ups. The respondent leads were narrowed down to five projects from five major included; *Prarambh* – Ahmedabad, *Ashiyana Shubham* – Chennai, *Ashiyana Nirmay* – Delhi NCR, *Ashiyana Utsav* – Lavasa, and *Atashri* – Pune. As these cities represent different corners and States of India, a wide spectrum of cultural diversity and social attributes could be captured among the cross-sectional data. These projects were 1-3 bedroom apartments and villas with carpet area 640 ft^2 to 1650 ft^2, sold in price range of INR 2.83to 5.75 million (INR 3480 - 4420 per ft^2); prices as of February, 2020. The villas were designed as twins- shared spaces separated by a common wall and a private garden at ground level, while the apartments comprised of two storied sprawling buildings with central open spaces – equipped with elevators and ramps. All projects were designed to suit the age, health and lifestyle of seniors which provided ample social, recreational and luxurious amenities.

Respondents included in the survey were within age group of 55 to 75. Respondents had a valid driver's licence and were physically capable of driving short distances and were not mobility dependant. All respondents were financially capable to purchase their home without need of financial assistance. Chronic medical conditions were not considered in the research survey; however, none of the respondents were physically handicapped. The respondents had not invested or bought any other senior housing property. Survey questions were taken in person for 131 respondents while 12 responses were taken over the telephonic discourse. The sample size comprised of 48 couples (96 individuals) and 47 single seniors. The questionnaire survey required the respondents to rate the identified 9 critical factors on Likert scale of 1 to 9, where value of 1 indicated the least relevant factor for not investing/buying the property while a value of 9 indicated highly critical reason for nor investing/buying the property. The scale of 1 to 9 was chosen to allow the respondents to make finer differentiation for their personal needs. Respondents were provided clarity on specific factor to make an accurate rating. The data was analyzed using binary probit regression models for age and gender. The first model looks at how these factors are perceived differently by younger seniors vs. older seniors. The second model is designed to look at how the above factors are viewed differently, by males and females.

4.0 RESULTS

The two binary probit models for Age and Gender showed significant dependency on factors of Location-distance and social isolation. In context of the research questions these dependencies provide insights into the marketing senior citizen housing campaigns for existing and future projects.

4.1 Model 1 - Age

The age model analyses the dependency of responses for individuals aged 55 to 65 and how they differ from individuals aged 66 to 75. The dummy dependent variable was used where data set groups of seniors aged 55 to 65 were assigned a value of 0 which while the senior data set aged 66 to 75 was assigned the value of 1. Table 1 shows the regression output for model 1 where age is the dependent variable. P-values of the model shows significant dependency on factors of location-distance of the project, social isolation and urban elements. McFadden R square value of the model is 0.44 while the adjusted R square value is 0.35; we however, overlook these values since it is a probit binary model. The Akaike Criterion for the models was 127.27, while the Schwartz Criterion was 153.9 and Hannon-Quinn Criterion (HQC) was 138.1. Analysis of the confusion matrix helped in building model specificity and sensitivity. ROCs plotted established reliable models. Collinearity in the model was tested using variance of inflation (VIF) for the independent variables, where all values were recorded below 10. Among 143 observations, 117 cases were correctly predicted (accuracy) at 81.82% Residuals tested in the model were normally distributed. Table 2 shows the calculations of the confusion matrix which had error rate of 18.18%, precision of 77.14%, and sensitivity of 84.37% and specificity of 86.31%. The Matthews Correlation Coefficient (MCC) was 0.63 and the F score was 0.80. All the measures indicated a robust binary model.

Table 1 Model 1 Senior Age

Binary Probit, using observations 1-143
Dependent variable: Age_
QML standard errors

	Coefficient	Std. Error	z	p-value	VIF
const	−4.29798	0.820457	−5.239	**<0.0001**	
Loca_Distance	0.313701	0.0985868	3.182	**0.0015**	1.663
Amenites_	0.0310115	0.0672528	0.4611	0.6447	1.017
Isolation_	0.345807	0.0854620	4.046	**<0.0001**	1.526
Family_	0.00537023	0.108574	0.04946	0.9606	1.097
Urban_elements_	0.274015	0.0929601	2.948	**0.0032**	1.690
New_Acquaintance_	−0.0439761	0.0652722	−0.6737	0.5005	1.247
Moral_inheritance_	−0.120875	0.0957340	−1.263	0.2067	1.008
Wealth_Possessions_	0.0185795	0.0797020	0.2331	0.8157	1.026

Mean dependent var	0.510490	S.D. dependent var	0.501647
McFadden R-squared	0.448623	Adjusted R-squared	0.357795
Log-likelihood	−54.63514	Akaike criterion	127.2703
Schwarz criterion	153.9359	Hannan-Quinn	138.1059

Number of cases 'correctly predicted' = 117 (81.8%)
f(beta'x) at mean of independent vars = 0.502
Likelihood ratio test: Chi-square(8) = 88.9069 [0.0000]

Table 2 Confusion Matrix Model 1 Senior Age

		Predicted	
Actual		0	1
	0	54	16
	1	10	63

Measure	Code	Value
Error Rate	ERR	0.1818
Accuracy	ACC	0.8181
Sensitivity True Positive Rate Recall	SN TPR REC	0.8437
Specificity True Negative Rate	SP TNR	0.8631
Precision Positive Predictive Value	PREC PPV	0.7714
False Positive Rate	FPR	0.1369
Matthews Correlation Coefficient	MCC	0.6328
F Score	F	0.8038

Table 3 Model 2 Senior Gender

Binary Probit, using observations 1-143
Dependent variable: Gender_
QML standard errors

	Coefficient	Std. Error	z	p-value	VIF
const	−3.45571	0.657108	−5.259	**<0.0001**	
Loca_Distance	0.140944	0.0710921	1.983	**0.0474**	1.663
Amenites_	0.0985870	0.0667657	1.477	0.1398	1.017
Isolation_	0.197980	0.0771744	2.565	**0.0103**	1.526
Family_	0.0630518	0.0896036	0.7037	0.4816	1.097
Urban_elements_	0.139064	0.0851252	1.634	0.1023	1.690
New_Acquaintance_	0.273759	0.0736976	3.715	**0.0002**	1.247
Moral_inheritance_	0.0226535	0.0721336	0.3140	0.7535	1.008
Wealth_Possessions_	0.000600616	0.0848676	0.007077	0.9944	1.026

Mean dependent var	0.531469	S.D. dependent var	0.500763
McFadden R-squared	0.301447	Adjusted R-squared	0.210388
Log-likelihood	−69.04260	Akaike criterion	156.0852
Schwarz criterion	182.7508	Hannan-Quinn	166.9208

Number of cases 'correctly predicted' = 107 (74.8%)
f(beta'x) at mean of independent vars = 0.501
Likelihood ratio test: Chi-square(8) = 59.5881 [0.0000]

4.2 Model 2 - Senior Gender

The gender model analyses the dependency of responses for male and female and how they differ in opinions. The dummy dependent variable was used where data set groups of where women seniors were assigned a value of 0 which while the male seniors were assigned the value of 1. Table 3 shows the regression output for model 2. P values of the model shows significant dependency on factors of location-distance of the project, social isolation and new acquaintance. McFadden R square value of the model is 0.30 while the adjusted R square value is 0.21. Akaike Criterion for the models was 156.08, while the Schwartz Criterion was 182.75 and HQC was 166.92. Collinearity in the model was tested using variance of inflation (VIF) for the independent variables, where all values were recorded below 10. Among 143 observations, 107 cases were correctly predicted (accuracy) at 74.82% Residuals tested in the model were normally distributed. Table 4 shows the calculations of the confusion matrix which had error rate of 25.17%, precision of 71.23%, and sensitivity of 77.61% and specificity of 72.36%. The Matthews Correlation Coefficient (MCC) was 0.4989 and the F score was 0.74.

Table 4 Confusion Matrix Model 2 - Senior Gender

Actual \ Predicted	0	1
0	52	15
1	21	55

Measure	Code	Value
Error Rate	ERR	0.2517
Accuracy	ACC	0.7482
Sensitivity True Positive Rate Recall	SN TPR REC	0.7761
Specificity True Negative Rate	SP TNR	0.7236
Precision Positive Predictive Value	PREC PPV	0.7123
False Positive Rate	FPR	0.2764
Matthews Correlation Coefficient	MCC	0.4989
F Score	F	0.7428

The Receiver Operator Characteristic (ROC) curves for models of Age and Gender (Figure 1) shows the diagnostic abilities of the binary classifiers and indicates a satisfactory Area under the curve (AUC) to accept the accuracy of both the models. The curves were plotted using cut-offs at intervals of 1, 5, 10, 20, … 90,95,99% using the forecast data of the predicted model with Sensitivity on the Y axis and False positives on the X axis.

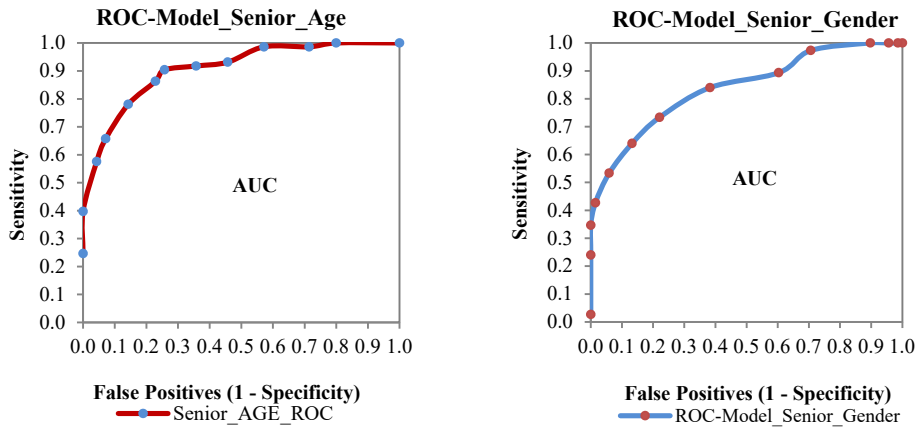

Figure 1 ROC – Models - Senior Age and Gender

■5.0 DISCUSSION

Results of the two binary probit models give us key pointers to the future of senior housing markets amid COVID-19 pandemic in India. Pre-COVID-19 pandemic, a decision to not invest or buy into a property can be attributed to significant dependence on distant location of the project, as Model 1- Age shows that seniors aged 66 to 75 recorded significant aversion to move to a new location as compared to the seniors in the age group of 55 to 65, as one of the depending factors for not buying a senior home. If distance of the project location can be brought closer to the city, the upcoming projects may find more buyers in this segment. This can be attempted through an improved local Area Planning (LAP) approach where land pooling models such as Town Planning Schemes (TPS) which have already gained acceptance in few states of India, especially Gujarat and Maharashtra. This approach can mandate a 1-2% of land allotted for senior citizen housing projects as a part of 40-50% land deductions which is used for roads, public spaces, and institutions, commercial and lower income

housing projects; evident from the (Pandya & Patel, 2020) case studies. Reduction of travel time is also likely to increase the number of social visits per months by the children and adults in the family & friends; alleviating concerns of social isolation. This also means that seniors stay closer to urban elements; places they connect with habitually and emotionally. Urban city planners are encouraged to draw inclusive planning policy for senior citizen housing within the urban core along with incentives for real estate developers to boost this market segment as an outcome of this research models.

Model 2- Gender shows significant preference of males who rated location distance, social isolation and new acquaintances as critical factors for non-purchase decision when compared to female seniors. It can be debated as to at what extent can the real estate developers devise marketing campaigns targeting these genders separately. In hindsight, it seems unlikely that a senior couple would prefer to live separately due to differences in the preferences. This however does not overlook the fact that many seniors may be single and this is where the marketing campaigns can be effective. The key take away from the probit model on gender is that there are likely to be more single seniors buyers for projects planned within the city while distant located projects are more likely to have higher number of single senior women interested in moving. Existing senior citizen projects in India may consider realigning their strategy to take advantage using this approach.

The COVID-19 pandemic brings focus back to health care and hospitality which will be required to be directly linked to all future senior housing projects. Projects will likely be planned and developed in and around healthcare clusters within the city or in nearby suburb with access to latest medical technology facilities. Indian cultural context has yet not fully abandoned the concept of joint family system where seniors, adults and children live in large housing spaces. COVID-19 pandemic is already strengthening this notion and future projects are likely to be planned carefully as to promote social distancing which means limiting recreational activities to smaller group size. If these models were adopted than senior housing projects are likely to be designed in smaller size clusters within the city core thus limiting the options of social and recreational amenities. Trends are likely to be clearer post year 2021 as majority of research literature in gerontology and impacts of COVID-19 are being studied and researched. Institutional investors and REIT funds are keys to pushing this sector which require (Gupta et al., 2017) dynamic changes in reforms. Currently there is an absence of facility management specializing in senior housing. Ownership and use of senior housing is a matter of debate (Eichholtz et al., 2007) and India would benefit more by using the lease model instead of ownership models in luxury senior citizen housing projects. Professional facility managers would play a crucial role in near future. More and more studies around the world rank the factor of location among one of the highest which influences a property buyer. Practice of social distancing, protection against deadly infections and emergency health care with family support; all are driving forces which are likely to push senior housing communities closer to the core green city core in the future. Cities are likely to witness such communities sustaining within the urban dense areas in the decade of 2020s. Inclusive urban planning to accommodate senior citizen planning within the city core is predicted.

■6.0 CONCLUSION

Senior citizen housing is still a nascent market in India and further State level research is required due to diverse cultural context of the country. Location of senior housing projects, experiencing isolation and new acquaintances are some of the significantly crucial factors to consider while marketing senior housing projects to younger seniors vs. the older seniors. Senior men and women seem to view senior housing differently as men prefer a location closer to the city, fear isolation and are likely to be more attached to the urban elements of the city as compared to senior women. These findings of binary probit models generated from pre-COVID-19 data suggests that gender specific marketing campaign is likely to improve sales of senior citizen housing projects in post-COVID-19 senior housing market in India. Accommodating senior citizen projects within the city core may be a best way forward for the city planners. We can further predict the senior housing markets in India by integrating factors such as social distancing, personal hygiene and need for recreational activities within the tested and discussed probit models to ascertain the impact due to COVID-19 pandemic on the senior housing markets.

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