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Measuring Housing Affordability Using Residual Income Method for Million-plus Cities in India

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Abstract

Housing affordability is an ever-growing concern in rapidly urbanizing countries like India. The need for affordable housing can hardly be overemphasized in India. Government has many policies and programs running for fulfilling the requirement. But it is essential to define affordability standards for the success of any such policies and programs. The Ratio Method, which is currently used as the base for determining affordable housing, doesn't have the flexibility to match the varied scale and standards across Indian cities. This paper is based on Michel E Stone's residual income' method to measure housing affordability for India's million-plus city. It gives a new approach for measuring housing affordability based on the minimum living cost for survival. It uses Poverty Line data (2014) and NSSO economic survey data (2012) for defining the minimum standard of living in the city. Stakeholders can use the city-specific measurement for affordable housing generated from this paper in affordable housing policies and programs.

Keywords: Housing; Affordability; residual income; poverty line.

1. Introduction

Shelter or housing is one of most crucial survival needs for the human being. Housing is not only a necessity of life. It has a pervasive impact on all aspects of our existence (Stone, 1993). Housing is not only providing us safety from external forces but also gives us identity in society. Housing is defined as shelter and amenities together, which makes it a dwelling unit. This dwelling unit is located in a site setting, neighborhood, and society. That's how housing fulfills our emotional, symbolic, and identity needs as well.

In the urban world of the 21st-century, housing has become a significant issue, especially in fast-growing cities. The problem of housing lies both in quality and quantity. Increasing numbers of slums in cities are a clear indicator of housing shortage in developing countries. A large share of the population is bound to live in inhabitable situations. Thus it has become a real challenge for many countries to provide adequate housing to all their citizens. In this scenario, one word which has dominated the policy for housing is 'Affordable housing'. Affordable housing is a relative term, and there is no standard definition. The concept of affordable housing can be relative (housing affordability through history) and subjective (classic assumption of an individual with their rational self-interest) at the same time (Cai, 2017).

Affordable housing is directly linked with affordability. Because of the contested nature of the word affordability, there is no common definition of housing affordability. In Britain and the United States, affordability is often expressed in terms of "affordable housing." But affordability is not a characteristic of housing—it is a relationship between housing and people. For some people, all housing is affordable, no matter how expensive it is; for others, no housing is affordable unless it is free. "Affordable" housing can have meaning (and utility) only if three essential questions are answered:

1. Affordable to whom?
2. on what standard of affordability?
3. for how long?

1.1. Concept of Housing Affordability

Despite the importance of the term in policy formulation and research there is no common accepted definition of housing affordability. Various factors are involved in defining housing affordability. It varies from social context to economic groups. Although it is not particularly related to any economic group, it is generally seen that housing affordability problems are more pertinent in lower- and middle-income groups. Household income alone doesn't define housing affordability but housing cost together with income is what defines housing affordability.

Affordability is frequently interpreted as the relationship between household income (or more generally means) and housing expenditure; housing is affordable if expenditure relative to income is reasonable or moderate. (Kutty, 2005).

In economic system housing affordability reflects the relationship between housing market and housing finance. Housing being one of the costliest commodities in one's life requires financial assistance in the form of subsidies on loan. It also has many other characteristics because its immovability and its attachment to land.

Unlike amenity and overcrowding problems which are of more prevalent in less developed economies where there is little land for accommodation, the problem of housing affordability is associated with multi-facet economic, social, political and demographic considerations. (Jing LI 2014)

By nature, housing affordability refers to "an expression of the subjective social and material experiences of people, constituted as households, in relation to their individual housing situations" (Stone, 2006a)

1.2. Measuring Housing Affordability

Because of subjective nature of housing affordability there are different methods used globally to measure housing affordability. Basically, it is the relationship between housing cost and incomes which can be calculated as ratio or relative difference. These two methods are more popular globally and has been used for policy formulation all around the world. Another method given by Michael E stone is based on the concept called shelter poverty. As per stone housing can be affordable only if people are able to fulfil their non-housing need at an adequate level after paying for housing.

Overall housing affordability measuring methods can be categorised into three types.

Table 1. Methods of measuring housing affordability, compiled by author based on sources

Method	Technique	Country	Affordability Criteria
Ratio Approach	HUD Guidelines	USA	Less than 30% of family income on housing
	H+T Index	USA	Less than 45% of family income on housing and transportation
	Amenity Based Housing Affordability Index	USA	50-80 % on all the amenities (education, health etc.)
	Task force for affordable housing, 2008	India	30-40% of gross monthly income on housing
Relative Measurement	NAR Housing Affordability Index	USA	Relationship between family income and home price data
	RBI Affordability Measure	India	Relationship between House price index & family income bracket decided by GoI
Residual Income Method	Shelter Poverty Measure	UK	Family income after subtracting Housing cost should be able to meet non housing expenses
	Home Purchase Model AHURI	Australia	Family income after subtracting Housing cost should be more than Budget standard of city

1.2.1. Ratio Method

Since the definitions of affordable housing vary based on location and context, the universal measurement of such is also found to be difficult and complex. (Mia & Zull, 2020) Ratio method is one the most common measure for housing affordability where affordability is measured as housing cost to income ratio. In most of the cases, housing affordability is measured by looking at the expenditure on housing to income of the household. (Gopalan & Venkataraman, 2015)

1.2.2. Relative measure

Relative method is a comparative method which looks at house prices over the years across cities. It is based on the data of selling prices of houses and house prices index. These house price indexes are useful for all types of housing studies. Relative measure is a comparative method to measure housing affordability across the country. To be more precise, housing affordability is often measured by the "median multiple," which is basically the ratio of median house prices to gross annual median household income (Hulchanski 1995).

1.2.3. Residual Income Method

This concept came from the fact that housing is one the most prominent requirement after food and because of its distinctive parameters its cost makes the largest and least flexible share in the household expenditure. This means that the household will have affordability problems it cannot fulfill its non-housing needs at basic adequacy level after paying for housing. It has been observed that households with lower income spend larger share of their household income on non-housing needs compared to households with higher income. Thus, they have lesser amount left to spend on adequate housing. If they spend more amount on housing, then they have to compromise on other non-housing needs such as education or health. This creates affordability problems for lower income households. Percentage of household income share on non-housing needs increases exponentially as household income goes down.

In contrast to the ratio method, residual income method also considers non housing requirements of household. Operationalizing a residual income standard involves using a conservative, socially defined minimum standard of adequacy for non-housing items. Thus, while the residual income logic has broad validity, a particular residual income standard is not universal; it is socially grounded in space and time. (Stone, 2006) Perhaps the best approach is look at it in terms of a certain minimum consumption expenditure per person or preferably per household. Any household failing to meet this level of consumption expenditure can be treated as a poor household. This minimum level of consumption expenditure can be derived, in turn, in terms of minimum expenditure on food and non-food items.

1.3. Affordable housing in India

Although the issue of housing is pertinent at the global level, but it can be hardly overemphasized in the developing country like India. On one hand we have huge housing shortage and on the other hand we have vacant houses lying in the same urban areas. This is happening because of mismatch between the people for whom the houses are being built and those who need them. Indeed, if the newly built houses were available to the houseless, squatters, slum dwellers and those living in extremely congested condition, the shortage would be small. It would however, be unrealistic to assume that houseless HHs and those living in unacceptable conditions-in other words those who could be described as in housing poverty-would have the affordability and access to the burgeoning supply in the market. (MoHUPA, 2012)

India has followed the ratio approach for all of its housing programs. Affordable housing was firstly defined by task force on affordable housing headed by Deepak Parekh in 2008. According to which ratio between house cost and family income should be 5:1

Table 2. Affordable Housing definition as per ministry of housing and urban poverty alleviation report 2011

SIZE		EMI OR RENT
EWS	300 sq ft super built-up area 269 sq ft (25 sq m) carpet area	not exceeding 30–40% of gross monthly income of buyer
LIG	500 sq ft super built-up area 517 sq ft (48 sqm) carpet area	
MIG	600–1,200 sq ft super built-up area 861 sq ft (80 sqm) carpet area	

Table 3. Affordable housing definition as per Pradhan Mantri Awas Yojana 2015

PMAY 2015	EWS	LIG	MIG I	MIG II
Carpet area	Upto 30 sqm	Upto 60 sqm	Upto 160 sqm	Upto 200 sqm
Family income per annum (INR)	<300000	300001-600000	600001-1200000	1200001-1800000
Loan amount eligible for subsidy for Credit linked subsidy scheme	6	6	9	12
Direct Benefit for Beneficiary led construction (INR)	150000	NA	NA	NA
Subsidy Under Affordable Housing in Partnership	250000	NA	NA	NA

1.4. Million Plus cities in India

As per the 2011 census, the country had a population of 1,210.98 million, out of which 377.10 million (31.16%) lived in urban areas. During 2001-2011, India's urban population grew at a CAGR of 2.8%, resulting in an increase in the level of urbanization from 27.81% to 31.16%. This growing concentration of people in urban areas has led to land shortage problems, housing shortfall, and congested transit and has also severely stressed the existing basic amenities such as water, power, and open spaces of the towns and cities. Due to rapid pace of urbanization in India now, apart from mega towns, mid-sized cities are facing housing problems in the country. Apart from 5 megacities (Delhi, Mumbai, Kolkata, Chennai, Bengaluru, and Hyderabad), housing affordability is a rising problem in mid-sized cities of India. India has 53 million-plus cities as per census 2011.

Uttar Pradesh is one of the states in Northern India. It is the most populous state along with the highest housing shortage as per technical group report 2012.

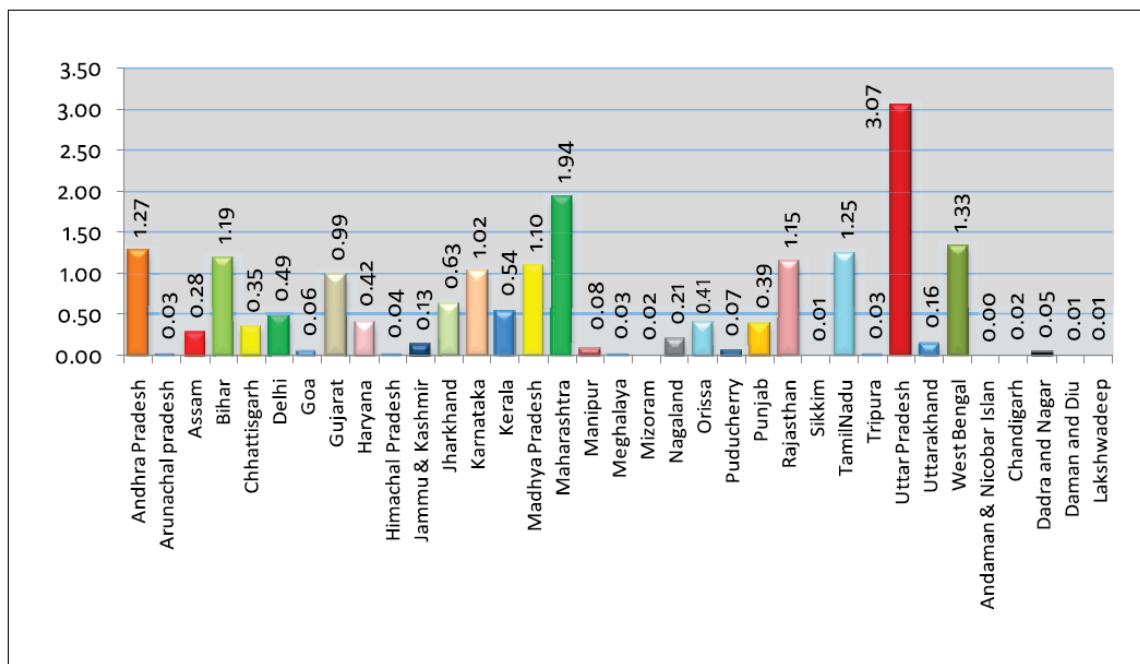


Figure 1. Housing shortage in different states as per technical group report 2012

Lucknow, the capital of Uttar Pradesh is situated 23 Mts. above sea level. It is situated on 26.30 & 27.10 North latitude and 80.30 & 81.13 East longitude. Lucknow is 12th in India and 2nd in UP in the list with a population of **28,17,105**. The city is having a total of 477860 households with an average household size of 5.8.

Rapid urbanization and growth have led to haphazard development in Lucknow. Population of Lucknow city has increased almost six times in the last six decades. Municipal limit has been expanded only once in 1991. This has led to continuous increase in density. It has gone from 49ppha in 1991 to 83ppha in 2011. Lucknow city is witnessing boom in real estate market on one hand, on the other hand number of slums are also growing. Being the capital of the state, Lucknow attracts migrants from all over the state. The city continues to attract migrants, many of who end up in informal settlements which is generally being regarded as slum. Most of them comprised of poor and low-income group, who are forced to live in slum or slum like condition due to poor affordability. As per RAY report Lucknow city has total 609 slums out of which 502 re notified and 107 are non-notified.

These increasing number of slums are indicator that city is facing housing affordability problems. For this research work Housing affordability has been measured using residual income method for Lucknow.

2. Operationalizing Residual Income Method

To use the residual income method for defining housing affordability we need a minimum standard of non-shelter items. We also need a qualitative standard of adequate living. To define the non-housing necessities various methods have been used. In USA one strand has adopted a fraction of the federal poverty threshold as the standard (Budding 1980; Dolbeare 1966; Kutty 2005) while the other has used the non-housing, nontax items of a family budget standard (Newman 1971; Stone 2006).

Table 4. Methology followed for applying residual income method, source: author

Methodology				
1	Non-Housing Consumption Standards			
	<table border="1"> <tr> <td>Minimum Standard of Living</td> <td>Poverty Line report , Planning Commission , Gol, 2014</td> </tr> <tr> <td>Average Living Standard</td> <td>Household Expenditure Pattern in Uttar Pradesh based on NSSO 68th round , 2014</td> </tr> </table>	Minimum Standard of Living	Poverty Line report , Planning Commission , Gol, 2014	Average Living Standard
Minimum Standard of Living	Poverty Line report , Planning Commission , Gol, 2014			
Average Living Standard	Household Expenditure Pattern in Uttar Pradesh based on NSSO 68th round , 2014			
2	Conversion of 2011 Values to 2021 values as per inflation rates			
3	Income categories			
	Below Poverty Line	Single Adult (1)		
	Economically Weaker Section	Couple (2)		
	Lower Income Group	Couple One Child (3)		
	Middle Income Group -1	Couple two Child (4)		
Middle Income Group -2	Couple, one child, Grandparents (5)			
4	Computation of Maximum Affordable Housing cost			

	Affordable Housing cost equals	Household Income- Non housing consumption
5	Home Purchase Model	Rental Affordability Model
	Monthly Affordable housing cost as EMI for 20 yrs home loan+ necessary savings for down payment	maximum affordable housing cost after non housing consumption
6	Produce Graph	
	Maximum Affordable housing cost for	Different household income
		Different household size
		Based on minimum and average standards
	Inferences of graphs	

2.1. Living Standards

In India Minimum standard of living which has been used for this paper is defined by Poverty line. 2014 report of the expert group headed by C. Rangrajan Titled review the methodology for measurement of poverty defined poverty as minimum consumption expenditure per capita.

Perhaps the best approach is look at it in terms of a certain minimum consumption expenditure per person or preferably per household. Any household failing to meet this level of consumption expenditure can be treated as a poor household. This minimum level of consumption expenditure can be derived, in turn, in terms of minimum expenditure on food and non-food items. Minimum food consumption is related to fulfilling certain nutritional standards. However, the minimum non-food consumption is more problematic. The report explains how we went about it. This report has used consumer pyramids survey data of 2011-12 to define poverty line for each state’s rural and urban areas. The report has given minimum consumption standards for all the states of India. Poverty line for the state of Uttar Pradesh has been given as INR1329.55 per capita per month.

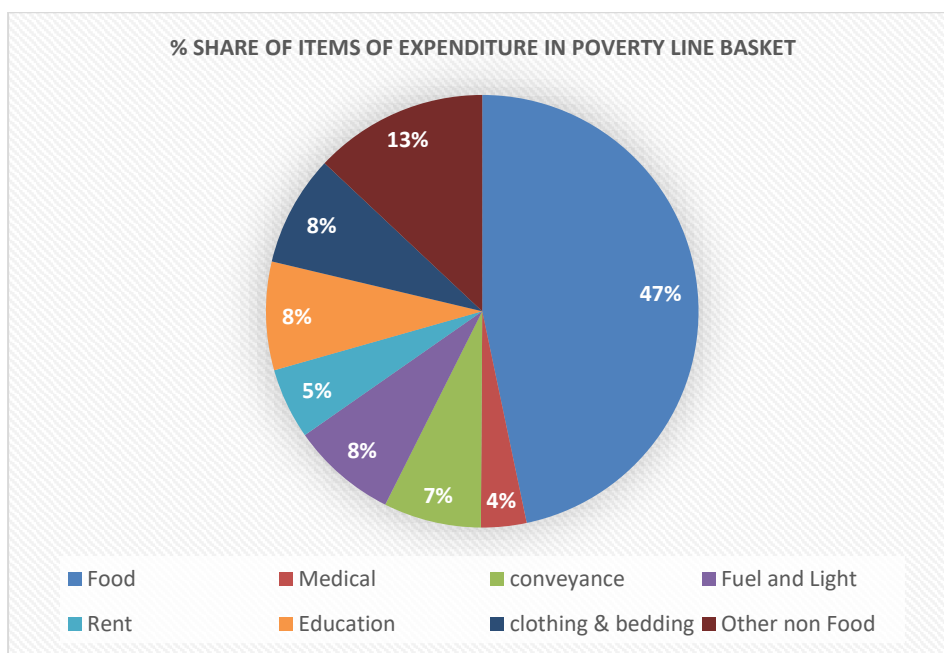


Figure 2. Percentage share of items of Expenditure in Poverty Line Basket as per Rangrajan committee report 2014

Average living standard has been defined based on the Directorate of Economics and statistics report, Government of Uttar Pradesh is referred. The title of the report is ‘Household consumer Expenditure pattern in Uttar Pradesh ‘is based on National Sample survey 68th round data of 2011-12. This report has defined expenditure patterns for rural and urban areas of Uttar Pradesh for different social groups, employment types, household types, etc. The average expenditure for an Urban area of Uttar Pradesh has been defined as INR 1881 per capita per month.

2.2 Income Categories

Although Housing affordability is not related to any particular income category but housing affordability problems are mainly faced by EWS and LIG. As per the technical group report on housing shortage 2012, 96% of housing shortage lies in EWS and LIG category. Housing programs are also focusing on the EWS category to provide subsidies. Four income categories as per MHoUPA 2011 report have been considered for this research.

Table 5. Income categories and housing shortage as per technical group report 2012

Category	EWS	LIG	MIG I	MIG II
Family income per annum (INR)	<300000	300001-600000	600001-1200000	1200001-180000
Housing shortage (Million)	10.55	7.41	0.82	
Total Housing shortage (Million)	18.78			

2.3 Household Sizes

Stone’s model suggests that household size and composition play an important role in deciding housing affordability. In India, generally, household sizes are large. In Lucknow, the average household size is 5.8 as per census 2011. We have an increasing number of single and couple in the urban area because of in-migration.

Considering the requirement of this research paper, five household compositions has been considered, which are Single adult, couple, couple with one child, couple with two children and couple, one child and grandparents.

3. Computation of Maximum Affordable Housing Cost

Two living standards have been considered for this research. One is the minimum living standard based on the poverty line, and the other is an average living standard based on the consumer expenditure survey. Both of these living standards has given the consumption amount for food and on food items which comprises rent as well. This living standard has consumption values based on 2012 data (survey dates). Since these surveys are not current annual values are not available. To convert these values for 2021, data inflation rates has been applied using the consumer price index method.

Final Value= Initial value* CPI Final/CPI initial

In this case, the CPI in 2012 was 75.36, and the CPI today is 131.26.

Table 6. Calculation of Non-Housing consumption in 2021 for Minimum and average living standards, source: Author

	2012 value (INR MPCE)	Rent component	Non-Housing Expenditure	2021 Value (INR MPCE)
Minimum Living Standard	1329.55	70.47	1259.08	2189.87
Average Living standard	1881.37	64.2	1817.17	3160.44

Now we have the non-housing expenditure for today as per both living standards. These living standards are applicable for all income groups. To calculate maximum affordable housing cost for different income groups, we have used the formula

Maximum affordable housing cost= Household income- Non Housing expenditure

Non-housing expenditure depends on household size as it is defined in monthly per capita expenditure in living standards. Large household sizes have more expenditure and thus less disposable income.

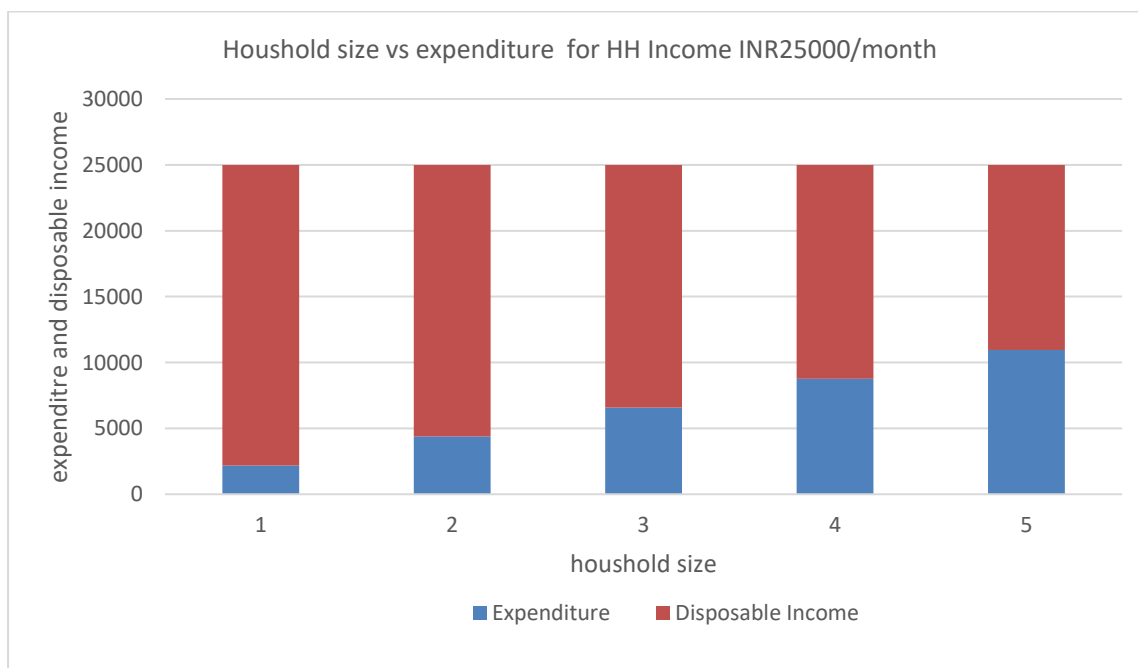


Figure 3. Relationship between household size, non-housing expenditure and disposable income

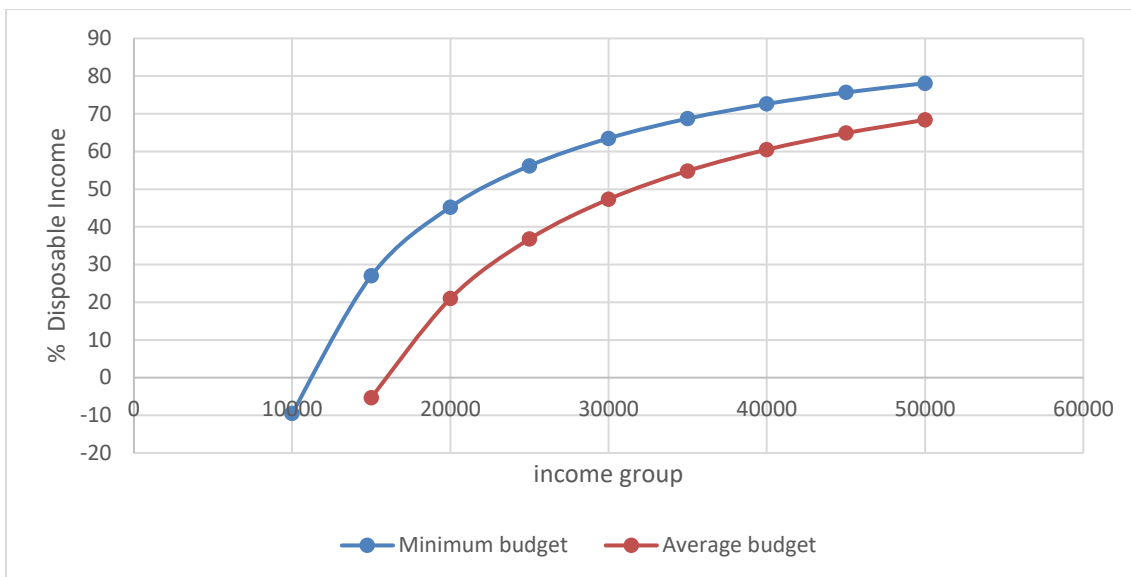


Figure 4. Percentage of disposable income for different household income of a household size of 5

3.1. Home Purchase Model

The home purchase model has been developed based on the maximum disposable income after fulfilling non-housing needs for both standards. Housing loan with a repayment period of 20 years has been considered, and monthly maximum affordable housing cost has been taken as loan repayment EMI. 20% disposable income has been taken as savings for down payment and stamp duty payment. Tax rebates and subsidies have not been considered as they are applicable only for public housing schemes.

In the Home purchase model, we have used two consumption standards and two methods for measuring maximum affordable housing cost. 30% thumb rule has been applied to show the comparison



Figure 5. Maximum affordable housing cost (EMI) for different HH income for a HH size of 5



Figure 6. Maximum affordable housing cost (EMI) for different HH income for a HH size of 3

Inferences of Home purchase model

Using the residual income method, we are able to calculate maximum affordable housing cost which is EMI for home purchase for a particular monthly household income and household size. Figure 5 and 6 above give clear indication that housing affordability is not only dependent on income, but HH size and composition is also a key factor for the same. Figure 4 describes that for a larger household size of 5, disposable income is very low for lower household income. Below INR 20000/month HH income family does not have enough housing affordability to purchase a new house. Affordable housing cost increases significantly for families higher HH incomes. Even with the average living standards of families above INR 30000/month, HH income has enough surplus to afford a new house without compromising on non-housing necessities. Figure 5 describes that housing affordability increases slightly for smaller household sizes. But still, families with lower HH income don't have enough disposable income after fulfilling non-housing needs to pay for a new house.

When compared with 30% criteria in figure 4 and 5 we can clearly see that actual figures don't follow the thumb rule. For families with lower income (below INR 25000/month) disposable income is much lower than 30%, where has it is significantly higher than 30%. This clearly indicates that EWS category is not able to pay 30 even with the minimum living standards and required subsidised housing programs for fulfilling their housing need.

3.2. Renter Model

As mentioned earlier in migration is one main reason for increasing housing demand in cities. A large portion of this migrated population is for a temporary basis. They are a floating population that keeps moving from one city to other as per job opportunities. Rental housing is a better suitable solution for this category. Although there is a rent control act prevailing in the state, there is no rental housing policy. Draft national rental housing policy has not been approved yet, and hence we do not have a comprehensive guideline to promote rental housing. It works on an unorganized system.

Rental housing model has been developed for this study to understand maximum affordable rent for different income groups and household sizes. Rental model is more applicable for families with lower HH incomes. There are no subsidy programs or policies for rental housing. So maximum affordable rent has been calculated based on the disposable income after fulfilling the non-housing needs.

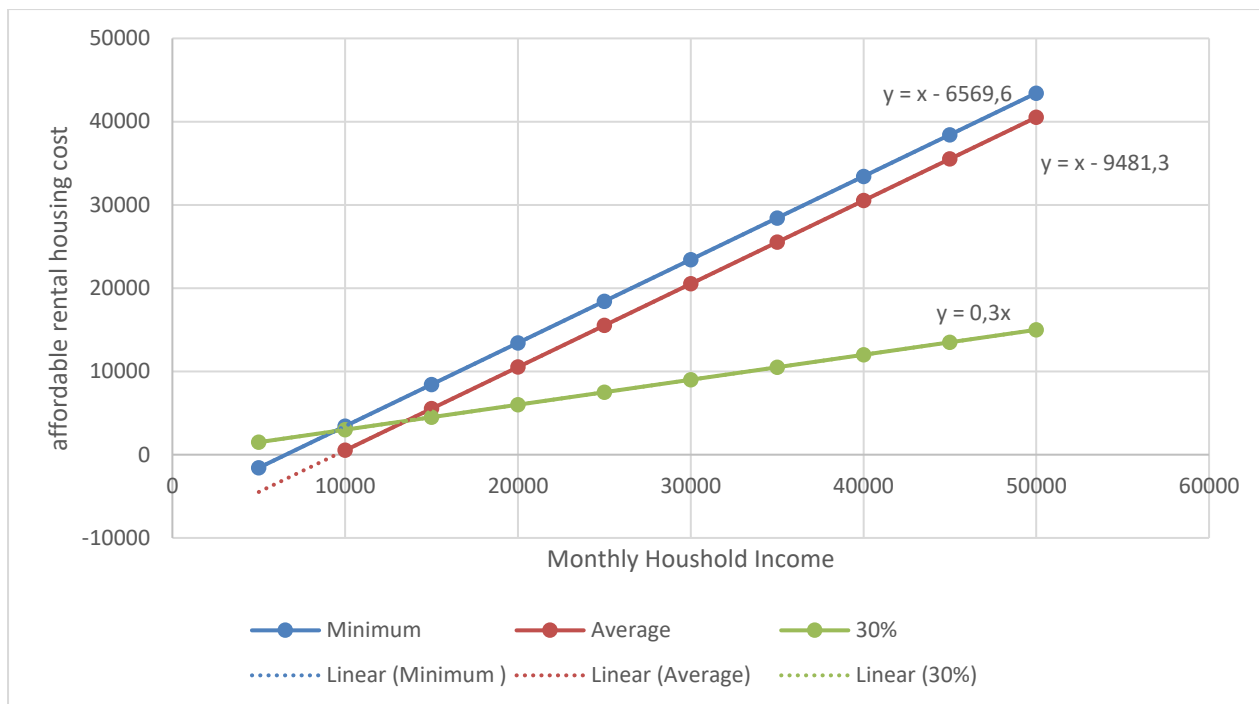


Figure 7. Maximum rental housing cost for different HH income for a HH size of 3

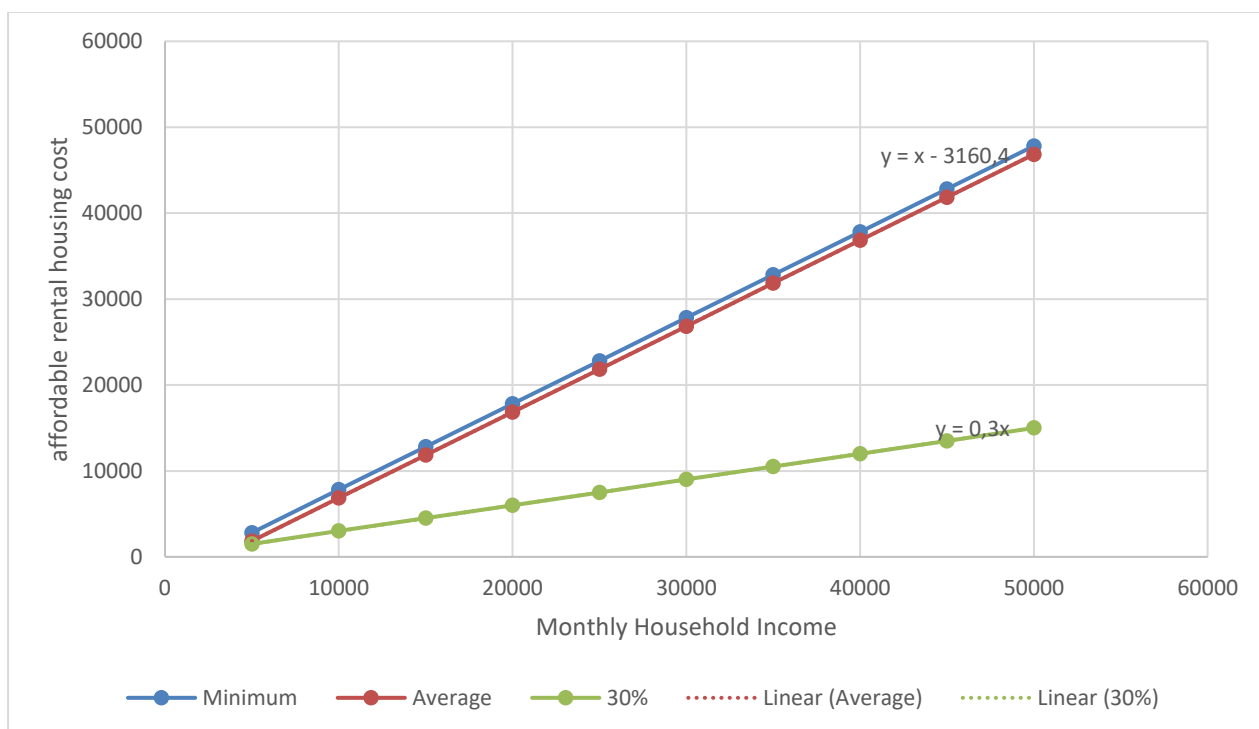


Figure 8. Affordable rental housing cost for different HH income for Single adult

Inferences of Renter model

Figure 7 and 8 show the relationship between HH income and maximum affordable rent for HH size of 3 and 1, respectively. It clearly indicates that a single individual can afford to rent a house even with very low income. Whereas family size of 3 has disposable income very low to be affordable rent for lower-income groups. Below INR 15000/month HH income doesn't have enough disposable income to rent a place. Comparison with 30% criteria shows the same story as the home purchase model. Maximum affordable rent is much lower than 30% for Lower-income groups which increase much above 30% for higher-income groups. The rental model is incomplete without details of properties and location. After doing the calculation of maximum affordable rent for different household sizes for a particular city, it is essential to see if the town has properties available at that cost.

5. Conclusion

Application of residual income method for a mid-sized city Lucknow to create home purchase and renter model has given following inferences

1. For EWS category, actual affordable housing cost is much below than 30%.
2. Household sizes and composition are important factors along with household income for deciding housing affordability.
3. Even For smaller HH size affordable housing cost falls much below than 30%. Whereas for higher-income groups affordable housing cost is much higher than 30.
4. This justifies that why 96% housing shortage is lying in EWS and LIG sectors.

If we talk about the Housing supply system, the Role of the Government in housing policies has changed in recent times. Earlier, where the government was acting as a provider, now it has become a facilitator. Public-Private Partnership is the new model for all programs. Subsidized housing programs are only applicable for the EWS category. These programs are also partially subsidized, and the beneficiary has to bear the cost after subsidy. Public housing programs are very small in numbers and insufficient to fulfill the huge quantum of the housing shortage. Thus, private developers are playing a major role in the supply of housing in the city.

All the policies and programs in India are following 30% rule for deciding the affordability of beneficiaries. Application of residual income model suggests it is much below than 30%. Even for LIG group, larger household sizes don't have enough disposable income for a home purchase. As mentioned above, private developers are supplying maximum houses in the city. The cost of houses are much above the affordability limits of EWS and LIG. The home purchase model will be further studied with respect to property prices of Lucknow city. Access to housing finance is one major factor which plays an important role in a home purchase. Residual income model should be studied along with formal housing finance system. Access to housing finance is highly dependent on the occupational category.

Overall residual income method gives a much clear picture on housing affordability as compared to 30% thumb rule. This method is very context-specific and requires much more data as compared to the traditional system. Although residual income method also misses some important aspects like access to housing finance, property location etc. Residual income methods can be very useful in the Indian context, where we have varying standards of living across states and cities. It can be further developed to be much more realistic, incorporating the missing parameters.

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Conflict of Interests

The Authors declare no conflict of interest.

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