The Determinants of Housing Choice in The Rural Area of Bangladesh and The Role of Finance in Housing Affordability.

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Abstract: *Choice of housing quality by the rural poor does not appear to be a well-researched topic in development economics in spite of its possible role in influencing health outcomes and social acceptance in society (e.g., the capability to function in society). Because housing services are composite durable goods, the dimensions along which one may measure quality is diverse; common demarcations include the material utilised to build the walls, roof, floor, quality of sanitation etc. In this study, we use primary Bangladesh survey data of rural households collected by the Institute of Microfinance (InM)[1], Dhaka, recently re-named, Institute for Inclusive Finance & Development. Over and above exploring the qualitative aspects of the data, we estimate multi-nominal logit model to capture the determinants of the choice of housing quality in selected geographically diversified parts of rural Bangladesh. A preliminary analysis is also made of the effects of housing quality on health. The impact of the access to credit is also examined in the context of housing affordability. The evidence shows that while household income (measured by expenditure quintiles) is associated with better quality of housing service, it also points to the role of borrowing in general and housing loans in particular.*

Keyword Words: *borrowing, housing quality, income, the floor, the wall.*

I. Introduction

1.1. Genesis

Housing is human beings' one fundamental need, which provides the shelter, security, social dignity as well as the base of production and a sense of belongingness to the owner with increased comfort and satisfaction as regard to privacy to the individual and his family. The housing adequacy and quality is considered an indication of the productivity, wellbeing and satisfaction of a society. As housing is a form of security to the retirees and the old, housing ownership, now a days, is seen an asset of investment. If the housing sufficiency is achieved by the all, the government will be able to save its budget on many provisions like in recreation, health care, crime control and pollution etc. (Olanrewaju, A. L. and Woon T. C., 2017).

Bangladesh intuitionally recognized housing as one of the five basic needs and so as incorporated in the national constitution immediate after independence. (UN-Habitat, 2009; RICS, 2010; Barau, et al,2014). It is worth mentioning that several international and national policy efforts have been taken to improve the situation of housing. Still, those efforts could not satisfy the increasing demand of housing all over the world as per the UN habitat standard of adequacy, habitability and financial and cultural affordability. Housing price surpasses the inflation. The fast taking growth in urban areas exceeds housing supply and, resultantly, deteriorates the housing shortage. It is forecasted from many studies that an additional 3 billion people will need housing access by 2030 across the world.

Housing shortage in South and Southeast Asian region is an old phenomenon that started to deteriorate mainly from the world war second. A very early UN mission in the decade of fifty, with the focus on living condition of lower income family, observed that the rural housing in those countries was very deplorably substandard with unhealthy environment (Hart V. D., 1952). Since then the deficiency has been acerbating constantly with the overcrowding of the urban areas of the populated countries in this region.

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[1] For the convenience in further mention throughout the current paper, source of the data set has been termed as 'InM-2011'.

At the same time, Internally displaced persons (IDP) from the result of the natural calamity, political conflict exacerbates the housing shortage[2] crisis and increases the slum and low quality housing services in those countries including Bangladesh (Islam, et al, 2008; Arnold, et al, 2013).

One interesting issue needs to be noticed that not all informal settlers with low quality housing in slum are income poor. Some occupying the land illegally and endowed with other non-land assets and improve gradually their income sources. Even, some middle class urbanites opt to live in slum to avoid the financial burden. Hence, the elite capture is found obvious in socialized housing program.

Arrangement of accommodation for huge population squeezes the area of cultivable agricultural land in Bangladesh as well as in some other countries of the region, which creates threat on food security. Studies say that the reduction of agricultural land for being conversion of non- agricultural use (predominantly for housing) is around 1% of total land size each year. This issue becomes critical and threatening in context of food safety for a land scarce country like Bangladesh with the per capita land is only 15 decimals. It is also observed that most unproductively land conversion is happened for housing purposes (Quasem.,2011). The horizontal expansion is comparatively cheaper than the vertical expansion for the current period which drives the rural middle class towards horizontal expansion (Ahmed and Shaha, 2013). If the current housing expenditure spreads over time with the accessible and affordable housing finance, it will surely incentivize the people towards vertical expansion.

Studies suggest that the income of household influences the demand of housing more than other determinants. Therefore, access to housing finance can play significant role in housing affordability in low-income group of people to lessen the existing shortages of quality housing.

Affordability is a matter of concern for the people especially for the low-income group of people in this country (NRC, 2009; Barau et al, 2014). The most common and standard measure of housing affordability is to maintain the housing expenditure at the cost of 30 present income of a households. Therefore, the households' choice for the quality of housing depends on the extent of affordability (Jahan, and Kalam ,2012). Low and Middle-income households (LMIH) in Dhaka have to pay 40 percent of their monthly income for house rent only, which make difficult for them to meet the minimum standard of the non-housing expenses (Choudhury, 2013). Study shown by Choudhury (2013), though major cities of the region such as Mumbai, Chennai, Colombo enjoy better economic status than Dhaka, house price-to-income ratio in Dhaka is the significantly highest. In Mumbai, Chennai and Colombo, the ratio is 11.80, 7.50 and 12.59 respectively whereas in Dhaka it is 18.75.
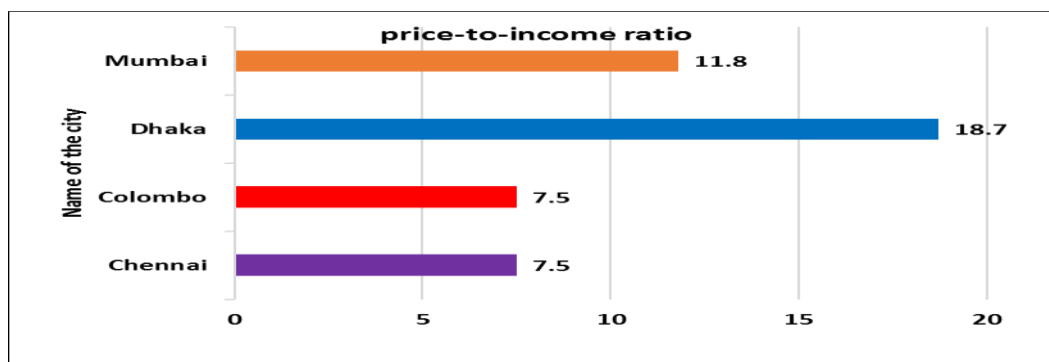

Figure 1.: The housing price-income ratio of the selective South Asian cities.
Source: Choudhury (2013).

Now, it is essentially felt for the objective of this study to see what instruments or variables measure the housing users' choice variable (Zinas, and Jusan, 2012).There are several matters what influence the choices of households in case of housing ,as a composite commodity, such as households' income, housing price, location, neighborhood environment, dwelling type, housing attributes, tenure type, family size, age, gender, education of households head, access to public services, access to public transport or citizen amenities, economic environment of housing market, access to credit market etc.

Moreover, researchers are also agreed on that the choice of housing type has serious impact on public health too. Indoor air quality and exposure to dampness are contributors to asthma and other allergic reactions,

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[2] The housing shortage is estimated in 1991 to be about 3.10 million units, composed of 2.15 million in rural areas and 0.95 million units in urban areas in Bangladesh. The annual population growth rate of the city is 4.34% and the household size is 4.8 (BBS, 2001).

particularly among children. It is hypothesized that damp environments are hospitable to mites, roaches, viruses, and molds, which affect respiratory disease (Frumkin, 2003).

The built environment or neighborhood around the residential environment also affects health through opportunities for physical activity and access to nutritious foods (Srinivasan, 2003).

1.2. Overview of housing and socio-economic correlates in Bangladesh

Housing, a basic need, is seen as one important determining indicator of living standard. The other living standard beset with housing is the living amenities, inter alia, sanitation facilities, electric facility, access to drinking water. The relationship of these facilities with the type of housing is needed to examine for the determinants of the choice of housing. Hence, the feature of rural housing status along the basic public services in Bangladesh is briefly described to get a picture as well as the rationale for the study in the following section.

Bangladesh is a country where still more than 70% population live in rural area. Among them majority is lower income group. Information in this section is mostly obtained from the survey titled "Housing Income and Expenditure Survey" done by Bangladesh Bureau of Statistics(BBS) -2010 with the technical and financial assistance of the World Bank. These data series generated are traditionally considered as the core source of data for estimation of poverty and its socio-economic correlates in Bangladesh. From the HIES-2010, it is found that the income per capita in rural area in BDT per month is only 2,130.0 and expenditure is close to it, 2,122.0 BDT.
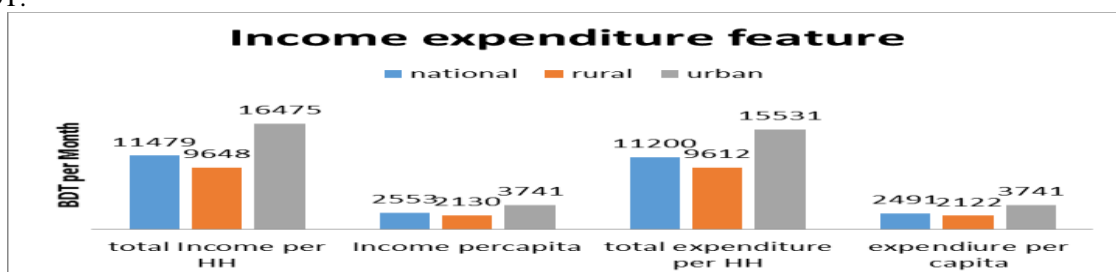

Figure 2: The total per capita income and the total per capita consumption expenditure.
Source: "Report of the Housing Income and Expenditure Survey -2010" by Bangladesh Bureau of Statistics.

The incidence of poverty with respect to the upper poverty line is 35.2% in rural area whereas in urban is 21.3%.

Table 1: Poverty Head Count Rate (percent) in 2010 and 2005 in Bangladesh.

Residence	Upper Poverty Line		Lower Poverty Line	
	2010	2005	2010	2005
National	31.5	40.0	17.6	25.1
Rural	35.2	43.8	21.1	28.6
Urban	21.3	28.4	7.7	14.6

Source: "Report of the Housing Income and Expenditure Survey -2010" by Bangladesh Bureau of Statistics (BBS).

Housing structure of the rural area is not well with respect to the UN-habitat standard. The materials of roof are mostly corrugated iron sheet (CIS) commonly known as tin. In case of wall materials, 43.24% is made of CIS/brick/wood, 20.57% of mud and 22.60% of hay/bamboo/others. The housing facilities are also not satisfactory in rural as well as in urban areas. Access of electricity is available in 42.49% households in rural area whereas in urban is 90%, the healthful sanitary/pucca toilet facilities are prevailing at 41.87% at rural and 76.12% in urban areas. Only 1.67% of supplied water is available in rural areas whereas in urban is 35.57%. The tube-well is available in 94.97% cases in rurality. A brief description of housing and socio-economic characteristics are presented in the following bar chart:
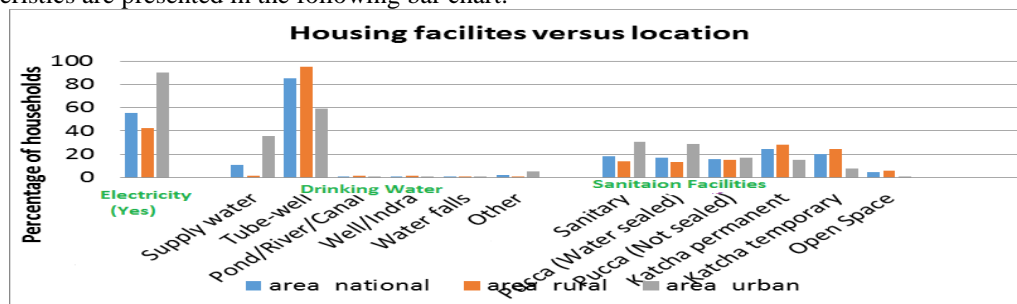

Figure 3: The housing facilities in national, rural and urban area in Bangladesh.
Source: "Report of the Housing Income and Expenditure Survey -2010" by Bangladesh Bureau of Statistics (BBS).

II. Methodology

2.1. Econometric modeling

According to the housing literature, the choice of housing depends on various types of determinants, inter alia, physical characteristics of house, neighborhood environment, the households' income, the price of house and its attributes and some others control variables such as education, gender, and so on. The borrowing or access to housing finance is supposed to be another influential determinant of the housing. The housing structure is varied on the basis of materials used in construction of the wall, floor and roof of a house. In the experimental sample, more than 98% of the roof of houses is made of tin[3]. Therefore, types of roof material will not give significant result in econometric analysis and will be excluded from the experiment. The other two are types of wall and floor material. There are several types of wall namely mud, bamboo, pucca[4], tin. The mostly found two types of floor are the mud and the pucca floor of housing structures. Therefore, these two types of housing characteristics 'the wall material' and 'the floor material' are used as dependent variables in the current analysis. As these types of wall and floor are made of different materials, the dependent variables are considered as discrete categorical variables and the outcome is to be nominal. The multi-nominal logit model(MNLM), formally written is as follows, is used in the analysis:

$$\ln \Omega_{m/b}(x) = \ln (Pr(y=m/\ x))/(Pr=(y=b/\ x)\ )= x\ \beta\ \text{ for } m=1 \text{ to } J \qquad (1)$$

Where **b** is the base category, which is also referred to as the comparison group (Long and Freese, 2006). As $\ln \Omega b/b(\mathbf{x}) = \ln1=0$, it always be $\beta_{b|b}=0$. Hence, log odds of an outcome compared with its own are always 0 and subsequently the effect of the independent variable will also be zero. This is why, generally j equation can be solved with the j-1 binary logit comparison.

The following equation adopted from the housing literatures shows the variables and the functional form to explore the interaction between the dependent and the independent variables in regard of housing choice.

$$T_h = f (P_h, Y, B, H_1, H_2...., L_1, L_2...Q_1, Q_{2......}C...) \qquad (2)$$

where, $\mathbf{T_h}$ is the type of housing quality chosen (wall material, floor material); $\mathbf{P_h}$ is the price of house, as price is not available in the sample, it is considered to be same (normalized); $\mathbf{Y}$ is the income of household (per capita annual consumption expenditure) and $\mathbf{H_i}$ (i =1 …I) is the house characteristics, $\mathbf{L_i}$ (i=1……n) is the location factor; Qi (i=1….t) is the environmental characteristics of the house and $\mathbf{C}$ is the other control variables.

2.2. Data analysis

The experimental sample collected by InM is formalized for this study purpose using the statistical software Stata-2012 and briefed into the size of 2561 households from eight districts of eight divisions in Bangladesh with geographical diversity in rural areas of mostly the poor people. The average per-capita consumption expenditure per annum is 26675.00 BDT which is near to the national poverty line in the rural area of Bangladesh. Interested dependent variables are housing types; the wall material and floor material of a house. The independent variables are per-capita consumption expenditure as the income proxy, general borrowing and housing borrowing as the dummy to investigate the impact of the finance on the category of housing choice. Among the households whose have access to credit or especially access to housing credit are drawing our interest to see the role of finance in affordability enhancement of the households. The environmental characteristics are required to test to see the impact of it on quality of housing type. Environmental variable in sample such as the surrounding environmental condition is to be examined. The medication facility, the other social and public amenities - the electricity, sanitation, drinking water types are the variables which supposed to influence household's choice. Therefore, these are included in the experimental tool box for regression analysis. Location is also an important factor for the choice variable consideration. Therefore, the area type is one variable from the sample has taken to relate the location effect on the housing choice. The others are the control variables of the households, the age, gender, education level of household-head and the size of the households.

In the second stage, regression has been run to have the outcome of the households' choice of housing type on public health. Illness per capita is taken to examine how much extent it is caused by the choice of a

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[3] corrugated iron sheet(CIS) which is predominantly used in construction of the top shade of the house as it is durable in protecting frequent raining in tropical country like Bangladesh and comparatively cheaper as well.

[4] Pucca is the common form of wall as well as floor of house in South Asia which is made of the mixture of substantial materials such as stone, brick, concrete, cement, sand, timber and iron rod etc. The term is frequently used for the durable and permanent structure as well as the better quality of housing material.

housing type. If the people are living in below standard housing facility, then, it is said in the housing literature that their tendency to illness is more and they become absent more frequently from their work. This is why, the per capita illness of the household member was taken as the proxy index of health standard of the housing type. The per capita illness was chosen as the dependent binary variable where the binary variable 'o' = no to illness (or ill-day) and '1'= yes to illness (or ill-day) in last 12 months. The independent variables are many such as the housing type, sanitation type, drinking water, surrounding environment, education, housing size, electricity status. The chosen housing type was the floor material of the housing because it is thought to be the more health sensitive.

III. Result and Discussion

Using the multi nominal logit model some interesting results are obtained from the regression of categorical housing type variables and the various continuous and discrete variables which are presented in tabular form in the appendix herewith. At first stage, two regression equations were run taking the wall material and the floor material of the house as the dependent variables for first and the second equation respectively. The dependent variable 'the wall material" is composed of five types of material; mud, bamboo, tin, pucca and others assigning number 1,2,3,4,5, respectively.

Similarly, in the second equation the categorical dependent variable is "the floor material, composed of three types of material; mud, others and pucca assigning number 1,2 and 3 respectively.

The type 'tin' and 'mud' are used as the base outcomes of the dependent variable in first and second equation respectively. The number of independent variables were eleven, inter alia, two are the categorical variables[5]. The rest of the variables are of two types; binary and the continuous. The discussion on the result of the econometric analysis are presented on the basis of the outcome co efficient of the variables as follows:

3.1. Gender impact on the choice of housing

In this econometric analysis female head is taken as the proxy of the gender to explore the impact on housing choice. But any of the coefficient are not found significant enough to explain the gender sensitivity in case of housing choice. One explanation is standing behind the fact that housing is a big expenditure for a household, the decision of taking housing service is a joint decision of family members irrespective of the gender of the head of a family.

3.2. Education favors the choice of quality housing

The relation of education and the choice of housing is found positive significantly. Education of household's head has taken as the proxy of households' education. It is found in the type of wall material that the log odds of pucca wall are significantly positive and log odds of mud wall are negative (insignificantly) compared to the tin wall. Similarly, the log odds of pucca floor are very significantly positive compared to the mud wall in the analysis of the type of floor material. It implies clearly that the more educated households favor the more quality housing. Hence, it is concluded that education is one of visible determinants of the housing choice.

3.3. The age of head influences the choice of housing

The relation of age with the wall material is found not significant but in case of floor material, the relation is found significantly positive. It is seen that the floor of pucca is chosen by the aged households' head with positive co-efficient of .01239919 compared to the mud floor. It implies the factor that the purchasing availability in housing of the aged people are more than the younger and hence, it is determinant of housing preference.

3.4. Better surrounding deserves better quality of housing.

Environmental factors play role in housing choice, the idea is supported by many studies of housing literature. In the current sample, the surrounding environment of houses has taken as the one independent variable to examine the impact on the choice of housing type. This variable is taken as continuous variable from the worst i.e. the dirtiest condition to the best i.e. the cleanest condition. The result is very significantly positive. The surroundings of pucca floor houses are .529 times cleaner than that of the mud floor. Similarly, the surroundings of pucca wall house are .8355 times cleaner than that of tin wall houses. The result is not significant between the mud and tin wall households. From the discussion, it is to infer that the higher quality housing is beset with the cleaner environment. Therefore, the environment is one determinant of choice of housing in rural areas of Bangladesh.

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[5] area type of four categories; plain, costal, char and haor and the health care type of five categories; traditional, dispensary, NGO based, govt. hospital and pvt. Hospital assigning 1,2,3,4,5 respectively.

3.5. Public amenities versus the choice of housing type:
      The public amenities are regressed to observe the impact on housing choice. Hygienic sanitation, pure water supply and the uninterrupted electric supply are the important public utilities for the living standard of the people. These are selected as the variables of latrine standard, drinking water standard and electricity status in this analysis to get the correlation with the housing choice. Latrine standard and the drinking water standard are considered as continuous variable from lower quality to higher quality, the electricity status is considered as the binary dummy (yes =1) variable to find the impact. It is observed that there is clear relation of the utilities with the quality of housing.
      In both the cases of equation with the wall material and floor material, the negative log odds of mud and bamboo and positive log odds of pucca households in choosing the sanitation, drinking water supply supports the argument vehemently that the better facility seekers choose for the better quality housing. In case of electricity status, though the result is significantly positive with pucca floor but not significant with pucca wall households. It may be happened due to the fact that the electricity attainability is not always matter for only the wealth but also for the availability of the supply of the service in those experimental areas. It is to note that the difference of the co-efficient of log odds in drinking water is not robust. Because, in our sample the majority of the households are situated in area where the most (98%) of the drinking water sources are shallow tube well. Boiled tap water used in the very least households which is marked as top of the drinking water quality. Moreover, it is again reminded the issue of the availability of the supply of the drinking water by service provider authority in the experimental areas. Therefore, it is not depending on the mere individual housing type only.

3.6. The income effect and the standard of housing
      Econometric analysis of this experiment has robustly supported the housing literature regarding income elasticity. In case of floor material, the positive coefficient of pucca floor house is significant at 1% (p-value) compared to the base mud floor. In case of wall material, the log odds of mud wall are negative at 1% significant level and pucca wall positive at 5% significant compared to the base tin wall. Therefore, it provides the clear evidence in favor of the income factor in choosing the housing quality that the consumption expenditure per capita (proxy of income) is increased, the choice of households is uplifted from lower quality to higher quality.

3.7. The role of credit in choice of housing:
      Econometric analysis has extended the hypothesis mentioned in the introductory discussion in regard of the choice of housing type and the role of credit. Housing borrowing and total borrowing have taken as two separate dummy variables to test the role of housing borrowing and total borrowing on the type of housing choice. From the table [2], the coefficient of housing credit is -.34903411 at 5% significant level of mud wall and the coefficient of housing credit is -.19093698 of pucca wall but not significant level. In case of pucca floor the log odds are .47592999 at 10% significant level comparing with the base mud floor. It infers that the more housing credit is accessed, the more tin wall and pucca floor is built up by the people. Actually, it is the fact of borrowing micro finance housing. Housing finance enhances the affordability of households towards the expected quality housing type.
      In case of total borrowing, only significant result is the negative log odds of pucca floor compared with the mud floor. In the sample, the majority portion of total borrowing is micro credit. Therefore, this finding has reinforced the perception that the local residents of pucca floor houses are solvent enough to meet their daily necessities and apathetic to micro credit. It is again proved in another separate regression of borrowing against the total asset of households (table [5]). The more well off/ wealthier households, take less micro credit. The regression table shows that the coefficient of no borrowing households is significantly positive. It means that the wealthy people borrow less microfinance and support the analysis is inferred.

3.8. Relation between the health care selection and the choice of house
      The result of regression is concurring the literature with little confusion and so needed to clarify. In case of floor material, it is found robustly that the coefficient of pucca floor is positive enough with required significance in choosing the NGO based and Private Medication. It implies that the richer are aware of selecting better health care service as well as the better housing quality. In case of wall material, it is found that mud wall coefficient is sufficiently negative compared to tin wall in choosing the medication from government and private hospital compared to other type of medication like traditional and unregistered dispensary. Hence, it is further deduced that the poorer people leaving in mud wall house are less aware and enabled of selecting better medication services as well as better quality than that of tin wall households. In case of pucca households, negative coefficient with the households choosing of all types of medication compared to tin wall. This result is contradictory to the earlier result and difficult to interpret. One way to explain the fact reviewing the form and

condition of the micro housing loan disbursement. The major portion of micro housing loan takers are inhabitants of tin wall house and are more conscious than the people who are even richer and living in pucca house. Therefore, their case is the negative result.

3.9. Area type and the choice of household's housing material

Econometric analysis shows the relationship of the regional diversity and the type of housing. In the first result (table [2]) equation run by taking the wall material as the dependent variable and the area type as one of the independent variable among other variables. But some unexpected non-concave log likelihoods are found in the case of area type. In the second equation, when the floor material is as the dependent variable and the same area type as the independent variable, the result is interpretable. The coefficient of pucca floor household is negative in each three cases; coastal, char and hoar respectively compared to the mud floor household but only coastal coefficient shows the result at sufficient level of significance. Hence, it is to be inferred that the plain land households are enjoying the better quality housing compared to the households of other three areas as they are found with less endowment of pucca houses. For better understanding of the housing choice on areal variation, another separate regression has been conducted between the type of housing and the type of area and found that the coefficient of pucca wall household is more in plain area compared to the other three areas significantly (table [3]). In addition, the regression between the floor material versus the area type shows the clearly similar fashion of the result in choosing of housing type. From the preceding discussion, it is concluded that the geographically challenged areas are facing more shortage of better quality housing which should be more emphasized in the time of policy making in this regard.

3.10.   Health impact of housing material and the choice of housing

To analyze the impact of housing material on public health, the floor material of house has been chosen as the desired type here (table [4]). Because the floor material is supposed to be the most relevant type to the health affairs compared to the wall and roof material of housing. Annual per capita illness meaning i.e. the number of days in last twelve months are missing from work due to illness as the dependent variable. The independent variable is the floor material, consumption expenditure per capita, type of medication and other household characteristics variables. It is observed from the result of regression that the coefficient of pucca households are negatively related to the illness meaning the less of illness but the result is not significant. In the sample, the percentage of pucca floor is not too large to show the relationship significantly. Similar pattern is found in case of latrine type, per-capita consumption variable showing the negative coefficient but not at significant. But in case of education, surrounding environment, electricity status, the negative coefficient means the better quality of these amenities lessen the possibility of ill incidence. Drinking water variable shows the little complicated result. In drinking water case, the better drinking water with higher possibility of illness. This is impractical. The result may come for data insufficiency.

The top quality water is tap water, boiled and the arsenic free tube well, the bad quality is un-boiled tap water, pond water, and the medium quality is untested tube well water and others. Therefore, the positive co-efficient has been created for the uneven frequency of data. Finally, it is to be concluded that the illness (or day off), as an outcome of housing type, is supposed to be a key factor or concern   for determining the housing choice.

IV. Conclusion

Housing is one of the most important policy concern in Bangladesh. The determinants of choice of housing quality needed to know for the development and implementation of the policy instrument successfully. In this study, housing choice of the rural poor and role of housing borrowing in the housing affordability have been investigated with the data collected from the geographically diversified areas in the eight districts from eight division of Bangladesh. From the descriptive analysis in the introduction, the idea is founded that the housing choice are influenced by many variables including income and the borrowing. In econometric analysis, it is eventually proved that the income is the most influencing determinant of the housing choice of the households. The housing quality is improved with the rise of consumption expenditure. As consumption expenditure is considered as the income proxy, then, it can be said that income plays major role in housing choice. Among the other factors, housing location with better citizen amenities is also impacting the housing choice. The conscious and rich people are choosing better housing quality which have been shown in the regression taking the health care type as explanatory variable. The people who goes to better services for medication, they are interested in better quality housing too. Borrowing for housing purpose have been found influential determinants of the choice of housing type. It means, the policy can be taken towards the deepening of access to housing finance for better quality housing services. Though result is not robust, housing choice is correlated to public health found in the regression analysis when the illness per-capita in households has been taken as outcome variable in the regression. Therefore, policy makers need emphasis the formulation of policy

support towards the improvement of the quality of housing in consideration of having higher labor productivity through ensuring the better public health status of a country too.

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Appendix

Table: 2. Multinomial logit regression for the choice of housing for wall and floor materials.

Explanatory Variable in Stata	Wall materials				Floor materials	
	Mud	Bamboo	Pucca	Others	Pucca	Others
Female_head	.22811407	.25474212	-.19248064	-.15230288	.35048478	-19.033115
Educlevel_Head	-.01269276	.02805459	.05309631**	-.08580859*	.08369434***	.1984302
Age_Head	.00082511	-.00018538	-.00128419	-.01621139*	.01239919*	.61866567
Size_Hh	-.06648329**	-.22855449**	.01723093	-.08686115	.03725472	-4.3357604
Surr_Envrn_Clnness	.03223115	.21829357	.83554106***	-.23744926	.52885307**	-1.6775526
Latrin_Standard	-.42473471***	-.76012597***	.91398611***	-.45716347***	1.5165732***	-.2416118
Drnking_W_Stnrd	.47288478***	.75982703***	.74981188***	.09960227	.41703707**	9.4007161
Electri_Status	-.20369801*	-1.1383431***	-.22185019	-.78728534**	.68702448**	9.5944867
Consup_Pc	-.00001657*	-.00004479**	7.959e-06**	-.00004315**	.00001855**	-.00020769
Total_Credit	.08935958	13.613908	-.06209164	-.2432606	-1.0973079*	7.4988574
Housing_Credit	-.34903411**	.14624993	-.19093698	-.5110397	.47592999*	-8.7030302
Health_Care_Type						
Dispensary	-.19301253	-.60481246	-1.0280127***	.14795673	-.25968341	12.840125
NGO Based	-.5123576	.28143488	-.03591348	-13.8768	.75382546*	-11.438895
Govt. Hospital	-.85817573***	-.20425516	-1.1115864***	-.03153497	-.03291279	-.22964562
Pvt.Hospital	-.79129694**	.25645937	-.68094093**	-.11261421	.98453796**	-9.5782848
Area_Type						
Coastal					-2.6656282***	-7.7401122
Char					-.02479477	11.520834
Haor					-.68032985	11.648522
_Cons	1.0102921*	-13.369068	-8.1635434***	1.9182342	-10.823047***	-62.672848

legend: * p<.1; **p<.05; ***p<.01

Table: 3. Multinomial logit regression for choice of housing for wall and floor materials with the area based diversity.

Explanatory variable in Stata	Wall material				Floor material	
	Mud	Bamboo	Pucca	Others	Pucca	Others
Area_type						
Coastal	-17.649344	-1.005003	-2.5264495***	-.41716888	-3.3768418**	-11.464186
Char	-1.4504353***	2.7774742***	-.14409524	-.18343547	-.89946929**	1.7917577
Haor	.73403394***	.28478577	-.64867112**	.83170782***	-2.0217738***	1.5449886
_cons	-.18259802***	-3.3389127***	-1.3067769***	-2.722609***	2.1371136***	-7.313279***
legend: * p<.1; **p<.05; ***p<.01						

Table.4: The outcome variable, per capita illness of households and the choice of housing type.

Explanatory variables	Per-capita illness
hh_floor material	
Others	1.0915612
Pucca	-.24192323
female_head	.17755102
Educlevel head	-.03560664*
size_hh	-.0317186
surr_envrn~s	-.1814064**
Driniking_water_quality	.34764251***
latrin_standard	-.01767481
electri_status	-.26896736*
consup_pc	-1.165e-06
_cons	-2.1339212***
legend:*p<.1;**p<.05;***p<.01	

Table 5: The result of the regression between the total credit and the total asset.

Explanatory variables	Total credit per households
t_asst_hh	1.874e-07**
_cons	-4.7682104***
legend: * p<.1; **p<.05; ***p<.01	