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Willingness to Pay for Health-Enhancing Housing Components and the Self-Help Approach to Housing the Urban Poor

by

*Orville Solon**

*Assistant Professor, School of Economics, University of the Philippines

Abstract

The self-help approach, which proposes that government facilitate rather than directly provide for housing improvements in urban poor communities, could lead households to underinvest in housing components with strong health benefits. This argues for the direct provision of health beneficial housing components, owing to their public goods nature. Data from a survey of households from Metro Manila and Metro Cebu in the Philippines was used to identify which housing components had significant influence on health status. Hedonic regressions were used to estimate the lack of willingness to pay by households for such housing components as sewers, pest control, and removal of stagnant water. The net cost of providing health beneficial housing components were estimated to be the additional rent from having such housing components improved less the value of health benefits these generate. Lower bound estimates of the value of improved health are measured as the foregone health expenditures implied by reduced health risks.

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I. Introduction

Allowing poor residents of cities in the developing world to build housing with their own resources at their own pace and initiative is now considered more effective and lasting than having governments provide them with dwelling units (*World Bank, 1992 and 1993*). However, it has long been argued that observed symptoms of the housing problem -- illegal land occupation, makeshift building materials and high density neighborhoods -- are in fact solutions (*Mangin [1967], Turner [1976]*). Indeed, with monopolistic urban land markets in the background, poor households squat on undeveloped or marginal areas to have better access to employment and market opportunities. With limited resources and in the face of the risk of eviction, poor households build makeshift structures in overcrowded communities. The housing conditions of poor households are rational responses to the structure of incentives prevailing in the urban economy (*Jimenez [1984], Remolona [1984], Solon [1987]*).

The self-help approach therefore proposes that public policy assume a facilitative rather than an interventionist role. By strengthening tenure security, poor households are encouraged to invest in their housing. By promoting access to credit facilities, poor households are allowed to increase the pace of housing investment. By providing water and sanitation services according to their willingness to pay, poor households are placed in a better position to improve upon the quality of the home environment.

This paper attempts to qualify the self-help approach by pointing out that households may be less willing to provide or pay for components of housing with benefits (or costs) that are shared by entire neighborhoods. Hence, such components as treatment of excreta and wastewater and the control of disease-carrying pests may end up being underprovided. Consequently, especially since such housing components are considered important factors in disease avoidance, household health status may be compromised. By identifying which components of housing enhance household health and comparing these with those that households are (or are not) willing to pay for, the paper argues for some form of direct public intervention or subsidy. Data from a survey of households in two metropolitan centers in the Philippines are used to substantiate the arguments in the paper. A more detailed description of the data is presented in Appendix 1.

The rest of the paper develops into four sections. Section 2 presents the analytical framework from which the hypothesis that the self-help approach will result in less than adequate

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household environment is developed. Section 3 identifies which components of housing have significant influences on health. Section 4 determines what households are willing to pay for health-enhancing housing components, and presents an analysis of the factors that affect households' willingness to pay. The last section summarizes the results of the analysis and makes suggestions for policy.

II. Analytical Model

The theory concerning the underprovision of services that produce external benefits is well established. The purpose of this section is to develop a model that shows this result and provides a framework for empirical analysis. In particular, the model is specified to show that comparing willingness to pay for housing characteristics with the health impact of the same characteristics provides a simple test of the hypothesis.

Consider a community or neighborhood of N households, each behaving according to the following utility maximization problem:

$$\begin{aligned} &\max_{\{a\}} \; U = U(z, H_1, H_2, H_3, s) \\ &s.t. \; y = z + r \end{aligned} \tag{1}$$

where $a = (z, H_1, H_2, H_3)$, z is a composite consumption commodity including health care services, H_1 is a vector of housing components that provide basic shelter services, H_2 is a vector of housing components that provide basic amenities with benefits that are internal to the household, H_3 is a vector of housing components that provide community level amenities, and s is household health. The utility function is assumed to be increasing and twice-differentiable with respect to its arguments.

Household income, y, is spent on consumption (used as numeraire) and on housing which is rented at the rate r. For convenience, medical expenditures are ignored by subsuming them under z.

Following the hedonic price approach (*Freeman [1979]*), rent is expressed as a function of housing components,

$$r = r(H_1, H_2, H_3) \tag{2}$$

where r increases with H_1, H_2, and H_3. Suppose that a non-linear specification of equation (2) is estimated. The coefficients representing $\frac{\partial r}{\partial H}$ may be interpreted as an inverse demand function for H. It is in this sense that $c = \frac{\partial r}{\partial H}$ is considered the implicit price of component H.

Household health is assumed to be determined according to the following production function

$$s = s(y - r, H_1, H_2, H_3, H_N) \tag{3}$$

where $H_N = \sum_n H_{3n}$, for $n = 1, \ldots, N$, N being the number of households in the community. Household health is assumed to be increasing with respect to its arguments. It is through H_N, defined here as the sum of community level housing facilities demanded by the entire community, that the external health benefits of neighborhood amenities are examined.

To show lack of willingness to pay for housing components that are shared by the community, consider the relevant optimality condition for H_3. If the household were to consider the full benefits (own H_3 and H_N) then the household will demand H_3 to a point where the direct marginal benefits plus the full health benefits is equal to its implicit price, or

$$(\frac{\partial r}{\partial H_3})^F = \frac{\frac{\partial U}{\partial H_3} + (\frac{\partial U}{\partial s})(\frac{\partial s}{\partial H_3}) + (\frac{\partial U}{\partial s})(\frac{\partial s}{\partial H_N})}{\frac{\partial U}{\partial z} + (\frac{\partial U}{\partial s})(\frac{\partial s}{\partial z})} \qquad (4)$$

However, assuming away Tiebout-type adjustments that would allow rental markets to capture community level benefits, the household will only pay an implicit price for H_3 equal to $(\frac{\partial r}{\partial H_3})^I$ so that

$$(\frac{\partial r}{\partial H_3})^I = \frac{\frac{\partial U}{\partial H_3} + (\frac{\partial U}{\partial s})(\frac{\partial s}{\partial H_3})}{\frac{\partial U}{\partial z} + (\frac{\partial U}{\partial s})(\frac{\partial s}{\partial z})} \qquad (5)$$

By comparing equations (4) and (5), the lack of willingness to pay for H_3 may be established. Since $(\frac{\partial r}{\partial H_3})^I < (\frac{\partial r}{\partial H_3})^F$, then $H_3^I < H_3^F$. Consequently, since everyone else in the community can be expected to demand H_3 according to equation (5), H_N will fall short of Pareto optimal levels.

III. Identifying Health-Enhancing Housing Conditions

There are two ways of identifying which components of housing enhance health status. One approach is to consider how housing characteristics influence the transmission of diseases or provide for conditions conducive to the development of disease (*Briscoe [1992]*). For example, water supply and toilet facilities are usually identified as the key to disease transmission via the oral-fecal route. Ventilation and cooking facilities, on the other hand, help define the conditions associated with respiratory illness. The health benefits from improvements in housing may be expressed in terms of the healthy days associated with the reduction in specific disease incidence (*Feacham and others [1992]*).

The other approach which is taken here is less direct. The influence of specific housing characteristics on health are determined by regressing households' health status valuation against housing characteristics. Analogous to the concept of implicit prices, the regression coefficients then provide the implicit value of housing characteristics measured in terms of health.

Three sets of housing components corresponding to H_1, H_2, and H_3 in equation (3) are tested against the respondents' health status valuation of the entire household and of the children in the household: (1) those that provide basic shelter such as interior space, floor, age and general condition of the structure; (2) those that provide basic housing facilities internal to the household including toilet facilities and water supply; and (3) those that provide basic sanitation facilities with spillover benefits including garbage collection, waste disposal, sewers, and presence of pests. Table 1 presents the descriptive statistics for these three sets of housing components.

The household environment faced by the urban poor is deplorable. This is indicated by the average condition of basic housing and sanitation facilities. Less than half of the urban poor households consider their housing structure generally well-maintained. In addition, a significant proportion of households (48 percent) either do not have any toilet facility whatsoever or continue to use open pit latrines. A slightly higher proportion of households (56 percent) have no access to individual or shared piped water source. About 49 percent of households dispose of garbage by burning or by dumping into canals, vacant lots and walkways. While 28 percent of households had flowing sewer systems, over two-thirds were observed to have stagnant water poold in their immediate surroundings. Furthermore, mosquitoes, flies, and rodents were visibly present in the home environment of close to 90 percent of respondents.

In contrast, the dwelling units of the urban poor are substandard but are far from being considered miserable. While space is limited (about 5 m^2 per household member), their housing structures cannot be considered makeshift. Most had floors of bamboo or wood (65 percent) instead of the expected dirt floors.

Health-enhancing housing components are identified by estimating equation (3) using the respondents' valuation of household and children's health status. The Ordered Probit estimates of equation (3) are presented in Tables 2a (where household health status is regressed against the various housing components) and 2b (where children's health status is regressed against housing components).

A number of components associated with the shelter aspect of housing are found to have significant influence over health status. Interior space per household member is shown to have a positive effect on children's health status. Interior space is considered to be an important factor in the spread of communicable diseases and other diseases associated with congestion. The general condition of the housing structure was likewise found to have a positive and significant effect on both children's and household health status.

Surprisingly, none of the specific housing components associated with basic facilities were found to have any significant influence on health status. Source of drinking water and toilet facilities had coefficients which were found to be not statistically different from zero.

Sanitation facilities with external benefits, on the other hand, are found to be highly correlated with health status. Households with garbage collected by a disposal unit and those with unclogged sewers gave themselves higher health status ratings. On the other hand, those with human and animal waste, stagnant water, and pests in their surroundings gave themselves correspondingly lower health status ratings.

IV. Willingness to Pay for Health-Enhancing Housing Conditions

Assuming that differences in the condition of housing components are reflected in housing rents, the implicit price of individual housing components can be derived by estimating equation (2) as a log-linear equation. The implicit prices can then be interpreted as inverse demand functions for housing components assuming that the supply of each component is fixed and that households competitively bid for each housing characteristic.

Implicit value of health enhancing housing conditions.

In estimating equation (2), monthly rental payments were regressed against the housing characteristics listed in Table 1. Note that most of the housing components are specified as dummy variables. Hedonic pricing models usually assume housing components to be continuous so that $e_i = \frac{\partial r}{\partial H_i}$ can be evaluated. With dummy variables, however, implicit prices have to be computed using total rather than partial derivatives. Thus, the estimated implicit prices may be biased upwards.

The regression results are presented in Table 3. Of the components representing basic housing amenities, households are shown to have positive willingness to pay for flush toilets. For shelter components, households are observed to be willing to pay for greater interior space per household member and for floorings made of cement, tiles, or marble.

Among the various community level sanitation components tested, households are only revealed to have willingness to pay for garbage to be collected, and for the removal of human and animal waste within the neighborhood. No willingness to pay for flowing sewers, pest control, and removal of stagnant water were indicated by the results.

A comparison of which housing components enhance health status and which components households are revealed to be willing to pay for is presented in Table 4. For basic shelter components, the interior space per household member was found to have a positive impact on health status and for which households are willing to pay. On the other hand, households are found to be unwilling to pay for the general condition of the housing structure despite having a positive impact on health. Furthermore, characteristics like cement, tile, or marble floors had positive implicit prices with no corresponding impacts on health.

Among the basic housing facilities, piped source of drinking water had no effect on health but had a negative and significant implicit price attached to it. However, households have high willingness to pay for toilet facilities that required continuous water source (flush toilets), but these type of facilities do not seem to have any impact on health status.

Except for the absence of human and animal waste within the neighborhood and for having garbage collected by a disposal unit, housing components with strong spillover effects did not have any significant influence on rent. But all these components have strong influence on household health. This result supports the hypothesis that households are less willing to pay for housing components that produce neighborhood externalities.

To be able to determine whether households' unwillingness to pay for housing components that produce neighborhood externalities is justified, it is necessary to come up with a measure that will be able to quantify, in monetary terms, the reduction in health expenditures brought about by good housing conditions. This value should then be compared with the corresponding increase in rent expense if good housing conditions are maintained. The methodology for comparing these two values is shown in Appendix 2. Results are shown in Table 5. The simulations suggest that by requiring households to maintain health-beneficial housing components, they stand to save about P37 as health spending drops owing to better health. However, if such housing components were to be accessed through the rental market, rents would have to be increased by as much as P120.

V. Collective Action for Health-Enhancing Housing Environment

A summary of the comparison between housing components for which households were willing to pay for and its impact on health is presented in Table 6 below. The results suggest that by following the self-help approach, housing components with high health impacts and with strong neighborhood effects may end up being underprovided. The results call for some form of collective action to be integrated into the self-help approach.

There are two ways that might help the self-help approach avoid the result of underprovided neighborhood sanitation facilities. One is for governments to directly provide or subsidize the provision of such facilities. Doing this with the participation of the concerned communities might help reduce the inefficiencies and unresponsiveness associated with government sponsored projects. It is also important that government intervention confines itself to specific facilities like a sewer system. Experience with broadly defined sites and services projects have not been encouraging.

The other approach is to give the communities incentives to provide health enhancing neighborhood facilities themselves. One possibility is to integrate the building and maintenance of community level sanitation systems with the process of granting residential land tenure. In the case of squatter communities for instance, that household waste is properly collected and disposed of can be made a condition for eligibility in urban land reform schemes. After all, part of the reason why households find high density squatter communities attractive is security in numbers.

Table 1. Descriptive Statistics of Variables (Number of observations: 303)

Variable	Mean	Standard Deviation	Minimum	Maximum
Children in the household are very unhealthy	0.01	0.08	0	1
Children in the household are somewhat unhealthy	0.06	0.24	0	1
Children in the household are unhealthy	0.16	0.37	0	1
Children in the household are moderately healthy	0.60	0.49	0	1
Children in the household are most healthy	0.17	0.37	0	1
Household members are very unhealthy	0.01	0.08	0	1
Household members are moderately unhealthy	0.03	0.16	0	1
Household members are moderately healthy	0.21	0.41	0	1
Household members are most healthy	0.76	0.43	0	1
Interior space per household member (in m^2)	4.85	5.16	0	38
Flooring is made of dirt	0.09	0.28	0	1
Flooring is made of bamboo or wood	0.65	0.48	0	1
Flooring is made of cement, tiles, or marble	0.26	0.44	0	1
Age of housing structure (in years)	11.30	10.03	0	80
Housing structure is generally well-maintained	0.36	0.48	0	1
Household does not have a toilet	0.38	0.49	0	1
Household uses an open pit toilet	0.10	0.29	0	1
Household uses a flush toilet	0.52	0.50	0	1
Presence of piped water supply	0.44	0.50	0	1
Presence of human and animal waste within the neighborhood	0.83	0.38	0	1
Presence of flowing sewers	0.28	0.45	0	1
Presence of stagnant water	0.69	0.46	0	1
Presence of pests	0.88	0.32	0	1
Garbage is collected	0.51	0.50	0	1
Number of years of schooling of household head's spouse	7.65	3.22	0	15
Monthly household expenditures	1575.57	841.59	400	7480
Monthly rent expense	237.60	368.80	8	5000
Monthly household expenditures net of rent expense	1337.97	707.16	100	7105

Table 2a. Impact of Housing Characteristics on Household Health Status

Variable	Coefficient Estimate	Standard Error	T-statistic
Constant	3.01307	0.57727	5.21953*
Interior space per household member	0.02296	0.02253	1.01918
Flooring is made of bamboo or wood [a]	-0.04372	0.25375	-0.17230
Flooring is made of cement, tiles, or marble [a]	0.49406	0.32705	1.51064
Age of housing structure	-0.01175	0.00770	-1.52608
Housing structure is generally well-maintained [b]	0.69525	0.20522	3.38787*
Presence of open pit toilet [c]	0.21846	0.22249	0.98187
Presence of a flush toilet [c]	0.13072	0.19477	0.67112
Presence of piped water supply [d]	0.09863	0.16654	0.59228
Presence of human and animal waste within the neighborhood	0.26708	0.27567	0.96883
Presence of flowing sewers	-0.00946	0.22621	-0.04184
Presence of stagnant water	-0.46795	0.21551	-2.17136*
Presence of pests	-0.69214	0.33869	-2.04356*
Garbage is collected [e]	0.31860	0.16572	1.92245*
Number of years of schooling of household head's spouse	-0.00709	0.02694	-0.26309
Monthly household expenditures net of rent expense	-0.00007	0.00011	-0.66072
μ_1	0.63407	0.22439	2.82567*
μ_2	1.90333	0.14812	12.81960*
Log of Likelihood Function: -177.588			

* Significant at 90% confidence interval

[a] Compared to dirt floor

[b] Compared to ill-maintained

[c] Compared to no toilet facility

[d] Compared to fetched or peddled

[e] Compared to dumped or burned

Table 2b. Impact of Housing Characteristics on Children's Health Status

Variable	Coefficient Estimate	Standard Error	T-statistic
Constant	1.92402	0.52126	3.69108*
Interior space per household member	0.02448	0.01068	2.29191*
Flooring is made of bamboo or wood [a]	0.06902	0.28684	0.24063
Flooring is made of cement, tiles, or marble [a]	0.18527	0.31128	0.59518
Age of housing structure	-0.00608	0.00738	-0.82325
Housing structure is generally well-maintained [b]	0.42806	0.14344	2.98432*
Presence of open pit toilet [c]	-0.20959	0.22833	-0.91790
Presence of a flush toilet [c]	0.06853	0.15345	0.44662
Presence of piped water supply [d]	-0.19241	0.13620	-1.41269
Presence of human and animal waste within the neighborhood	-0.31682	0.17583	-1.80181*
Presence of flowing sewers	0.35609	0.15895	2.24029*
Presence of stagnant water	0.02675	0.15623	0.17122
Presence of pests	0.24583	0.24648	0.99736
Garbage is collected [e]	0.18513	0.13822	1.33935
Number of years of schooling of household head's spouse	0.04865	0.02052	2.37080*
Monthly household expenditures net of rent expense	7.46e-05	1.21e-04	0.61424
μ_1	1.12416	0.26817	4.19190*
μ_2	1.97570	0.11142	17.73280*
μ_3	3.86976	0.11555	33.49050*
Log of Likelihood Function: -307.858			

* Significant at 90% confidence interval

[a] Compared to dirt floor

[b] Compared to ill-maintained

[c] Compared to no toilet facility

[d] Compared to fetched or peddled

[e] Compared to dumped or burned

Table 3. Willingness to Pay for Housing Characteristics

Variable	Coefficient Estimate	Standard Error	T-statistic
Constant	4.94798	0.21596	22.91170*
Interior space per household member	0.01450	0.00785	1.84723*
Flooring is made of bamboo or wood [a]	-0.04049	0.15512	-0.26103
Flooring is made of cement, tiles, or marble [a]	0.29179	0.17638	1.65432*
Age of housing structure	0.00363	0.00377	0.96200
Housing structure is generally well-maintained [b]	0.11424	0.09358	1.22074
Presence of open pit toilet [c]	0.10106	0.17989	0.56177
Presence of a flush toilet [c]	0.25662	0.10608	2.41917*
Presence of piped water supply [d]	-0.15979	0.09174	-1.74171*
Presence of human and animal waste within the neighborhood	-0.20705	0.11932	-1.73519*
Presence of flowing sewers	0.03753	0.10126	0.37067
Presence of stagnant water	0.08152	0.09389	0.86830
Presence of pests	-0.16996	0.12254	-1.38696
Garbage is collected [e]	0.24789	0.08778	2.82409*
R-squared: 0.171483		F-statistic: 4.60123	
Adjusted R-squared: 0.134214		Log of Likelihood Function: -336.792	

* Significant at 90% confidence interval

[a] Compared to dirt floor

[b] Compared to ill-maintained

[c] Compared to no toilet facility

[d] Compared to fetched or peddled

[e] Compared to dumped or burned

Table 4. Comparing Health Impact and Implicit Prices of Housing Components

Variable	Health Impact (on Household or Children's Health Status)	Willingness to Pay
Interior space per household member	+	+
Flooring is made of bamboo or wood [a]	0	0
Flooring is made of cement, tiles, or marble [a]	0	+
Age of housing structure	0	0
Housing structure is generally well-maintained [b]	+	0
Presence of open pit toilet [c]	0	0
Presence of a flush toilet [c]	0	+
Presence of piped water supply [d]	0	-
Presence of human and animal waste within the neighborhood	-	-
Presence of flowing sewers	+	0
Presence of stagnant water	-	0
Presence of pests	-	0
Garbage is collected [e]	+	+

[a] Compared to dirt floor
[b] Compared to ill-maintained
[c] Compared to no toilet facility
[d] Compared to fetched or peddled
[e] Compared to dumped or burned

Table 5. Reduction in Health Expenses vs. Increase in Rent Due to Good Housing Conditions

	Average	Range of Values
Using Household Health Status		
Reduction in Health Expenses	₱ 37	₱ 9 - ₱ 175
Increase in Rent	₱ 119	₱ 73 - ₱ 238
Gain (Loss) due to Good Housing Conditions	(₱ 82)	
Using Children's Health Status		
Reduction in Health Expenses	₱ 38	₱ 10 - ₱ 179
Increase in Rent	₱ 121	₱ 0 - ₱ 245
Gain (Loss) due to Good Housing Conditions	(₱ 83)	

Table 6. Summary of Results

Housing Component	Health Impact	Willingness to Pay
Shelter components	high	high
Housing Amenities	low	high
Housing Environment	high	low

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Appendix 1. Description of the Data

About 1,995 households from Metro Manila and Metro Cebu were interviewed in 1988 (see Table A.1). Of the 1,044 households surveyed in each Manila, around 81 percent were identified as urban poor on the basis of the communities where they lived. Similarly, around 82 percent of the Cebu sample resided in urban poor communities. Urban poor communities were identified as "areas for priority development" by the Presidential Commission for the Urban Poor and the National Housing Authority of the Philippine Government. The rest of the households surveyed served as the control sample. In both cities and for both the urban poor and the urban non-poor, area-based random sampling techniques were used. However, only households with children between ages 0-7 were selected.

Table A.1. Sampling Distribution

City	Non-poor	Poor	Total
Manila	194	850	1044
Cebu	174	777	951
Total	368	1627	1995

In estimating the various models in this paper, a subsample of urban poor households reporting housing rental payments was used. Only 303 households satisfied this condition.

Appendix 2. Valuation of the Improvement in Health Status vs. Increase in Rent Due to Good Housing Conditions

1. Using the resulting estimates from equation (3), four health status predictions were made: (1) household health status when housing conditions are good; (2) household health status when housing conditions are not good; (3) children's health status when housing conditions are good; and (4) children's health status when housing conditions are not good.

$$\hat{s} = \hat{s}(z, H_1, H_2, H_3, H_K) \qquad \textbf{(A.2a)}$$

Note, however, that only the significant H variables were used in characterizing good and not good housing conditions.

2. Ordinary Least Squares estimation was done to determine how each of those health status predictions, $\hat{s}$, influence the proportion of household's medical expenditures to total expenditures, m.

$$m = m(\hat{s}, z) \qquad \textbf{(A.2b)}$$

3. The differences in the coefficients (βs) of predicted health status under varying housing conditions were then calculated and multiplied by the level of total household expenditures, y, to get the amount of savings in medical expenditures attributable to good housing conditions, h.

$$h = (\beta_{good} - \beta_{bad}) \; X \; y \qquad \textbf{(A.2c)}$$

4. Using the resulting estimates from equation (2), predictions for rent when housing conditions are good and when housing conditions are not good were made.

$$\hat{r} = \hat{r}(H_1, H_2, H_3) \qquad \textbf{(A.2d)}$$

5. The difference in the predicted values of rent under varying housing conditions were calculated to get the amount of increase in rent expenditures attributable to good housing conditions, w.

$$w = \hat{r}_{good} - \hat{r}_{bad} \qquad \textbf{(A.2e)}$$

6. The difference in the value of h from procedure (3) and w from procedure (5) represents the household's gain, g, if it decides to transfer to a good house.

$$g = h - w \qquad \textbf{(A.2f)}$$