

A further report of the preliminary findings of an experimental study of housing and health; this time the focus is on the 18-month effects of improved housing on social adjustment and mental health.

HOUSING AS AN ENVIRONMENTAL FACTOR IN MENTAL HEALTH: THE JOHNS HOPKINS LONGITUDINAL STUDY

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A SERIES of reports have described the progress of a longitudinal study of the effects of housing quality on physical morbidity and social-psychological adjustment. The present report is devoted largely to some of the study's preliminary findings in social adjustment and mental health areas. A brief summary of the hypotheses to be tested, the experimental design, and some characteristics of the study population may be a useful preliminary.

Study Design and Previous Findings

Hypotheses to be tested, experimental design, and measurements made—At the outset of the study, a series of hypotheses were formulated in some detail and have previously been reported elsewhere.^{1,2} For present purposes, they may be summarized as follows:

With regard to physical health, the expectation was that the slum environment has a generally deleterious effect and that, in addition, the incidence of certain specific disease entities may be related to certain specific components of housing quality.

With regard to social psychological

adjustment, the expectation was that the slum environment offered inhibitions and restraints upon the development of wholesome family relationships, sociality and neighborliness, and good citizenship in the general community. Finally, slum housing was considered from the point of view of personal psychological development as producing inhibitions and restraints upon realistic aspirations for self and family, upon morale, and upon appropriate solutions of, and points of view toward, life's problems.

Measurements have been made on a test group of approximately 400 Negro families (2,000 persons) and on a control group of approximately 600 Negro families (3,000 persons). Both from interviews with the female head of the household and from public document sources, data have been gathered systematically on housing quality, demographic characteristics, morbidity, social adjustment, health practice and information, dietary habits, school performance of children, and police and juvenile court information.

Initial measures were obtained on both the test and control groups at a time when the test families were living

in the slum (the "before" period). Subsequently, the test families moved into a new public housing project, and since that time (the "after" period) we have obtained morbidity data every ten weeks; adjustment data approximately annually.

Previous findings summarized—Examination of "before" data reveals close comparability of test and control groups on distributions of all demographic variables examined, for example: family size, age of oldest child, marital status, income, education, and so forth. Although an effort also was made at the outset to match test and control families on initial housing quality, subsequent assembling of individual housing quality items into a weighted index showed that almost 10 per cent more test than control families were to be found in what may be considered "very bad" housing, according to criteria adapted from the American Public Health Association Appraisal Method.

"Before" morbidity data show close initial comparability on medical history (including history of chronic complaints) and incidence of illness in the two months prior to the "before" interview. The first 18 months of the "after" period revealed eventually a small increment for the test group in the direction of the hypothesis. In other words, after a small initial reversal, test illness rates remained slightly lower than control illness rates.³

Preliminary Social Adjustment Findings

The social adjustment data we are presenting do not take into account certain alterations that had occurred in the test and control groups during the time period under consideration. For example, by the 18-month period some controls had actually moved to public housing projects, but they still appear in the control data. Furthermore, although 5 per cent and 8 per cent of the

test and control families, respectively, had dropped out of the study by the same period, they still appear in the "before" data. An analysis of these test and control group losses revealed negligible bias on either demographic variables or "before" measures of adjustment.

Attitudes and experience with regard to housing—We know from initial measurements that the "before" housing quality of a majority of test and control groups was in general of poor quality. Later, when test families moved into the housing development, the quality of housing improved markedly for them; former deficiencies such as lack of hot water, sharing of facilities, crowding, lack of central heating, and infestation were wiped out. In general, despite considerable moving about in the first 18 months of the "after" period, control families did not improve their housing quality to the same extent. (The extent to which they did improve it will be discussed in a later section of this report.)

It is of some interest, therefore, to determine whether respondents' reactions to their places of residence correspond to these objective facts. Table 1(a) shows how test and control groups compare at the outset (Wave 1), 18 months later (Wave 7), and, in summary, gives the relative "before"-"after" difference or "gain"* on answers to the question, "How do you like your apartment?" Thus, at the outset, only 13.9 per cent of test respondents, compared to 21.6 per cent of control respondents (reflecting the slightly poorer initial housing quality of the test families) indicated they liked their apartment "a lot." Eighteen months later, 69.2 per cent of the test respondents signified the highest degree of satisfaction with living quarters, a gain of 55.3 per cent. Con-

* Although we will be using the concept of "percentage gain," our primary interest in this preliminary report is not in the precise magnitude of the differences; rather, we wish to illustrate the consistency of the test-control picture that has emerged.

control respondents also showed some change, from 21.6 per cent to 38.1 per cent, a gain of 16.5 per cent.

Our respondents were also asked to enumerate from a list the places in which their children play. The data, shown in Table 1(b), can be summarized as follows: At Wave 1, approximately 40 per cent of places mentioned by both test and control respondents alike were classified as "not safe" (street, etc.); 18 months later, while the control distribution remained very nearly at the initial level, the test respondents mentioning generally unsafe places dropped to 2.4 per cent.

In formulating the basic hypotheses of the study, it was reasoned that considerations of physical space would loom large in the adjustments of test and control families. We know that, while still in the slum, almost half of the test families (and their matched controls) shared some important facility with nonfamily members. We also know that a large proportion—whether sharing facilities

or not—lived under crowded conditions, according to prevalent criteria of crowding. The move to the housing project (where such factors are controlled by management regulations) reduced this crowding sharply.

A number of questions were asked about personal and family reactions to the issue of space. On each item, the test gains in the "after" period exceeded those for control families. For example, negative reports of family members being bothered by insufficient space, Table 1(c), showed a test gain of 33.1 per cent, compared to a gain of 12.4 per cent among the controls. An item pertaining to the housewife's opportunities for privacy also showed larger gains among the test than among the control group in the proportions saying they could "very easily" be by themselves somewhere in the apartment if they wanted to, Table 1(d).

Activities within the family and relations with neighbors—One of the study's hypotheses suggested that because of

Table 1—Attitudes and Experience with Regard to Housing

	N=	Wave 1 ("Before")		Wave 7 ("After")		Difference† "After" minus "Before"	
		Test (396)	Control* (633)	Test (377)	Control* (583)	Test	Control
(a) How do you like your apartment?							
"A lot"		13.9%	21.6%	69.2%	38.1%	+55.3%	+16.5%
(b) Safety of places where children play							
Not safe		42.2	39.0	2.4	39.5	-39.8	+ 0.5
(c) Family members bothered by not enough space?‡							
"No"		60.6	72.0	93.7	84.4	+33.1	+12.4
(d) Can you be by yourself in the apartment if you want to?‡							
"Very easily"		23.7	33.7	54.1	44.3	+30.4	+10.6

* Control per cents in Tables 1-4 were adjusted because of the two control families per test family in about half of our matched "pairings." In effect, these double-control families were each given a weight of 0.5.

† A plus (+) indicates "gain" for the specified group between Wave 1 ("before") and the later period ("after"); a minus (-) indicates "loss."

‡ Using the observed variances common to the content areas discussed, a tentative estimate of the standard deviation of the difference of the differences was obtained. A difference of 10 per cent or greater between test gain and control gain over time on a given item may be considered significant at the 0.05 level.

§ Data were obtained at Wave 5 (after 14 months). N's are 381 and 594 for the test and control groups, respectively.

Table 2—Activities within the Family and Relations with Neighbors

N=	Wave 1 ("Before")		Wave 7 ("After")		Difference "After" minus "Before"		
	Test (396)	Control* (633)	Test (377)	Control* (583)	Test	Control	
(a) Family do things together?							
Sit and talk:							
	"Often"	62.6%	69.0%	73.7%	70.9%	+11.1%	+ 1.9%
Go for walk:							
	"Often"	22.2	24.8	27.1	25.9	+ 4.9	+ 1.1
Go to movies:							
	"Often"	15.4	18.2	21.5	19.0	+ 6.1	+ 0.8
(b) You and other women around here help one another out?†							
Picking things up at store:							
	"Yes"	31.6	31.8	59.8	38.2	+28.2	+ 6.4
With children:							
	"Yes"	49.0	51.2	72.4	56.2	+23.4	+ 5.0
When someone is sick:							
	"Yes"	63.9	65.0	75.1	69.3	+11.2	+ 4.3
(c) Where neighborly contacts live?†							
	"In building"	27.3	21.0	86.4	17.9	+59.1	- 3.1

* Control per cents weighted.

† Data were obtained at Wave 5 (after 14 months). N's are 381 and 594 for the test and control groups, respectively.

such factors as increased space, intra-family activities would become more numerous. Respondents of the appropriate family composition were asked how often members, together, went shopping, sat and talked, went for walks, went to the movies, or listened to the radio or watched TV. Table 2(a) gives the "often" response to only three of these items. For all items in the series, there was somewhat greater increment for the test group than for the control group from the "before" to the "after" period.

The housing development into which the test families moved represented not merely housing free of notable deficiencies; it also constituted housing of a particular architectural pattern. Approximately two-thirds of the families in

the project (and in the test sample) live in 11-story buildings with 10 families to a floor. An outside screened corridor runs the length of each floor, connecting all apartments. In the middle of each floor are located the entrances to the two elevators serving the building and a 16 by 30 foot play area.

It might reasonably be expected that such architecture and facilities would have effects on relations among neighbors. Respondents were asked, "How many women around here do you visit back and forth with in the daytime?" Among test families, the percentage having no "visiting" contact with other women decreased 26 per cent; among controls, the decrement was 8 per cent.

In order to obtain information about the nature of these daytime contacts, the

respondents were asked. "Do you and other women (around here) help one another out in the daytime in any way like. . . ." (followed by a series of items). The "yes" responses to only three of these items are given in Table 2(b). All items in the series show uniformly greater gain for test than for control families from the "before" to the "after" period.

A further indicator of the role apparently played by architecture in promoting neighborly relations may be seen in the responses to the question, "Where do most of these women live with whom you do things in the daytime?" Table 2(c) shows that in the "before" period, 27.3 per cent of test and 21.0 per cent of control respondents had most of their contacts with women who lived in the same building. For the "after" period, a marked change occurred among the test respondents: 86.4 per cent had main contacts in the same building. For control respondents, main contacts with women in the same buildings are substantially unchanged between the "before" and "after" periods.

Social status—Is the move into better housing accompanied by a rise in the respondent's estimation of her own status? The test and control groups were asked to classify themselves as to whether they belonged to a group of

people going up in the world, going down in the world, or not doing either. Table 3(a) shows negligible and similar gains over time for the two groups, 7.6 per cent and 6.4 per cent for test and controls, respectively, for the "going up" category.

Respondents were also asked to compare their situation (now) to that of "five years ago." The response category "better off" (now) is shown in Table 3(b). Test families gained 19.0 per cent between the "before" and "after" periods compared to a 4.0 per cent gain for the control families.

Psychological state—The basic hypotheses of the study suggested that if housing quality had effects on some of the social and situational variables discussed above, it would probably also have effects ultimately on the inner psychological life of our respondents. Inner psychological variables have been measured by a number of scales constructed especially for this study.* The titles of the scales and a characteristic item from each are shown in a footnote to Table 4.

* These are unidimensional scales which were constructed and tested on an independent group at the same time that other instruments were being prepared and pretested for the study. The scales met the criterion of 95 per cent reproducibility.

Table 3—Social Status

N=	Wave 1 ("Before")		Wave 7 ("After")		Difference "After" minus "Before"	
	Test (396)	Control* (633)	Test (377)	Control* (583)	Test	Control
(a) What group belong to?						
"People going up in world"	67.7%	61.2%	75.3%	67.6%	+ 7.6%	+ 6.4%
(b) Compared to 5 years ago, how do you feel?						
"Better off" (now)	55.8	57.6	74.8	61.6	+19.0	+ 4.0

* Control per cents weighted.

Table 4—Psychological State

Scale†	N=	Wave 1 ("Before")		Wave 7 ("After")		Difference "After" minus "Before"	
		Test (396)	Control* (633)	Test (377)	Control* (583)	Test	Control
(a) Mood:							
	Positive	37.1%	37.7%	50.7%	48.3%	+13.6%	+10.6%
(b) Adequate emotionality:							
	Positive	42.9	45.2	45.9	40.4	+ 3.0	- 4.8
(c) Optimism-pessimism:							
	Positive	41.9	34.1	50.7	45.3	+ 8.8	+11.2
(d) Satisfaction with status quo:							
	Positive	36.4	36.6	59.7	56.1	+23.3	+19.5
(e) Nervousness:							
	Positive	44.5	42.3	43.5	40.0	- 1.0	- 2.3
(f) Potency:							
	Positive	49.8	39.8	54.7	51.3	+ 4.9	+11.5

* Control per cents weighted.

† Scale a. Mood. Item: "Are you sometimes so blue that you feel there's no use going on?"

Scale b. Adequate emotionality. Item: "Is it often hard for you to control your temper?"

Scale c. Morale—Optimism-pessimism. Item: "If things seem to be going well for a while, there's usually some trouble right around the corner."

Scale d. Morale—Satisfaction with status quo. Item: "I'm really very happy about the way I've been getting along lately."

Scale e. Nervousness. Item: "Are you often so nervous or upset that you can't go on with what you are doing?"

Scale f. Potency—Efficacy of self-help. Item: "When you come right down to it, there's nothing you can do to make things really better for yourself."

Each item of a scale has been assigned a "positive" and "negative" direction of response related to the title of the scale. Thus, agreement with the prototype item for "Scale f" is taken to signify the lack of perceived potency (negative); disagreement, the presence of perceived potency (positive). Answers to all items in a scale were summed for each respondent. Table 4 shows how test and control groups distribute themselves over time on the "positive" end of each scale. For all six scales, there is general close similarity in the gains for both groups.

Discussion of the Social Adjustment Findings

The variables reviewed in the preceding section may be looked at as supporting to some extent many of the

hypotheses of the study. The test families have without question revealed an awareness of their improved circumstances and in their reports of behavior and attitude have confirmed speculation that space in and of itself is an important factor (Table 1).

More modestly, but consistently, improvement in housing also brings with it increase in activities the family undertakes together; possibly an important finding in a population known more for division than cohesion in family structure, Table 2(a).

Most striking of all is the sharp rise in neighborly interactivity that has accompanied the test move to the project, Table 2(b). The present view is that this rise may be due as much to architecture as to improvement in housing quality; this is a matter to be investi-

gated in subsequent analysis of the data, Table 2(c).

Less confirmation of the basic hypotheses was found in connection with the respondent's self-assignment to a position on the social class hierarchy (Table 3), and in responses to the scales of psychological state (Table 4).

One might reason as follows regarding the contrast between Tables 1, 2 and Tables 3, 4. The issues dealt with in the first two tables are all matters of social reality; those dealt with in the last two tables are matters of personal-psychological import. It is possible that 18 months is enough time to effect differences on the former through housing improvement, but it may take longer to obtain effects, if they are obtained at all, in a person's inner psychological regions. This matter will be illuminated when an evaluation is made of later adjustment data, obtained about 12 months after Wave 7.

Meanwhile, let us turn to an interesting development which suggests that time is not the only factor that needs to be watched carefully if we are to understand completely the influence of housing.

Control "Upward" Movement and Consequent Social Adjustment Gains

In the 18 months between Wave 1 and Wave 7, only 8 per cent of the test families moved from the housing project, whereas 56 per cent of the control families moved from their Wave 1 address. Not only was there a high movement rate among the controls, but, in moving, they achieved a marked improvement in housing quality. Thus, at Wave 1, 52 per cent of the controls lived in "very bad" housing (based on criteria adapted from the APHA appraisal scheme); by Wave 7, the proportion had diminished to 28 per cent.

One consequence of this movement among controls to improved housing is

of course to reduce the difference in the housing quality of test and control groups in the "after" period, and to that extent such movement makes it more difficult to discern the true effects of housing quality on all dependent variables including the adjustment measures. From preliminary experimenting with various analytic schemes, we have become convinced that analysis of control moves will be an important factor in assessing the role of housing quality in health and adjustment. For, if the housing quality hypothesis is correct, then control families which have improved their housing should show gains from Wave 1 to Wave 7 on the dependent variables of the study precisely as is expected of the test families.

We have, in fact, already obtained data suggesting not only that upward housing quality movement is accompanied by gains in the dependent variable, but also that the size of the housing increment dictates the amount of gain. For example, from a sample of 195 control families which initially occupied some of the worst housing, we distinguished three Wave 1-Wave 7 subgroups: those which, in moving, made a "large" change, those which made a "moderate" change, and those which made no change in their housing quality. Wave 1-Wave 7 gains were tabulated for each subgroup for the dependent variables.

Table 5 gives the gains for a few selected variables analyzed in this way. On the question, "How do you like your apartment?" the control families which made a large change upward gained 51.9 per cent in the category, "a lot," those which made a moderate change upward gained 22.7 per cent, and those which made no upward movement showed a relatively slight gain. On the question asking respondents to compare their present situation with that of five years ago, similar stepwise but more modest gains are apparent. Of even

Table 5—Selected Controls Only: “Gains” on Several Dependent Variables Among Families with Initially “Bad” Housing Who Made “Large,” “Moderate,” and “No” Improvement in Housing Quality Between Wave 1 and Wave 7

	N=	Magnitude of Housing Quality Improvement Between Wave 1 and Wave 7		
		Large (52)	Moderate (75)	None* (68)
How do you like apartment?				
“A lot”		+51.9%	+22.7%	+10.3%
Compared to 5 years ago, how do you feel?				
“Better off” (now)		+23.1	+13.3	— 1.5
Psychological state				
Optimism-pessimism:				
Positive		+25.0	+16.0	+ 5.9
Satisfaction with status quo:				
Positive		+34.6	+25.4	+14.7
Potency:				
Positive		+26.9	+12.0	+10.3

* Composed of families who moved between Waves 1 and 7 but did not alter housing quality, as well as families who did not move in that period.

more interest is the distribution of gains in responses to the psychological state scales. On each of the scales shown in Table 5, the greater the housing quality improvement, the greater the gain in the positive end of the scale. It is of interest to compare the latter distributions to those covering the same items in Table 4. This comparison reveals that test gains, even though they might be expected to rank with the gains of “large step” controls, actually fall far short. The key to this puzzle may lie in the analysis we are planning which takes into account the different initial housing quality levels of the matched test families.

Thus it appears that the size of housing quality change is one important consideration in attempting to assess the effect of housing. Another obviously important consideration, mentioned earlier, is the length of residence in the particular dwelling unit. We are only now in

process of taking this factor into account by means of an “average weighted housing-quality score” for each control family for the duration of the “after” period of the study.

Summary

We have presented data from the controlled longitudinal study of the effects of the housing environment on social-psychological adjustment. The data confirm some basic study hypotheses concerning attitudes and experience with regard to housing, activities within the family, and relations with neighbors. On many matters covered in these areas, test families showed substantially greater gain in a 14 to 18 month period than did control families. On two important issues having to do with social status and psychological state variables, there seems as yet to be no difference between test and control families.

We also discussed movement to improved housing among control families. Special analysis showed, at least among control families, that size of the "upward" move helps determine the size of the gain on a number of variables, including, even in the relatively short period of the study to date, psychological state variables.

ACKNOWLEDGMENTS—We are indebted to numerous consultants in the fields of social psychology and measurement, especially Professor Isidor Chein, Research Center for Hu-

man Relations, New York University; Professor William G. Cochran, Department of Statistics, Harvard University; and Dr. Lee S. Christie, System Development Corporation. Special recognition is due also to the following members of the study staff: Joseph R. Dallas, Mary S. Tyler, and Florence Nolan.

REFERENCES

1. Study Memorandum BHA-2: Plan of Procedures and Analysis of the Study of Adjustment. (Oct.), 1954.
2. Wilner, D. M.; Walkley, R. P.; and Tayback, M. How Does the Quality of Housing Affect Health and Family Adjustment? *A.J.P.H.* 46:736-744 (June), 1956.
3. Wilner, D. M.; Walkley, R. P.; Glasser, M. N.; and Tayback, M. The Effects of Housing Quality on Morbidity—Preliminary Findings of the Johns Hopkins Longitudinal Study. *Ibid.* 48:1607-1615 (Dec.), 1958.

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This paper was presented before a Joint Session of the Conference of Municipal Public Health Engineers and the Engineering and Sanitation and Mental Health Sections of the American Public Health Association at the Eighty-Sixth Annual Meeting in St. Louis, Mo., October 28, 1958.

This is Department of Biostatistics Paper No. 324. This investigation is being supported by a research grant from the National Institutes of Health, Public Health Service, U. S. Department of Health, Education, and Welfare.