Technical Reports

Effects of Improved Housing on Health in South Dos Palos, Calif.

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THE RELATIONSHIP between physical health and the environment has been the focus of much research. Relatively little of this research, however, has been controlled, that is, it has not included comparisons over time of the health behavior of a group that has experienced environmental improvements with the health behavior of a similar group experiencing none (*1,2*). While observations made at one point in time can show correlation, they cannot show causation. To establish causation, two conditions must be met. First, the health of a group of persons who have experienced favorable changes in the quality of their environment (for example, in their housing) must be measured for a period before and after the improvement. Second, to help assure that any observed changes in health are not due to some factor other than the specified environmental improvement, the experience of those who have enjoyed the improvement (for example, who have been rehoused)—the test group—must be compared with the experience of a group that has not enjoyed the improvement (for example, has not been rehoused)—the control group. Furthermore, the control group must be from the same community as the test group and cannot differ significantly in demographic or socioeconomic respects.

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Environment of Study Samples

We therefore selected for study two groups from a small central California community—a test group that had been rehoused and a control group that was demographically and socioeconomically similar. Data were then analyzed on the two groups' utilization of outpatient medical care during a 1½-year period before the rehousing of the test group and for a 1-year period after this event. All persons in the samples lived in South Dos Palos in Merced County, were black, and had extremely low incomes. Before members of the test group moved in the summer of 1967 to 30 units of public housing built by the Merced County Housing Authority, the vast

majority of the residents of South Dos Palos lived in substandard dwellings, mostly of wood-frame construction, that were 20 or more years old and badly in need of renovation or repair. Nearly all the dwellings vacated by the test group were subsequently condemned.

Environmental health surveys conducted by the Merced County Health Department offer some further insights into living conditions in South Dos Palos. During heavy rains, the land in the area floods. The soil, a very heavy clay, is characterized as unsuitable for underground sewage disposal (for example, by means of cesspools, septic tanks, or pit privies). Yet no sewer system is available to any residents of the area except those in the public housing project, and pit privies are more common than private cesspools or septic tanks. Another serious environmental health deficiency is the lack of a system for solid waste disposal. Residents must haul trash to the public dump. Such hauling is done with varying frequency; some residents allow large piles of trash to accumulate.

While as early as 1955, part of the community had been served by a public water system, it was not until 1968 that piped water was available to every residence. Thus, many of the families in the test group previously had to carry water to their houses in large cans. Some families in the control group did not have piped water even at the time our fieldwork was done.

The area also has further deficiencies from the standpoint of environmental safety. The complete absence of sidewalks constitutes obvious hazards for pedestrians, and the many abandoned, dilapidated buildings and trash piles can be dangerous to children at play.

Upon being rehoused, the families in the test group experienced a substantial improvement in their residential environment. The new public housing that they occupied constitutes adequate housing by any standard. The units are duplex, of stucco construction, and adequately spaced on landscaped grounds (fig. 1). The houses have gas heat and modern kitchens, plumbing, and sewage facilities. Refuse is hauled away weekly. The housing project is on a paved street, with sidewalks and street lighting.

Table 1 indicates the extent of environmental change realized by the test group families, upon being rehoused, in respect to selected aspects of the residential environment. It also shows the values for the control group families in respect to the same aspects. The control group's housing, while not as poor as that of the test group before its rehousing, was of a generally equivalent quality. Some differences in quality were encountered, however, for two reasons. Because of the allocation procedures for public housing, those suffering the greatest housing deficiencies were admitted into the project. Also, many of the remaining poorest units in the community tended to be occupied for relatively short periods so that our

Table 1. Changes for test group in selected aspects of residential environment after group was rehoused and values for control group for the same aspects

Aspect	Test group		Control group
	Before rehousing	After rehousing	
Ratio of persons per room	2.005	1.460	1.453
Ratio of persons per sleeping room	4.348	2.337	3.128
Index measuring water supply and conditions of plumbing and other facilities in bathroom and kitchen; range of 0 to 41 points, 0 indicating highest score and 41, lowest possible score	20.074	.000	13.591
Index measuring degree of rat infestation, inside and outside the housing unit; range of 0 to 12, 0 indicating lowest degree of infestation and 12, highest possible degree	7.198	.000	3.116
Dummy variable indicating presence or absence of vermin other than rats or of insect infestation inside housing unit; presence of 1 or more types of pests=1 and absence of pests=0	.951	.445	.919
Index measuring quality of sewage disposal system; range of 0 to 8 points, 0 indicating highest score and 8, lowest possible score	7.136	.000	5.326
Index measuring quality of garbage or refuse disposal and collection system; range of 0 to 16 points, 0 indicating highest score and 16, lowest possible score	9.309	.247	7.291
Index measuring degree of deterioration and structural deficiencies of both general and specific nature; range of 0 to 226, 0 indicating lowest degree and 226, highest possible degree	92.457	.000	55.895
Index measuring degree of satisfaction with housing; range of 0 to 4, 0 indicating highest degree and 4, lowest possible degree	3.000	.815	2.372

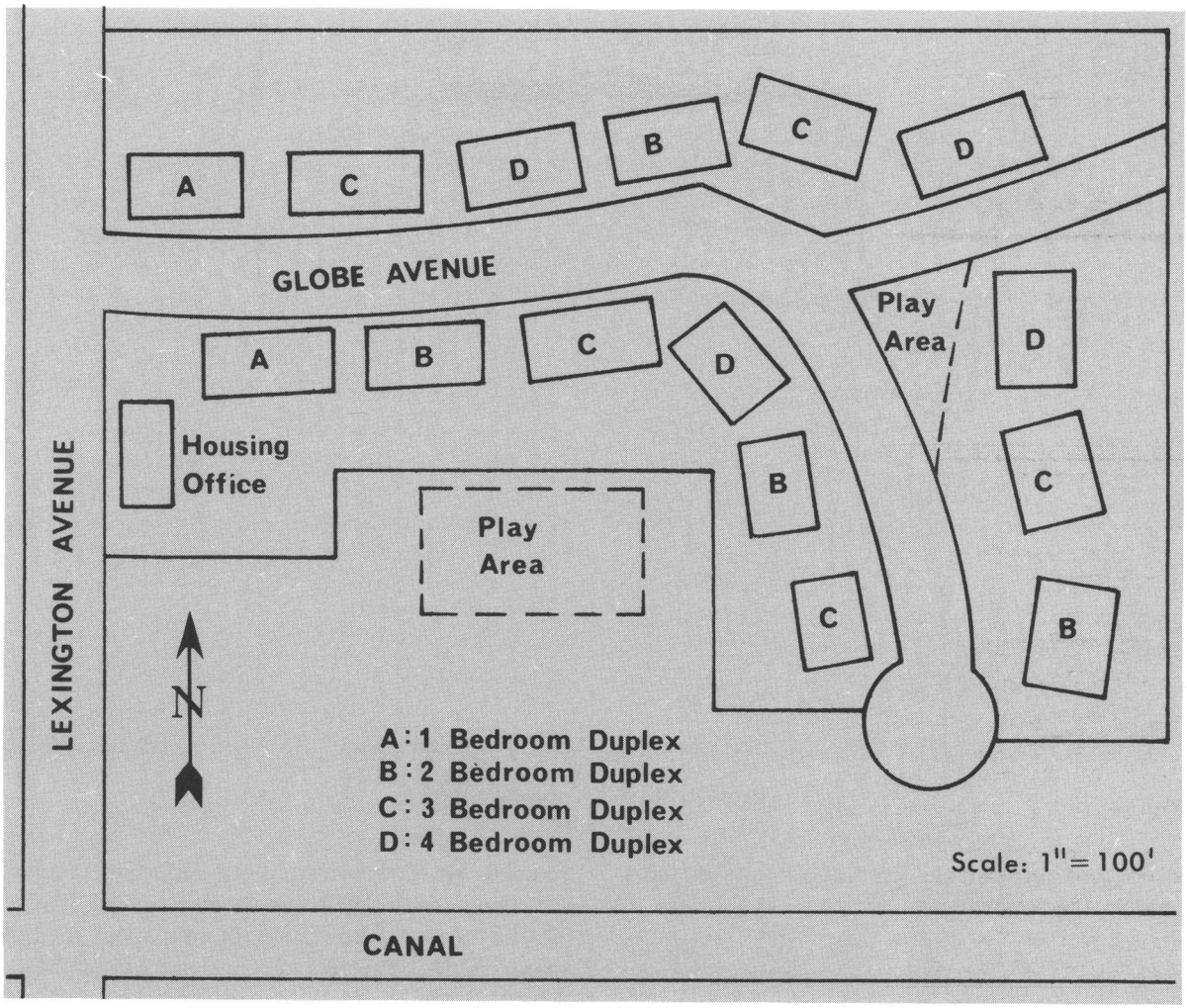


Figure 1. The new housing project
SOURCE: Housing Authority of County of Merced, Calif.

requirement of 2½ years of continuous occupancy for inclusion in the control group eliminated many families that had moved during the study period. The control group did, however, function as an essential check since the control families were living under conditions similar to those of the test group before that group was rehoused and experienced no significant changes in their housing over the study period.

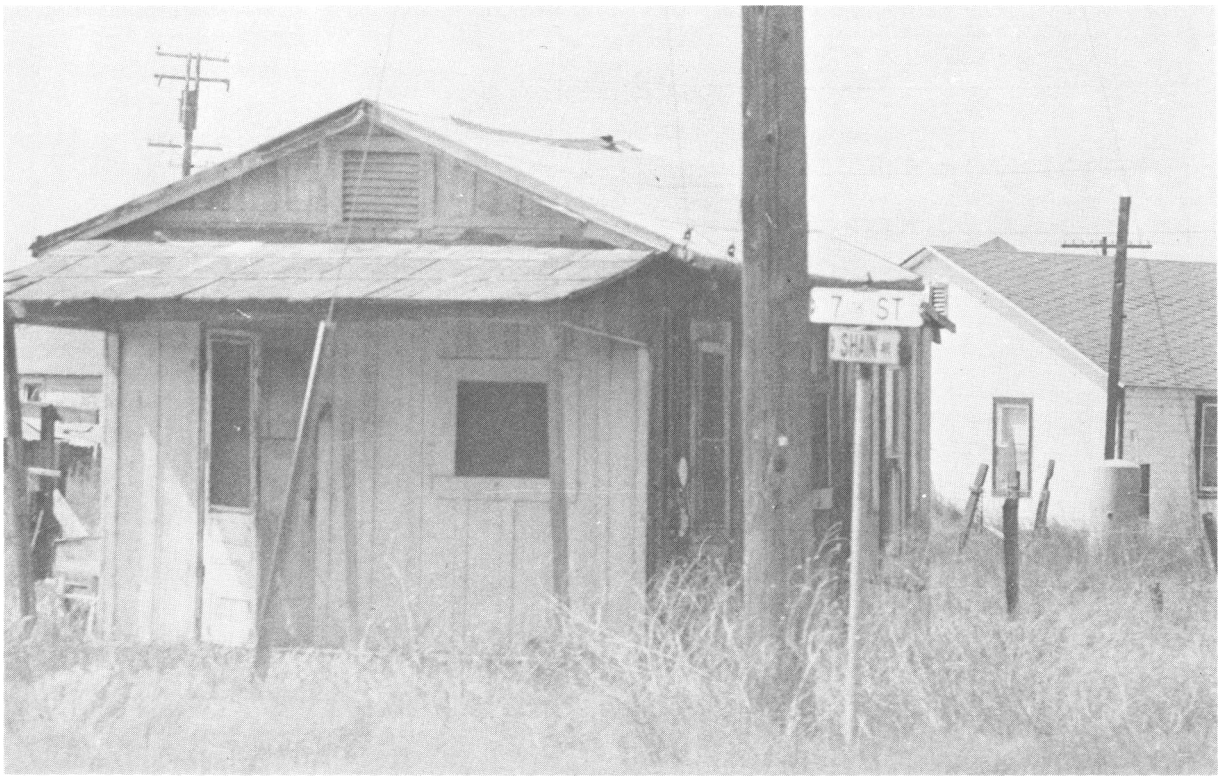
Data Collection and Interpretation

Before examining empirical evidence of the effects of housing improvement on health, a discussion of the data procedures used in the study is necessary. The most important consideration is how adequate were the data collected on medical care utilization as an indicator of health levels.

To determine the sources from which information on outpatient and inpatient visits of members of the test and control groups could be gathered, these persons were queried on where they received medical care. Information on outpatient and inpatient visits for the two groups were then collected from three basic sources during the spring and summer of 1968 and recorded:

1. Several private physicians in the communities of Dos Palos, Los Banos, and Merced
2. The weekly farmworkers clinic held at the South Dos Palos Homes Project
3. The Merced General Hospital.

The period for which data were gathered was from February 1966 through August 1968, that is, for 18 months before the test group was rehoused and for 12 months after the rehousing. Records of outpatient visits during the study period were found for approximately equal pro-



Previous housing of test group

portions of the test and control groups, as indicated in the following table:

Item	*Test group*	*Control group*
(1) Number of persons	81	86
(2) Number for whom records were found	51	56
Ratio of (2) to (1)	.630	.651

Far fewer records of inpatient visits than of outpatient visits were found. Only seven members of the test group and two members of the control group had records of hospital stays during the study period. The small sample sizes, especially for the control group, make a detailed analysis of inpatient data impractical, so that in discussing the rates for utilization of medical care, we will concentrate on outpatient visits, on which data are more ample. Because of the extensive cooperation of members of the health profession in Merced County, we believe that we obtained nearly complete records of the outpatient visits of the two samples.

Before examining the behavior of the test and control groups in respect to outpatient visits, we will consider the adequacy of this measure as an indicator of health levels. Such consideration is crucial, since we restrict our empirical analysis of changes in health to an examination of changes in the rates for utilization of outpatient medical care. Thus, any conclusions regarding health must rest implicity on the assumption that outpatient visits provide a reliable indicator of it.

Our real concern, then, is the relationship of utilization rates to the rates for the outbreaks of disease. The incidence of morbidity is certainly a determinant of utilization, but it is equally clear that it is only one of several causative factors. At least two others must be regarded as significant in determining the level of visits. One is the issue of costs to the patient for care, costs which embody not only medical fees but also the accessibility and convenience of medical facilities; that is, there is a demand function in the theoretical sense that there is a price for medical care. Also, there is the issue of the "propensities" of the person to seek care. In a group of persons with similar morbidity rates and who must expend a similar amount of money, time, or effort in making outpatient visits, those who are extremely concerned about their health will tend to make more visits than those who are less concerned.

While these considerations indicate that the

Housing of control group

level of visits is determined by other factors besides morbidity rates, they do not render outpatient data useless, since analysis of the health effects of improved housing actually relies on measures of the changes in outpatient visits. Thus, if

$V = f(M, C, P)$,

where

$V =$ the level of outpatient visits,

$M =$ morbidity rates,

$C =$ the cost to the patient for care (including costs of transportation and time), and

$P =$ the propensity of the patient to seek care,

then the change in rates of visits over some period can be expressed as:

$$\frac{dV}{dt} = \frac{\partial V}{\partial M}\frac{dM}{dt} + \frac{\partial V}{\partial C}\frac{dC}{dt} + \frac{\partial V}{\partial P}\frac{dP}{dt},$$

where $M = f(t)$, $C = f(t)$, and $V = f(t)$.

Now, if $\frac{dC}{dt}$ and $\frac{dP}{dt}$ are equal to zero, then the change in visits is solely a function of the change in morbidity. Even if they are not equal to zero, relative differences in the visits for the test and the control groups can be shown to be a function of changes in morbidity if the expressions

$\frac{\partial V}{\partial C}\frac{dC}{dt}$ and $\frac{\partial V}{\partial P}\frac{dP}{dt}$ are equal for the two groups.

Let us examine, in turn, the possibilities of either of these two conditions holding at the test site of our study. Two issues must be resolved here. First, it must be determined whether the costs of medical care to the study area residents changed over time relative to the costs for other goods and services and whether the propensities of the residents to seek care, irrespective of the issue of costs, changed during the study period. Second, if changes in costs or propensities were experienced, did the impact vary for the two groups? In treating these issues, we assume that the function $V = f(M, C, P)$ is the same for the two groups; what we really seek to identify is the nature of the functions $C = f(t)$ and $P = f(t)$, equations which apply to test and control group members.

While these questions cannot be answered with certainty, some probabilistic statements can be

made. We have no indications that differential changes occurred in the costs of medical care for the two groups over the study period. Institution of Medi-Cal in the State (which took place about the time of rehousing of the test group) changed the procedures for obtaining care for some members of the test and control groups, making treatment by private physicians less costly, but the impact of this program has been roughly equal for the two groups. Moreover, free care in some form has always been available to residents of the study area. There were no significant differences between the two groups in respect to income changes, another possible determinant of the demand function for medical care. Throughout our analysis it was assumed that changes in outpatient visits were a fairly reliable indicator of health levels for both the test and control groups. Since the analysis has shown that the costs of treatment have remained constant for both groups, this assumption appears to be valid.

This assumption can be further substantiated by a simple geographic analysis of the location of the sources of medical care used before and after the rehousing of the test group. If the rehousing of the test group placed its members in an area where less medical care was accessible, then a decreased number of outpatient visits for this group could be explained by an implicit increase in the costs to the patient of such visits, an increase which would come about because of the lessened accessibility of services.

Upon examination of the geographic data, however, we found no significant difference after the rehousing of the test group in either the actual distance or in the travel time to the providers of medical care. Nor was there any difference between the rehoused test group and the control group in respect to these variables. Therefore, it can be safely assumed that rehousing had no effect upon the costs of treatment, at least in terms of travel time or distance to the medical care providers. This assumption is substantiated by our observation that, in both the test and control groups, an approximately equal number of persons participated in publicly sponsored medical care programs for low income families (64 percent of the control group and 78 percent of the test group). The issue of the propensity to seek care is a difficult one, since no measures of change for this determinant were made. Questions, however, were asked of family heads in both the test and control groups after the rehousing occurred, and their replies provide some insights into this subject.

The respondents' attitudes toward medical care were elicited in a series of three questions relating to (*a*) preoccupation with health, (*b*) how severe an illness had to be before care was sought, and (*c*) the degree of trust which was placed in physicians. The results suggest that members of the control group were more prone to visit a physician for treatment of a minor illness than members of the test group. Whether the higher average resulted, however, from changed attitudes of persons in the control group is not known, since no measure was made of this propensity in the control group in the period before the test group was rehoused.

While the issue cannot be resolved with certainty, some support is provided for the assertion that the propensity to seek care did not change for either group over the study period. We thus have accepted the measure of outpatient visits as a reasonably good indicator of morbidity rates for the analysis.

Outpatient Visits of the Two Groups

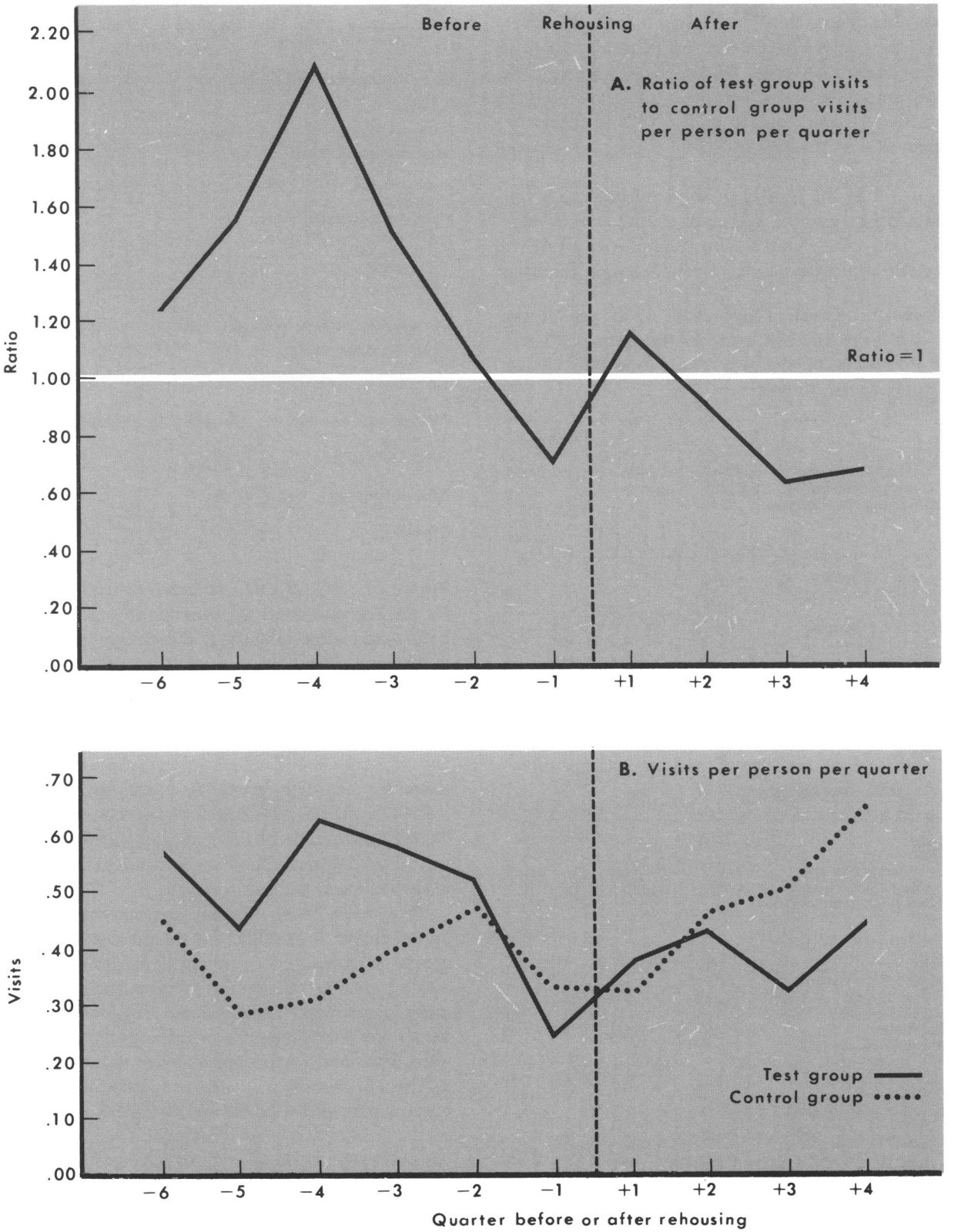
In panel A of figure 2 the ratio of visits per person (V_t) of the test group to the visits per person (V_c) of the control group is shown by quarters of years. In five of the six quarters before the rehousing, this ratio was greater than 1, indicating higher rates of medical care utilization for the test group. In three of the four periods after rehousing, the test group had lower average visits than the control group; the ratios were less than 1. Panel B of figure 2 shows the absolute levels of average visits for both groups quarterly over the study period.

This evidence suggests a relative health improvement in the test group. We must, however, look more closely at the average utilization rates and at the changes in these rates over the study period and determine whether the differences between the groups are statistically significant.

In the following table the mean levels for outpatient visits of all persons in the test and control groups before the rehousing and the changes in these levels afterwards are compared:

Item	*Level before rehousing*	*Change*
Test group	1.992	−0.461
Control group	1.489	+ .442
t level on difference	1.28	2.29
Level of significance	.20	0.5

Figure 2. Outpatient visits over time for test and control groups



The mean visits of the control group were somewhat higher than those for the test group in the period before the rehousing, but the difference was not statistically significant at the .05 level, and the two groups can be regarded as having the same utilization rates before the rehousing. The test group showed a decline in the level of visits relative to the control group (whose visits increased), a decline of 0.903 visits per person per year.

To code the quality of the environment of the two groups and the degree of change numerically, we used a deficiency scaling method (*3*). Relative health improvements were calculated on the basis of whether the health change attributable to rehousing was equal to $\Delta H^T - \Delta H^C$ in the following 4-celled typology that we used in the analysis:

Health levels	*Test group*	*Control group*
Before rehousing	H_B^T	H_B^C
After rehousing	H_A^T	H_A^C
Change	$H^T = H_A^T - H_B^T$	$H^C = H_A^C - H_B^C$

Where H_B^T, H_B^C, H_A^T, H_A^C all refer to health levels for the test and control groups during the periods before and after rehousing, the change in health attributable to rehousing is: $\Delta H^T - \Delta H^C$

As can be seen in the first line of the table on page 52 showing health levels before and after of the total test and control groups, $\Delta H^T = -0.461$ and $H^C = +0.442$. Thus, the relative improvement for the test group is equal to $-0.461 - 0.442 = 0.903$. All calculations of relative health changes in the rest of this paper are made in this way. This difference in changes in utilization rates is significant at the .05 level.

Thus, for these overall measurements, an improvement in health was found for the test group, as measured by medical care utilization, which can be tentatively attributed to the improvement in housing. Tables 2 and 3 show the behavior for the two groups in respect to outpatient visits, classified by the patient's sex and age.

This age-specific and sex-specific categorization points up several notable results. Male segments of the test and control groups showed virtually no difference in levels of, or changes in, outpatient visits. A marginally significant change at the .06 level was found, however, in the female population. The relative decline among females

Table 2. Level of outpatient visits per person per year for test and control groups, before rehousing of the test group and the change afterwards, by sex

Number in sex groups, level before rehousing, and change	Test group	Control group	Difference: *t* value	Difference: Level of significance
Number of males	37	36	.....	
Level before	1.424	1.111	.68	.50
Change	− .072	+ .278	.63	.37
Number of females	44	50	.....	
Level before	2.470	1.760	1.20	.24
Change	− .789	+ .559	1.93	.06

Table 3. Level of outpatient visits per person per year for test and control groups before rehousing of test group and the change afterwards, by age group

Number in age groups, level before rehousing, and change	Test group	Control group	Difference: *t* value	Difference: Level of significance
Number of persons 0–9 years	18	18	.....	
Level before	2.556	1.074	1.81	.08
Change	− 1.667	− .130	2.28	.03
Number of persons 10–19 years	45	43	.....	
Level before	1.082	.993	.25	.82
Change	+ .174	− .132	.87	.45
Number of persons 20–34 years	4	6	.....	
Level before	6.67	2.778	1.33	.22
Change	− 1.417	+ 2.888	1.25	.25
Number of persons 35 years and older	14	19	.....	
Level before	2.857	2.596	.25	.82
Change	− .786	+ 1.509	1.40	.17

Table 4. Direction of change in housing-related and nonhousing-related visits of test and control group members after rehousing of test group

Direction of change	Number of persons with given change: Test group	Number of persons with given change: Control group
Housing-related visits:		
Increase	13	20
No change	36	48
Decrease	32	18
Nonhousing-related visits:		
Increase	15	21
No change	42	37
Decrease	24	28

New housing of test group

in the test group was 1.348 visits per person per year. Also noteworthy was the higher level of visits for females compared with that for males which was found in both groups over the entire study period.

When the test and control groups were combined for observation, the level of visits for the various age categories in the period before the rehousing showed a rough U-shaped function with increasing age. For the older age categories in both groups, three persons 20–34 years old and four persons 35 years and older had high mean levels of visits, as did one member of the youngest category, 0–9 years. The persons in the category 10–19 years had the lowest mean level of visits.

When the two groups were compared for the period before the rehousing, the level of outpatient visits for the test group did not differ significantly (.05) from the level for the control group in any age category. For the category 0–9 years, the difference was significant at the .08 level, the highest level thus far found in any comparison between the test and control groups of the levels of such visits in the period before the rehousing.

A comparison of changes in the mean number of visits for the test and control groups showed a significant (.05) difference between the two groups only for the age category 0–9 years, while the difference for the category 35 years and older showed a relative improvement for the test group which was significant at the .17 level. These varying changes in utilization rates amounted to relative declines in visits for members of the test

Table 5. Level of housing-related and nonhousing-related outpatient visits per person per year for test and control groups before rehousing of test group and the change afterwards

Level before rehousing and change	Test group	Control group	Difference	
			t value	Level of significance
Housing-related visits.	81	87	.....	
Level before.....	.947	.395	2.87	.01
Change.....	− .280	+ .151	1.99	.05
Nonhousing related visits.....	81	86	.....	
Level before.....	1.046	1.093	.15	.88
Change.....	− .181	+ .290	1.23	.22

group, in comparison with members of the control group, of 1.537 per year for the category 0–9 years and of 2.295 per year for the category 35 years and older.

This classification seems to point up effectively how the health of different age groups is differentially affected by housing improvement. The health of the youngest and the oldest groups was most improved, and the improvement in these groups was the most statistically significant. It seems likely that those in the age group 10–19 years experienced no change in health levels attributable to housing change, while the small sample sizes preclude our deriving any conclusions from the data on those from 20 through 34 years.

The foregoing data provide some evidence that health improvements were realized by the test group as a result of a change in housing. More detailed analysis on the type of outpatient visits being reduced could shed further light on the issue. The next area of investigation, then, was of outpatient visits classified according to whether the diagnoses were "housing-related" or "nonhousing-related." Visits were judged to be housing-related or nonhousing-related based on three considerations.

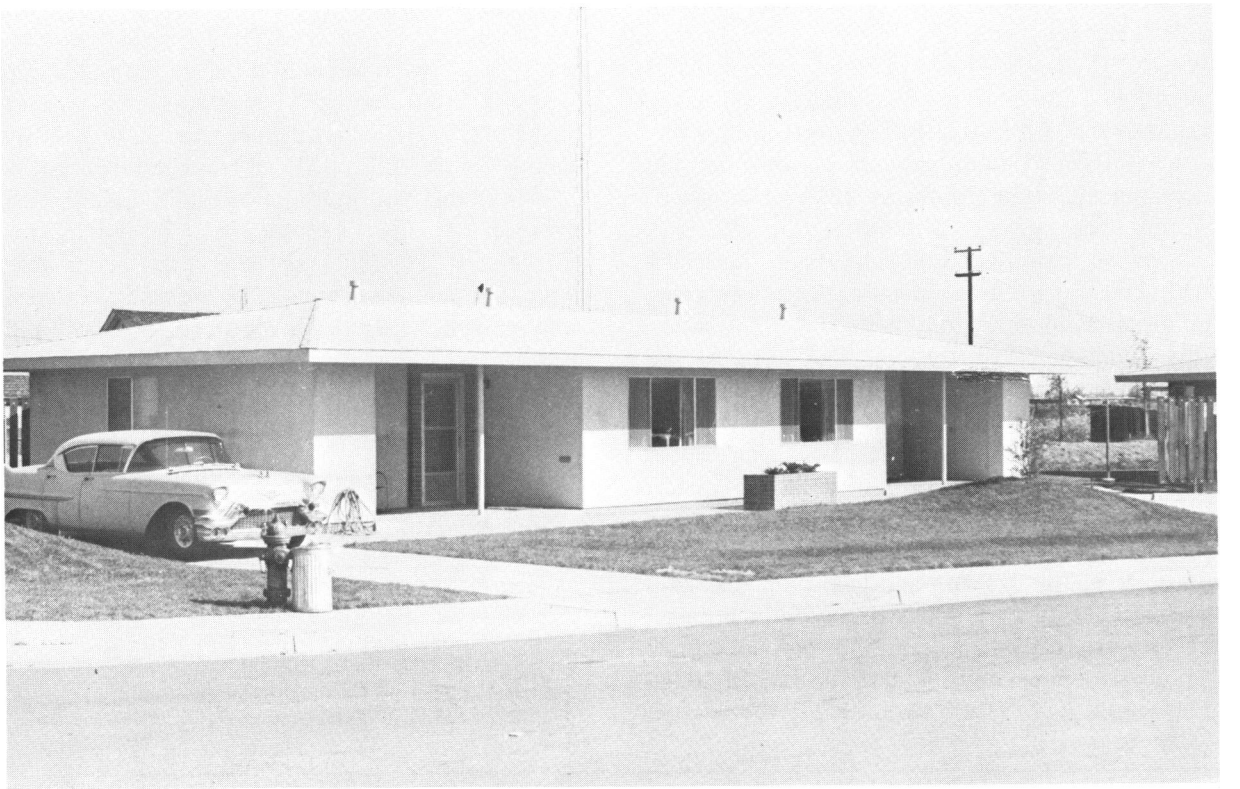
First, some diseases might be directly caused by poor housing conditions such as an inadequate water supply, poor facilities for food storage and preparation, or lack of protection from the elements. Second, in some instances, disease transmission might be facilitated by poor housing conditions, although the disease itself might have been originally contracted by some family member outside the housing unit. Finally, there are diagnoses for which there is some evidence that housing conditions may be one possible determinant, but for which there are alternative possible causes. These diagnoses include circulatory diseases and certain personality disorders and nervous conditions. Conditions such as these may arise from housing conditions, or they may be caused by some outside force, such as poverty. All classifications of the diagnoses were made by a consulting physician.

Table 6. Level of housing-related and nonhousing-related outpatient visits per person per year for test and control groups before rehousing of test group and the change afterwards, by sex of patient

Level before rehousing and change	Test group	Control group	Difference	
			t value	Level of significance
Housing-related visits:				
Number of males...	37	36	.....	
Level before.....	.810	.389	1.33	.19
Change.....	+ .027	+ .195	.46	.64
Number of females..	44	50	.....	
Level before.....	1.061	.400	2.77	.01
Change.....	− .538	+ .120	2.50	.02
Nonhousing-related visits:				
Number of males...	37	36	.....	
Level before.....	.613	.723	.36	.70
Change.....	− .099	+ .083	.45	.66
Number of females..	44	36	.....	
Level before.....	1.410	1.360	.10	.91
Change.....	− .250	+ .440	1.14	.26

Table 7. Level of housing-related visits for test and control groups per person per year before rehousing of test group and the change afterwards, by age group

Level before rehousing and change	Test group	Control group	Difference	
			t value	Level of significance
Housing-related visits:				
Number of persons 0–9 years.....	18	18	.....	
Level before.....	1.630	.407	1.94	.06
Change.....	− .963	+ .204	2.03	.05
Number of persons 10–19 years....	45	43	.....	
Level before.....	.593	.388	1.28	.20
Change.....	− .037	+ .772	.51	.60
Number of persons 20–34 years....	4	6	.....	
Level before.....	1.167	.555	.69	.50
Change.....	+ .583	+ .278	.30	.77
Number of persons 35 years and older.....	14	19	.....	
Level before.....	1.142	.351	1.70	.10
Change.....	− .428	+ .228	1.07	.29
Nonhousing-related visits:				
Number of persons 0–9 years.....	18	18	.....	
Level before.....	.926	.667	.63	.57
Change.....	− .704	− .334	.87	.39
Number of persons 10–19 years....	45	43	.....	
Level before.....	.489	.605	.41	.69
Change.....	+ .244	− .210	1.48	.15
Number of persons 20–34 years....	4	6	.....	
Level before.....	5.500	2.223	1.37	.20
Change.....	− 2.000	+ 2.610	1.68	.13
Number of persons 35 years and older.....	14	19	.....	
Level before.....	1.715	2.245	.61	.54
Change.....	− .358	+ 1.281	1.12	.28



New housing of test group

Analysis of the outpatient data after the diagnoses were put into housing-associated and nonhousing-associated categories revealed a significant difference in behavior between the test and control groups with regard to utilization of medical facilities when individual behavior was considered. Considering only the housing-related visits of the test and control groups, the change in visits from the period before the rehousing to the period after it showed striking differences. Table 4 presents the number of members of the test and control groups who increased their visits in the housing-related category, showed no change in utilization, or reduced such visits. The data in the table suggest that a substantially greater proportion of the test than the control population reduced those visits that could be termed housing-related. A chi-square test of the cells in the table indicates that a significant difference ($X^2 = 6.99$) exists between the test and control groups in the distribution of their members among the three categories in the left column. A comparison between the test and control populations for nonhousing-related visits showed no significant difference in distribution.

Further analysis of the visits, divided into housing-related and nonhousing-related diagnostic categories, was performed by comparing the mean levels of visits for the test and control groups before the rehousing and the changes in visits. Summarized in tables 5, 6, and 7, these data tend to confirm that housing and environmental improvement induced a relative improvement in physical health for the test group. In no instance was there any significant reduction for the test group in nonhousing-related visits. Housing-related visits, on the other hand, showed significant declines for the total test group relative to the total control group (table 5), for females (table 6), and for the age group 0–9 years (table 7). Significant improvements were thus realized for exactly the same categories as those for which total visits were reduced. All pregnancy and birth-related cases were excluded from the data and from the analysis.

Levels and Changes

As mentioned earlier, we concentrated on deriving a working hypothesis under which empirical testing would lead to conclusions regarding the

causality in relationships between housing and health. Thus, cross-sectional observations of levels of housing and health at only one point in time were ruled out because it was determined that a controlled examination of a changing situation was required. In this manner, a working hypothesis was advanced stating that housing and environmental change lead to health change, and empirical tests were performed to test it.

This working hypothesis, however, must actually be regarded as a derivation from a broader, but empirically untestable, underlying hypothesis. This underlying hypothesis is that housing and environmental levels are one of the determinants of health levels. Table 4 shows that the test group had significantly higher levels of housing-related outpatient visits than the control group during the period before the rehousing; the test group was also, as table 1 indicates, living under significantly poorer housing and environmental conditions at the time. These two observations taken together are, then, consistent with our underlying hypothesis about housing and health, although they cannot serve as a basis for the acceptance of housing and environmental levels as determinants of health levels.

The differences in health and housing between the two groups in the period before the test group was rehoused, though significant, are small in magnitude. We do not believe that they seriously damaged the controlled experimental conditions of our study. Nor do they necessarily indicate the presence of any unknown or unaccounted for phenomena. The differences are, in fact, consistent with the underlying hypothesis we used in determining the relationship between housing and health.

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Changes in the physical health of residents of South Dos Palos, Calif., were studied after some of them were rehoused. Rates of medical care utilization for the rehoused group and a group that was not rehoused were measured. The rates were then observed from several different aspects.

When such visits were classified as to whether they were housing-related or nonhousing-related, only the housing-related visits showed a significant relative improvement for the test group. Analysis of the visits classified in this manner was performed in two ways: (*a*) through a chi-square test of individual behavior and with *t* tests on the averages for the total test and control groups and for sex-specific and age-specific categories. The significant results realized through both of these testing procedures provide strong evidence that the test group experienced a relative decline in the rates of utilization of outpatient medical care.

The evidence supports a conclusion that the persons who were rehoused realized a reduction in outpatient visits relative to those who were not. Since rates of outpatient visits are assumed to be a reasonably good indication of morbidity, morbidity rates are presumed to have declined for the test group relative to the control group. Analysis of the pertinent medical diagnoses showed that declines in housing-related outpatient visits for the test group were significant in comparison with the changes for the control group. The same was not true for nonhousing-related visits. This last bit of evidence, in conjunction with the rigorous nature of the experimental design of the study, lends strength to our conclusion that housing and environmental improvement for the test group played a causal role in the decline in morbidity for this group.