# Housing Allowance Demand Experiment

# Economic and Racial/Ethnic Concentration in the Housing Allowance Demand Experiment

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# ECONOMIC AND RACIAL/ETHNIC CONCENTRATION IN THE HOUSING ALLOWANCE DEMAND EXPERIMENT

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## ABSTRACT

This report examines the effect of experimental housing allowance programs on the residential location of households enrolled in the Housing Allowance Demand Experiment. Specific neighborhood characteristics considered are concentration of low-income households and of minority households in the households' Census tracts. Changes are also described using other measures of neighborhood quality such as crime rates and a neighborhood hedonic index.

The analysis of program effects is limited and, in some cases, sharply curtailed by small sample sizes. The overall finding is that the housing allowance did not induce households to choose neighborhoods with significantly different economic and racial/ethnic compositions from those they would have chosen in the absence of a program. The lack of any substantial effect from the allowance programs on racial concentration is consistent with the general lack of any strong association between racial segregation and household income. Likewise, cross-sectional analysis suggests that the changes in housing expenditures engendered by the allowance would not normally be expected to result in any substantial change in the low-income concentration of tracts selected by recipients.

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# SUMMARY

This report is one of a series of technical reports on the results of programs tested in the Housing Allowance Demand Experiment. The Demand Experiment is one of three experiments being conducted by the Department of Housing and Urban Development as a part of the Experimental Housing Allowance Program (EHAP). These experiments, authorized by Congress in the Housing Act of 1970, are designed to test the concept of direct cash assistance to low-income households to enable them to live in suitable housing. The focus of the Demand Experiment is on how low-income renter households use allowances. The experiment was conducted in Allegheny County, Pennsylvania (Pittsburgh) and Maricopa County, Arizona (Phoenix). It tested a variety of allowance plans involving approximately 1,200 Experimental households and 500 Control households at each site. Each household enrolled in the experiment was offered allowance payments for three years. Analysis is based on data from the first two years.

This report concerns changes in the residential location of enrolled households. A housing allowance, in contrast to most of the more traditional forms of housing assistance, allows participants substantial freedom in their choice of residential locations. Households offered allowances in the Demand Experiment could live anywhere in the program area (Allegheny County and Maricopa County), provided that their dwelling units met program requirements.[1] The freedom of locational choice inherent in the housing allowance concept has prompted speculation that the program would lead to large-scale redistribution of the population. The most frequent conjecture was that a housing allowance would allow the low-income population to disperse to higher-income areas and allow minorities to move into more integrated locations. Accordingly, this report examines households' moves in terms of the

[1] Several versions of a housing allowance program were tested. Some posed no requirement for the dwelling unit. Other versions required that participants occupy dwelling units that met minimum physical and occupancy standards (Minimum Standards). Still others required participants to spend at least a minimum amount for housing (Minimum Rent). No version directly imposed any locational requirements on participants (within the county). However, households that lived in subsidized housing or in units that they owned were not eligible to participate.

level of low-income and minority concentration in the Census tracts they left and the tracts they moved to.

1. Although there was substantial economic segregation in both sites, the availability of the housing allowance did not induce households to choose neighborhoods with significantly different economic compositions than those they would have chosen in the absence of a program.

   Enrolled households were concentrated in low-income neighborhoods. Overall, households with annual incomes of less than $5,000 made up about one-fourth of the total population in both sites. Most households enrolled in the Demand Experiment, however (82 percent in Pittsburgh and 75 percent in Phoenix) lived in Census tracts where more than a fourth of the population had incomes under $5,000.[1] On average, households offered the chance to receive housing allowances (Experimental households[2]) did move to neighborhoods with slightly lower concentrations of low-income households than the neighborhoods in which they started, but the change in concentration was no different for households not offered allowances (Control households). Average low-income concentration declined by about 1 percentage point for both Experimental and Control households in Pittsburgh. In Phoenix, the average deconcentration amounted to about 3 percentage points for each group.

   Further analysis confirmed the lack of any important differences in the level of deconcentration for Experimental and Control households. After adjusting for a variety of factors associated with the change in low-income concentration for households that

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[1] Census tract data from the 1970 census were used, so they are somewhat imprecise as descriptors of the neighborhoods participants were leaving and entering in 1974.

[2] The Experimental group includes all households that were offered the forms of housing allowance tested in the Demand Experiment. Households in the Control group were not offered any housing allowance, but received a $10 monthly payment for providing data for the experiment.

moved,[1] the estimates of Experimental-Control differences under varying versions of the housing allowance ranged from less than 1 percentage point to about 3 points for the major allowance plans. In addition, several population groups were examined separately, with no important program effects revealed.

2. The housing allowance did not generate any substantial movement of black households into less racially concentrated neighborhoods than they would have chosen in the absence of the program. There may have been a slight tendency for Experimental households to reduce their racial concentration more than Control households in some situations. But it does not appear that a housing allowance program would have any strong influence on patterns of racial integration.

   Black households in both Pittsburgh and Phoenix tend to reside in racially concentrated areas. On the average, black households enrolled in the Demand Experiment in Pittsburgh occupied Census tracts in which 55 percent of the population was black. Enrolled black households in Phoenix lived in tracts with an average 39 percent black population. Enrolled white households in the two sites lived in tracts with an average black population of only 5 percent.

   In both Phoenix and Pittsburgh, black Experimental households slightly reduced their average racial concentration during the two years of the experiment, while black Control households slightly increased their concentration. The average concentration level in the black Experimental households' Census tracts declined about 4 percentage points in Pittsburgh and 3 points in Phoenix, while the average for black Control households increased by about 3 percentage points at both sites. Much of the difference between Experimental and Control household patterns occurred because

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[1] During the two years of the experiment, 38 percent of the Experimental households in Pittsburgh and 62 percent in Phoenix changed their residence. Because the remaining households had no change in location, average change figures for the households that moved are somewhat higher than the average for the whole participant group.

Control households, at enrollment, lived in Census tracts that had lower levels of black concentration than the tracts occupied by Experimental households at enrollment. Analysis taking the initial location into account showed no statistically significant difference between the Experimental and Control groups, although the general direction of the difference was one of slightly greater deconcentration for Experimental households.

3. There is no evidence that the housing allowance contributed to "white flight"--that is, to the movement of nonminority households into neighborhoods with lower concentration of black households.

   Nonminority households in both Pittsburgh and Phoenix began the experiment in neighborhoods with relatively small black populations --on the average, 6 percent of the population in these Census tracts in Pittsburgh was black and 3 percent in Phoenix. This average changed little during the course of the experiment: after two years, the average black population in tracts occupied by nonminority participants had declined by about one-half of a percentage point in each city. There was no statistically significant difference between nonminority Experimental and Control households' patterns.

4. The Spanish American population offered a housing allowance in Phoenix did not change its degree of Spanish American concentration in ways that differed significantly from the Control group. Thus there is no evidence that a housing allowance program would be a major factor in residential integration of this ethnic group.

   Spanish Americans make up the largest minority group in Phoenix, comprising roughly 14 percent of the population in 1970, and tend to be subject to patterns of geographic concentration similar to those for other minorities elsewhere. At enrollment, Spanish American households were living in Census tracts in which an average of 41 percent of the population was Spanish American, while nonminority participants occupied tracts with an average

Spanish American concentration of 17 percent. The average concentration had declined for both Experimental and Control Spanish American households by the end of two years, with a decline of 4 percent for Experimental households and 5 percent for Control households.

5. The housing allowance did not induce households to make important improvements in the quality of the neighborhoods they chose.

   Although the major analyses focused on low-income and minority concentration, more limited analyses investigated a number of factors which might be considered to describe the quality of neighborhoods. These included the distance from home to work, central city or suburban location, average rent levels in the Census tract, crime levels in the Census tract, and an index that analytically assigned a dollar value to a combination of neighborhood characteristics. In all cases, households showed an average improvement over the two years of the experiment, with no important differences between the Experimental and Control groups.

SOURCES OF STATMENTS

The sources of summary statements are indicated below.

1. See Table 2-3 for mean changes in low-income concentration for all Experimental and Control households. Tables 2-4, 2-5 and 2-6 present changes for the different housing allowance plans, and Table 2-8 for households that moved.

2. Table 3-1 presents the mean racial concentration for black households at enrollment. The mean change in racial concentration for black households is indicated in Table 3-3; analysis taking the initial location into account is summarized in Table 3-8.

3. The mean percentage of black population in the initial tracts of white enrollees can be found in Table 3-1; the mean change at the end of two years is presented in Table 3-3.

4. See Table 4-1 for the initial Spanish American concentration and Table 4-3 for the mean change in concentration after two years. Tables 4-4 and 4-8 present the results of the change analysis for the major housing allowance plans.

5. Tables 5-2, 5-3, and 5-4 present changes in neighborhood quality indicators over the two years of the experiment.

# CHAPTER 1

# INTRODUCTION

This is one of a series of technical reports on the Housing Allowance Demand Experiment. The Demand Experiment was designed to provide information on how low-income households use housing allowance payments. Evaluation is based on two years of observation at two sites: Pittsburgh (Allegheny County), Pennsylvania, and Phoenix (Maricopa County), Arizona. The experiment offered allowance payments to approximately 1,200 households selected at random in each area. Several different allowance plans were tested, involving different payment formulas and housing requirements. In addition, a control group of approximately 500 households was established at each site. This report discusses the patterns of change in the residential locations of households enrolled in the Demand Experiment and whether the housing allowance altered those patterns.

Unlike most previous forms of federal housing assistance to the poor, a housing allowance program offers households the opportunity to occupy housing in a location of their own choosing. In the Demand Experiment, this choice was somewhat constrained by requirements that households live within the designated program areas (Allegheny County or Maricopa County), and that they occupy rental housing. Some groups were further required to occupy housing meeting specified standards of physical adequacy or specified rent levels. As long as they met these requirements, however, households could choose housing anywhere within a relatively large metropolitan housing market. Even after becoming allowance recipients, they could move to new locations (again provided that they met the requirements).

This freedom of locational choice under a housing allowance stands in striking contrast to conventional public housing and other programs of subsidized housing construction, where the major locational decisions are made by the producers rather than the consumers of housing,[1] and was a major advantage

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[1]The rent supplement and Section 23 Leased Housing program established in 1965 had already moved in the direction of allowing beneficiaries more flexibility in their choice of locations, but there was still a wide gap between those programs and the housing allowance. The current Section 8 (footnote continued on next page)

of the housing allowance concept in the minds of its advocates. For example, the President's Committee on Urban Housing (the Kaiser Committee) argued in 1968 for the establishment of a housing allowance program, citing as the first of three "compelling" reasons the fact that "a housing allowance would allow recipient families greater freedom of choice in location and type of housing" (President's Committee on Urban Housing, 1968, p. 14).

If housing allowances were to be available to a large proportion of the low-income population, the program's freedom of locational choice implied at least the hypothetical possibility of large-scale population redistribution. This possibility has produced considerable speculation and some empirical research about the impact of housing allowances on residential location patterns. The underlying question has usually been whether housing allowances might serve as a mechanism for dispersing existing concentrations of low-income people and racial or ethnic minority groups. These dispersion questions therefore provide the primary focus for analysis in this report.

Much early discussion of housing allowances assumed that they would produce some dispersion--that low-income and minority households would tend to leave the economic or racial "ghetto" in favor of more heterogeneous neighborhoods.[1] The Kaiser Committee argued the desirability of such an outcome: "The excessive concentration of people of one narrow income level or age or race in one area should be avoided" (p. 48), and many subsequent commentators took this outcome as a goal. However, some opposition to the housing allowance concept was also based on the assumption that the program would foster locational mobility, with a consequent fear that poor people and minorities would "invade" the suburbs and accelerate the abandonment of central city areas.

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(footnote continued from previous page)
program for rent supplements in existing housing comes very close to the housing allowance in its freedom of locational choice. (The main difference is that Section 8 is administered by local housing authorities, whose jurisdiction is typically smaller than the metropolitan areas in the Demand Experiment. Because jurisdictional transfers tend to be difficult, the typical Section 8 participant has locational freedom within a smaller market than the Demand Experiment participants.)

[1] For example, Netzer (1970); Downs (1973); Peabody (1974); Weaver (1975). Some of these authors question whether the effect would be dispersion or merely "escape" from existing concentrations followed by the formation of new ones. The (implicit or explicit) assumption that people would flow out of existing concentrations is consistent, however.

The first empirical evidence on the impact of housing allowances came from a demonstration program implemented in Kansas City in 1970. The evidence from that demonstration was not entirely clear. Many housing allowance participants moved away from the central city into neighborhoods generally considered to be of better quality, and black households tended to move from highly concentrated areas to neighborhoods with a higher percentage of white residents. Solomon and Fenton (1974) describe the Kansas City experience as one of dispersal, but also note that most of the movement occurred along already established paths. Hence, the effect of the housing allowance could not be clearly distinguished from the prevailing patterns of mobility.

Further empirical evidence has come from the two other experiments in the Experimental Housing Allowance Program. Data from the Administrative Agency Experiment and the Supply Experiment have suggested that the locational impact of a program is not large. In both experiments, the proportion of participants changing neighborhoods was smaller than that in the Kansas City demonstration. The Supply Experiment indicates that a housing allowance did not contribute much to neighborhood growth or decline: participation was open to all eligible households in the program areas,[1] but the maximum net change in population in any neighborhood was less than 2 percent of the neighborhood population (Rand, 1978). Still, both experiments left open the possibility that a housing allowance might induce some economic or racial deconcentration. The Administrative Agency Experiment found that participants moved, on the average, to neighborhoods characterized by higher income levels than those they left (Abt Associates Inc., 1976). Both experiments found that black households, on average, moved to somewhat less racially concentrated areas than those they started from. As in the Kansas City case, however, the design of these experiments makes it impossible to distinguish between patterns caused by the housing allowance and those that would have occurred in the absence of the experimental program.

Uniquely among the experiments, the Demand Experiment has a design in which households were randomly assigned to Experimental and Control groups. The experiment therefore affords the opportunity to compare the patterns of

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[1] Brown County (Green Bay), Wisconsin, and St. Joseph County (South Bend), Indiana.

locational choice in a population offered housing allowances to the patterns observed in an equivalent population with no opportunity to participate.

The principal question addressed in this report is, to what extent does the availability of a housing allowance program lead low-income and minority households to relocate to neighborhoods that are less concentrated (i.e., that have a lower percentage of low-income or minority households) than the neighborhoods chosen by similar households in the absence of a housing allowance program? Subsequent chapters present the analyses responding to this question. Before proceeding with the details of the analysis, however, several points regarding the general approach are worth noting.

First it should be noted that a program effect on population distribution might occur in two ways. Households offered a housing allowance might, when they move, choose different kinds of neighborhoods than households with no opportunity to participate. This effect might be reflected as a difference between Experimental and Control households in the average change in low-income or minority concentration, or as a difference in the distribution of the changes.[1] Alternatively, even though both groups might choose the same kinds of neighborhoods when they moved, Experimental households might be more (or less) likely to move than Control households, causing a different average change for the two groups. (Both differential locational choice and differential mobility rates could occur, of course.)

Analysis in this report focuses mainly on the issue of locational choice among households that moved at some point during their two years of participation in the experiment.[2] To obtain a perspective on the combined effect of mobility and locational choice, summary figures are also presented for the full participant population, including those that did not move.

The second point concerns two general hypotheses about the influence of housing allowances on locational choice. One hypothesis is that the level

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[1] For example, the housing allowance might allow people to move in a counterbalancing pattern to both more concentrated and less concentrated neighborhoods than they would choose without the program.

[2] The effect of the allowance on mobility rates is examined in another report, which tends to indicate that the allowance has a small positive effect on mobility, at least in some situations (see MacMillan, 1978).

of low-income or minority concentration in a neighborhood is one element of the housing "bundle" people buy, and that they may use the allowance money to increase their consumption of this part of the housing bundle (i.e., to reduce their concentration). In the same vein, while people might not consciously choose neighborhoods because of low-income or minority concentration levels, they may choose some highly correlated dimension to the same effect.

The other hypothesis applies only to households enrolled in the Housing Gap allowance plans.[1] These households had to occupy housing that met program requirements--either a minimum standard for physical and occupancy characteristics or a minimum rent level--in order to receive allowance payments. If the availability of housing meeting these requirements differed in different neighborhoods, a Housing Gap program might induce households to choose neighborhoods in which more housing would meet the requirements, which again might be neighborhoods with smaller proportions of low-income or minority households. To examine the possibly different effects of the different allowance plans, the analysis generally separates the Housing Gap and Percent of Rent households.[2] In addition, because behavior might differ between Housing Gap households that met housing requirements at enrollment and those that did not meet the requirements, these groups are often analyzed separately.[3]

Finally, the focus of the report is on estimating the effect, if any, of the experimental programs. Very little effort is directed towards developing a behavioral model of locational choice. Such models are both complex in conception and in some cases beyond the capacity of the data base. Random

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[1]The various allowance plans offered to participatns in the experiment are described in Appendix I. In general, Housing Gap plans use a payment formula that makes up the difference between an estimated cost of modest, standard housing and a specified proportion of the household's income. In the other major category of allowance plans, the Percent of Rent plans, the allowance is a fixed percentage of actual rent, independent of income.

[2]A third group, the Unconstrained households, received payments computed by the Housing Gap formula but did not have to meet any housing requirement. This group is analyzed separately when the number of cases permits.

[3]Households that did not meet housing requirements at enrollment generally had to move to qualify for an allowance. Households that met requirements at enrollment qualified for allowance payments immediately and had no program incentive to move out of their original unit or neighborhood; in fact, they might hesitate to move for fear of losing the allowance.

assignment across Experimental and Control programs essentially allows reasonably good estimates of program impact without detailed behavioral models. Furthermore, the overall findings of the report clearly show that the programs had at most only marginal effects on the neighborhood characteristics examined in this report and that this lack of effect has a strong surface plausibility. Thus there seemed to be little justification for further model building to understand the way in which the programs influenced choice.[1]

Chapter 2 analyzes the effects of the housing allowance on low-income concentration. After defining the measures used and describing the initial locational patterns of households in the experiment, it presents an overview of the average changes in low-income concentration for all enrolled households and for various subgroups. It then examines more closely the patterns of change by contrasting origin and destination neighborhoods in terms of the level of low-income concentration, and finally reports the results of a multivariate analysis of the program's effect on choice of neighborhoods.

Chapters 3 and 4 discuss the effects of the housing allowance on minority concentration. In general, the analyses presented in these chapters parallel those of low-income concentration. Much of the minority concentration analysis considers only black households or only Spanish American households, however, and the analyses are somewhat restricted by the reduced number of cases. Chapter 3 examines neighborhood choices in terms of the concentration of black households, and Chapter 4 presents parallel analyses of Spanish American concentration.

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[1]This does not mean that better models of locational decisions are not desirable (as opposed to models of program effects, per se). Vidal (1978), for example, in examining the search patterns of black households in Pittsburgh, finds that the tendency of black households to move to racially concentrated neighborhoods mirrors a prior tendency to search in such neighborhoods. Furthermore, Vidal finds that these restricted search patterns do not appear to reflect deliberate avoidance of white neighborhoods due to expected discrimination or travel difficulties. Thus, programs of passive equal opportunity assistance (for example, legal aid in filing discrimination complaints) may not be effective in changing racially segregated housing patterns. Vidal suggests that more active efforts to influence the housing information provided by real estate agents and vacancy signs might be effective in broadening search patterns, since these sources were frequently used by black households in searching for housing. At the same time, most households find their units through personal contacts, which are more difficult to influence.

Although this report mainly addresses issues of the dispersion of low-income and minority concentration, numerous other topics connected with the relocation of participants have potential policy interest. Among them are questions of the extent to which participants use the housing allowance program's freedom of choice to move to better quality neighborhoods, to neighborhoods closer to their place of work, or from the central city to the suburbs. Detailed analysis of such questions is beyond the scope of this report, but Chapter 5 presents some simple comparisons of the average experience for Experimental and Control households.

The major findings and conclusions of the analysis are reviewed in Chapter 6.

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# CHAPTER 2

# CHANGES IN THE CONCENTRATION OF LOW-INCOME HOUSEHOLDS

The tendency for poor people to be geographically concentrated in particular neighborhoods has been observed in cities throughout the United States and is readily demonstrable in Pittsburgh and Phoenix, the Demand Experiment sites. The reduction of such concentrations has become a tenet of national policy: the 1974 Housing and Community Development Act incorporates the objective of reducing "the isolation of income groups within communities and geographic areas and the promotion of an increase in the diversity and vitality of neighborhoods through the spatial deconcentration of housing opportunities for persons of low income."[1] The purpose of the analyses presented in this chapter is to determine the extent to which the housing allowance served as a mechanism for such deconcentration.

## 2.1 DEFINING LOW-INCOME CONCENTRATION

In the following pages, a household's location is described in terms of the percentage of households in the Census tract with annual incomes under $5,000 (as of the 1970 Census). Some limiting characteristics of this measure must be recognized at the outset.

First, the choice of a $5,000 cutoff level is necessarily arbitrary. However, it does provide a reasonable parallel to the selection criterion for participation in the Demand Experiment. Eligibility was defined principally in terms of income and household size, and about 70 percent of the enrollees had total annual incomes at enrollment of under $5,000 in 1970 dollars.[2] The measure thus describes the extent to which the Demand Experiment households are living among people with similarly limited financial resources.

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[1] Housing and Community Development Act of 1974, Section 101(c)(6).

[2] Because the census was conducted in 1970, household incomes were converted to 1970 dollars for this comparison. For most households, the first year of the experiment occurred during 1974, at which time the Consumer Price Index was 27 percent above the 1970 level (Statistical Abstract, Government Printing Office, 1975). It thus took $6,350 in 1974 dollars to purchase $5,000 in 1970 dollars' worth of goods and services.

Defining neighborhoods in terms of Census tracts corresponds to the general intent of the Census Bureau's efforts,[1] but still requires some caveats. Not all tracts are completely homogeneous, and average tract characteristics may not describe the particular section of the tract in which a participant lives.[2] Further, census boundaries may not correspond to the intuitive neighborhood boundaries in the minds of the households, or they may be misleadingly abrupt indicators of what is really a fuzzy and flexible demarcation between neighborhoods. Nonetheless, tract data may be taken as reasonable indicators of the patterns of population distribution within a city.

The time lapse between the 1970 census and the Demand Experiment (which began in 1973) also requires a caveat. The analysis must assume that neighborhoods evolve slowly--i.e., that tracts that were (relatively) high-income in 1970 were still (relatively) high-income tracts in 1974-1975.

## Initial Patterns of Concentration

The maps on the following pages compare the distribution of Demand Experiment households at enrollment and all low-income households within Pittsburgh and Phoenix.[3] To characterize Census tracts, the maps use the following categories, which are also used in much of the subsequent analysis in this chapter.

> Higher-income neighborhoods. Census tracts with low-income concentration less than 25 percent.

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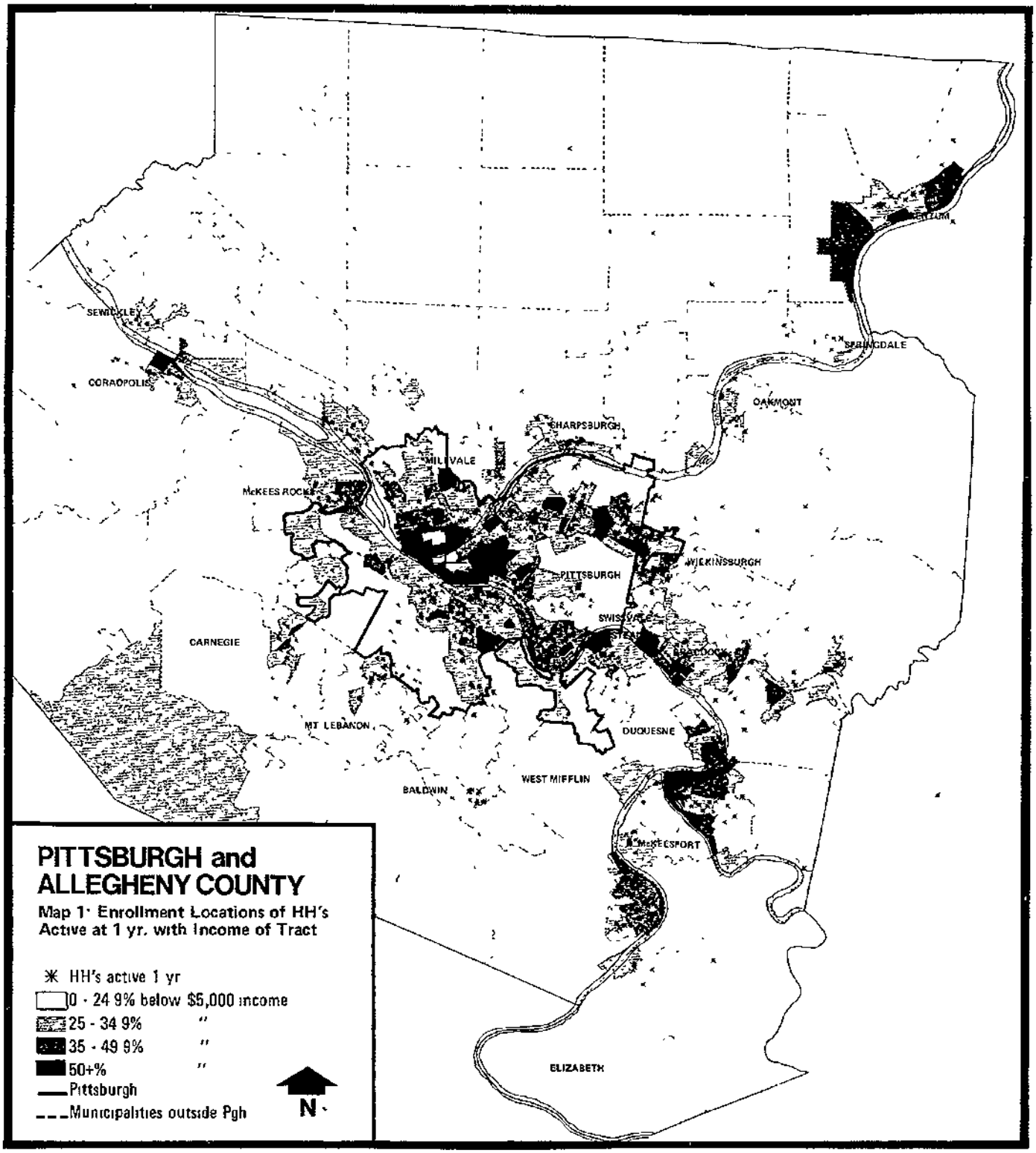
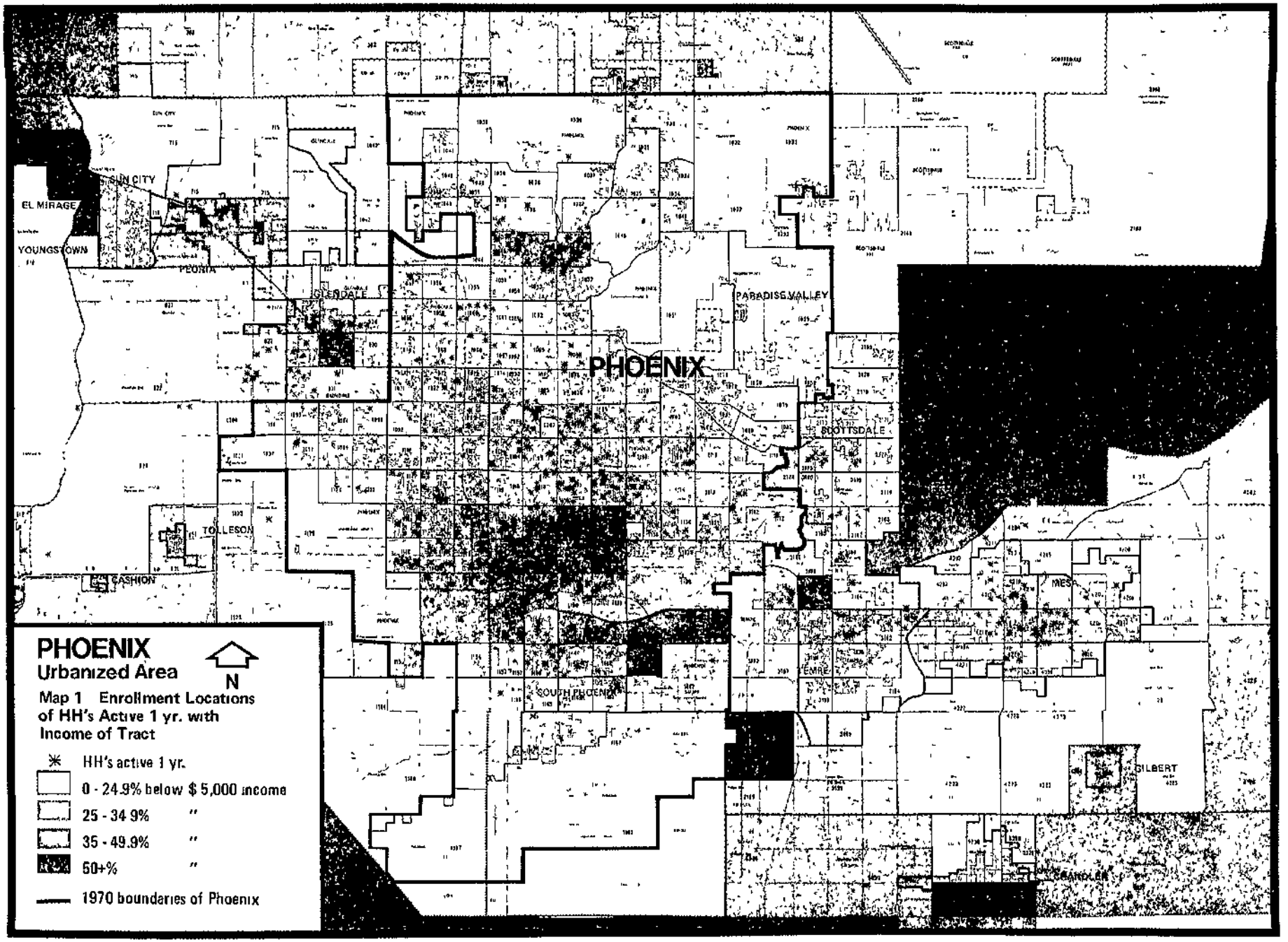
[1] According to the Census Bureau (1970 Census User's Guide), "tracts are small, relatively permanent areas into which large cities and adjacent areas are divided for the purpose of providing comparable small-area sta--tistics." Further, "tracts are originally designed to be relatively homogeneous with respect to population characteristics, economic status, and living conditions; the average tract has about 4,000 residents."

[2] The problems of possible lack of homogeneity could be partly overcome through use of block group (First Count) or block (Third Count) census data, either of which give finer geographic resolution than tract data. However, tract data are more complete, less subject to radical change in the period between the census and the experiment, and more convenient to use. Moreover, the more disaggregate data bases lack some of the variables used in analysis here.

[3] The maps show all households that remained in the experiment for one year. Most analysis in this report excludes households that were not still active after two years. However, the pattern of initial locations for the two-year group is not noticeably different from that of the one-year group.




scale 1 inch = 4 miles




scale 1 inch = 3.7 miles

Low-poverty neighborhoods. Those with low-income concentration from 25 to 34.9 percent.

Medium-poverty neighborhoods. Those with low-income concentration from 35 to 49.9 percent.

High-poverty neighborhoods. Those with low-income concentration of 50 percent or more.

The maps show the expected tendency for Demand Experiment households to be located in the more concentrated neighborhoods. In Pittsburgh, most of the highly concentrated neighborhoods are located near the center of the city and along the rivers, with the higher-income neighborhoods largely in the suburbs. High-poverty areas in Phoenix lie mainly in the South Phoenix area; substantial portions of the city itself are higher-income neighborhoods.[1]

The level of economic concentration for Demand Experiment households at enrollment is summarized in Table 2-1. Most households lived in neighborhoods in which a substantial proportion of the population had similar incomes: only about one household in five lived in a Census tract with fewer than 25 percent of the households having incomes under $5,000.[2] Even those living in higher-income areas were seldom far from relatively heavy concentrations of low-income households. Over two-thirds of the households living in higher-income areas (67 percent in Pittsburgh and 71 percent in Phoenix) lived in Census tracts immediately adjacent to tracts with low-income concentrations over 25 percent.[3]

Table 2-1 also compares the distribution of Demand Experiment households to that of all households in the city with incomes under $5,000.[4] The

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[1]The large high-poverty area to the east of Phoenix is part of an Indian reservation; reservation residents were not included in the experiment.

[2]It is interesting to note, however, that the enrolled households did not all originate in central city areas; 46 percent in Pittsburgh and 21 percent in Phoenix lived outside the central city.

[3]This finding suggests that many Demand Experiment households in higher-income Census tracts may have been living in low-income sections of those areas. Tract data can neither confirm nor refute this suggestion. However, households in the higher-income neighborhoods did tend to occupy better-quality housing, suggesting that the tract characteristics are at least a reasonable measure of relative status.

[4]Totals differ slightly from published totals due to the exclusion of tracts with missing data.

Table 2-1

LOW-INCOME CONCENTRATION OF EXPERIMENTAL AND CONTROL HOUSEHOLDS AT ENROLLMENT

| NEIGHBORHOOD TYPE | ALL HOUSEHOLDS WITH INCOMES LESS THAN $5,000 | DEMAND EXPERIMENT HOUSEHOLDS | | |
|---|---|---|---|---|
| | | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS | TOTAL |
| | PITTSBURGH | | | |
| Higher-income | 32% | 18% | 22% | 19% |
| Low-poverty | 29 | 40 | 41 | 40 |
| Medium-poverty | 21 | 27 | 27 | 27 |
| High-poverty | 18 | 15 | 10 | 14 |
| SAMPLE SIZE | (127,897) | (918) | (321) | (1,239) |
| | PHOENIX | | | |
| Higher-income | 29% | 19% | 17% | 18% |
| Low-poverty | 28 | 24 | 24 | 24 |
| Medium-poverty | 24 | 32 | 32 | 32 |
| High-poverty | 19 | 25 | 26 | 25 |
| SAMPLE SIZE | (73,817) | (719) | (282) | (1,001) |

SAMPLE: Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, and Initial Household Report Forms.

patterns are generally similar. (Differences are mainly due to the exclusion of homeowners in the Demand Experiment sample and to the difference between income eligibility limits for the experiment and the $5,000 limit imposed in the comparison data.) Thus, a majority of Demand Experiment households began in the two intermediate neighborhood categories rather than the high-poverty and higher-income neighborhoods.

Expected Change in Concentration

One perspective on the possible effect of the housing allowance can be obtained from a cross-sectional analysis of 1970 census data. Low-income concentration in the Census tract was regressed on household income and rent, respectively. The coefficients from the two regressions were then used to estimate the change in low-income concentration that might be expected of Demand Experiment households, given the availability of the allowance. Using the relationship between household income and low-income household concentration, the analysis indicates the change that might be expected if the household treated the allowance as ordinary income. The estimate using the relationship between rent and low-income household concentration indicates the change that might be expected under the extreme assumption that all of the allowance would be used to increase rental expenditures.

The cross-sectional analysis suggests that the allowance should not cause large changes in the average low-income concentration of neighborhoods occupied by allowance recipients. If recipients treat the allowance as ordinary income, the reduction in low-income concentration of Experimental and Control households should differ by less than 1 percentage point. Even if recipients used all of their allowance for increased rent, the difference should still only be about 4 percentage points in Pittsburgh and 7 in Phoenix. The limitations of such cross-sectional analysis in forecasting the dynamic response to the availability of a subsidy must be recognized, of course, and the absolute values shown in Table 2-2 treated with considerable caution. Nonetheless, the analysis suggests that dramatic changes in the average low-income concentration should not be expected simply because of a housing allowance. A priori, the data indicate that a housing allowance would be unlikely to fill the hopes or the fears of those envisioning substantial population shifts in the direction of economic integration.

Table 2-2

CROSS-SECTIONAL ESTIMATES OF EXPECTED CHANGES IN LOW-INCOME CONCENTRATION

| | PITTSBURGH | | PHOENIX | |
|---|---|---|---|---|
| | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS |
| Mean monthly payment (Sample size) | $49 (900) | $10 (321) | $66 (718) | $10 (287) |
| Mean initial low-income concentration | 35.4% | 33.9% | 39.0% | 39.8% |
| Change in low-income concentration if payment is used entirely for increased housing expenditures | -5.4 | -1.1 | -7.8 | -1.2 |
| Difference in estimates | -4.3 | | -6.6 | |
| Change in low-income concentration if payment is treated as ordinary income | -0.8 | -0.2 | -0.9 | -0.1 |
| Difference in estimates | -0.6 | | -0.8 | |

SAMPLE: Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, Initial Household Report Forms, and payments file.

## Average Change in Low-Income Concentration

Experimental and Control households were in fact almost identical in their overall average change in low-income concentration, as shown in Table 2-3. Households in both Pittsburgh and Phoenix tended, on the average, to move to neighborhoods with relatively fewer low-income families than the neighborhoods in which they lived at the time they enrolled. The changes were slightly greater in Phoenix than Pittsburgh, with an average reduction of about 3 percentage points compared to an average of about 1 point.[1] In neither case, however, was the average change for Experimental households significantly different from that for Control households.

Table 2-3 compares all households that were offered any form of a housing allowance program to the Control households. Because it is possible that different versions of the program would have different effects, it is useful to examine each of the major allowance plans separately. Moreover, it is important to separate households that moved, in order to eliminate any confounding effect of differential mobility rates. This is done in Tables 2-4, 2-5, and 2-6.

Table 2-4 also separates those Housing Gap households that were already occupying housing that met program requirements at the time they enrolled from households that did not meet requirements at enrollment.[2] Households that already met the requirements had little or no incentive to change their unit or neighborhood, and might even hesitate to do so for fear of losing the subsidy. Those not meeting requirements initially, generally had to move in order to receive their allowance (some were able to meet requirements in their original unit by upgrading).

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[1]The average change for Control households, particularly in Phoenix, is larger than the "expected" change estimated in Table 2-2. This probably occurs because the analyses presented in Table 2-2 took into account only the income increment represented by the housing allowance program. In fact, the average income from other sources increased over the two-year time period for both Experimental and Control households.

[2]Control households, of course, did not have to meet any requirements. For this analysis, however, the data on physical characteristics of the housing, occupancy levels, and rent levels were used to determine whether Control households would have met the standards that were applied to the Housing Gap households.

Table 2-3

MEAN CHANGE IN LOW-INCOME CONCENTRATION

| LOW-INCOME CONCENTRATION | PITTSBURGH | | PHOENIX | |
|---|---|---|---|---|
| | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS |
| Mean initial concentration | 35.4% | 33.9% | 39.0% | 39.8% |
| (standard deviation) | (13.2) | (12.8) | (15.2) | (15.3) |
| Mean final concentration | 34.4 | 32.7 | 36.3 | 36.5 |
| (standard deviation) | (13.2) | (13.2) | (15.7) | (15.7) |
| Mean change | -1.1 | -1.2 | -2.7 | -3.3 |
| (standard deviation) | (8.1) | (7.2) | (11.3) | (11.0) |
| SAMPLE SIZE | (916) | (320) | (715) | (282) |

SAMPLE: Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Experimental/Control differences not significant at the 0.05 level in a two-tailed t-test.

Table 2-4

CHANGES IN LOW-INCOME HOUSEHOLD CONCENTRATION
UNDER THE HOUSING GAP PLAN

| HOUSEHOLDS | ALL HOUSEHOLDS | | HOUSEHOLDS THAT MOVED | |
|---|---|---|---|---|
| | HOUSING GAP | CONTROL | HOUSING GAP | CONTROL |
| | PITTSBURGH | | | |
| ALL HOUSING GAP HOUSEHOLDS | | | | |
| Initial low-income concentration | 35.5% | 33.9% | 36.6% | 34.6% |
| (Sample size) | (449) | (321) | (167) | (112) |
| Change in concentration | -0.5 | -1.2 | -1.4 | -3.5 |
| Percentage of households that moved | 37.0 | 35.0 | --- | --- |
| HOUSING GAP HOUSEHOLDS INITIALLY FAILING REQUIREMENTS | | | | |
| Initial low-income concentration | 37.7 | 36.7 | 38.6 | 37.2 |
| (Sample size) | (289) | (200) | (115) | (69) |
| Change in concentration | -0.8 | -1.3 | -2.1 | -3.8 |
| Percentage of households that moved | 40.0 | 35.0 | --- | --- |
| HOUSING GAP HOUSEHOLDS INITIALLY PASSING REQUIREMENTS | | | | |
| Initial low-income concentration | 31.6 | 29.1 | 32.2 | 29.7 |
| (Sample size) | (157) | (119) | (52) | (42) |
| Change in concentration | 0.1 | -0.9 | 0.2 | -2.7 |
| Percentage of households that moved | 33.0 | 35.0 | --- | --- |
| | PHOENIX | | | |
| ALL HOUSING GAP HOUSEHOLDS | | | | |
| Initial low-income concentration | 38.5% | 39.8% | 38.6% | 39.2% |
| (Sample size) | (381) | (282) | (237) | (148) |
| Change in concentration | -2.8 | -3.3 | -4.6 | -6.3 |
| Percentage of households that moved | 62.0 | 52.0 | --- | --- |
| HOUSING GAP HOUSEHOLDS INITIALLY FAILING REQUIREMENTS | | | | |
| Initial low-income concentration | 41.3 | 43.5 | 41.0 | 43.3 |
| (Sample size) | (277) | (192) | (173) | (98) |
| Change in concentration | -3.2 | -3.6 | -5.1 | -7.0 |
| Percentage of households that moved | 62.0 | 51.0 | --- | --- |
| HOUSING GAP HOUSEHOLDS INITIALLY PASSING REQUIREMENTS | | | | |
| Initial low-income concentration | 30.8 | 31.5 | 31.7 | 30.4 |
| (Sample size) | (101) | (86) | (62) | (47) |
| Change in concentration | -1.7 | -2.9 | -2.7 | -5.4 |
| Percentage of households that moved | 61.0 | 55.0 | --- | --- |

SAMPLE: Housing Gap and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES 1970 Census of Population and Housing (Fourth County Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

NOTE: Housing Gap/Control differences not significant at the 0.05 level in a two-tailed t-test.

Measuring changes in low-income concentration only for households that moved necessarily produces larger average changes than those shown in Table 2-3. Again, Control households experienced a slightly greater average reduction in low-income concentration than the Housing Gap group, contrary to the direction suggested by the hypothesis; none of the Housing Gap/Control differences are significant at the 0.05 level. The figures in Table 2-4 also indicate that mobility rates for Housing Gap and Control households do not differ sufficiently to exaggerate or attenuate in the full population the patterns observed among those that moved. In all cases, the direction of difference between Housing Gap and Control households' net change is identical for the full population and the households that moved, and not significant for either population.

The effect of a general income transfer program, as represented by the Unconstrained housing allowance plan, appears ambiguous in Table 2-5. There is no significant difference between Unconstrained and Control households in Phoenix, although the reduction in low-income concentration was fractionally larger for the Unconstrained group. In Pittsburgh, the Unconstrained households had a substantially larger average deconcentration than their Control counterparts, although the difference is not quite significant at the 0.05 level. The Pittsburgh Unconstrained households had a significantly higher initial concentration level than the Control households, however, suggesting a need for analysis taking initial location into account.[1]

The Percent of Rent allowance plan, in which the allowance equals a fixed percentage of the household's monthly rent, offers a financial incentive to increase housing expenditures with no specific housing quality requirement. As shown in Table 2-6, changes in low-income concentration were not significantly different for Percent of Rent and Control households.

The preceding analyses were also carried out for several demographic groupings, including life cycle groupings, minority status, and household income categories. In no case does the overall comparison of Experimental and Control populations reveal significant differences in the mean change in

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[1]Thus the final concentration levels for Unconstrained and Control households in Pittsburgh are almost the same, 34.2 percent and 32.7 percent, respectively (30.6 percent and 31.1 percent for households that moved).

Table 2-5

CHANGES IN LOW-INCOME HOUSEHOLD CONCENTRATION
UNDER THE UNCONSTRAINED PLAN

| | ALL HOUSEHOLDS | | HOUSEHOLDS THAT MOVED | |
|---|---|---|---|---|
| | Unconstrained | Control | Unconstrained | Control |
| **PITTSBURGH** | | | | |
| Initial low-income concentration | 38.7% | 33.9%* | 41.9% | 34.6%* |
| (Sample size) | (63) | (321) | (25) | (112) |
| Change in concentration | -4.5 | -1.2 | -11.3 | -3.5 |
| Percentage of households that moved | 40.0% | 35.0% | --- | --- |
| **PHOENIX** | | | | |
| Initial low-income concentration | 40.6% | 39.8% | 39.3% | 39.3% |
| (Sample size) | (40) | (282) | (23) | (148) |
| Change in concentration | -3.9 | -3.3 | -6.8 | -6.4 |
| Percentage of households that moved | 58.0% | 52.0% | --- | --- |

SAMPLE: Unconstrained and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

*t-statistic shows Unconstrained/Control difference significant at the 0.05 level in a two-tailed test.

Table 2-6

CHANGES IN LOW-INCOME HOUSEHOLD CONCENTRATION
UNDER THE PERCENT OF RENT PLAN

| | ALL HOUSEHOLDS | | HOUSEHOLDS THAT MOVED | |
|---|---|---|---|---|
| | Percent of Rent | Control | Percent of Rent | Control |
| | PITTSBURGH | | | |
| Initial low-income concentration | 34.8% | 33.9% | 35.2% | 34.6% |
| (Sample size) | (406) | (321) | (153) | (112) |
| Change in concentration | -1.2 | -1.2 | -3.1 | -3.5 |
| Percentage of households that moved | 38.0% | 35.0% | --- | --- |
| | PHOENIX | | | |
| Initial low-income concentration | 39.4% | 39.8% | 39.2% | 39.3% |
| (Sample size) | (298) | (282) | (182) | (148) |
| Change in concentration | -2.4 | -3.3 | -4.0 | -6.4 |
| Percentage of households that moved | 61.0% | 52.0% | --- | --- |

SAMPLE: Percent of Rent and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Percent of Rent/Control differences not significant at the 0.05 level in a two-tailed t-test.

low-income concentration. In several subgroups, Experimental households have higher mobility rates than Control households, but these do not lead to significant differences in the average change in low-income concentration. Among elderly households in Phoenix, the Control group showed a significantly greater average reduction in low-income concentration than Experimental households (the difference is similar but not significant in Pittsburgh); however, there are very few Control households on which to base this comparison. In general, the examination of mean changes in low-income concentration does not suggest important program effects, either for the population as a whole or for important subgroups. (For further details, see Appendix III.)

## 2.2 ORIGIN-DESTINATION TRANSITIONS

Although the summary figures show small average reductions in low-income concentration, it is possible that experimental effects might vary with origin neighborhoods--affecting only the choice of those that start in the most concentrated areas, for example. This section explores the patterns of household movement in terms of the four neighborhood categories previously defined: high-poverty neighborhoods (low-income concentration of 50 percent or more); medium-poverty neighborhoods (35 to 49 percent); low-poverty neighborhoods (25 to 34 percent); and higher-income neighborhoods (less than 25 percent). To test for an effect of the housing allowance, patterns for Control households are used to project "expected" patterns for Experimental households; this allows a rough comparison of the actual behavior of households offered a subsidy with the behavior that would have been expected in the absence of the program.

Because the analysis uses the patterns of movement by Control households to formulate expectations about Experimental households, it is useful to begin by examining the Control households' experiences. Table 2-7 suggests that most Control households that moved did not make major changes in the character of their neighborhoods--indeed, a majority stayed within their initial neighborhood category.

Among those that did change neighborhood categories, there was movement in both directions. But reductions in low-income concentration were dominant: about three-fourths of those that changed categories went to neighborhoods

Table 2-7

ORIGIN-DESTINATION MATRICES FOR CONTROL MOVERS

| ORIGIN NEIGHBORHOOD TYPE | DESTINATION NEIGHBORHOOD TYPE: Higher-Income | Low-Poverty | Medium-Poverty | High-Poverty | SAMPLE SIZE |
|---|---|---|---|---|---|
| | | PITTSBURGH | | | |
| Higher-income | 0.905 | 0.048 | 0.048 | 0 | (21) |
| Low-poverty | 0.250 | 0.591 | 0.159 | 0 | (44) |
| Medium-poverty | 0.088 | 0.265 | 0.559 | 0.088 | (34) |
| High-poverty | 0.167 | 0.167 | 0.167 | 0.500 | (12) |
| SAMPLE SIZE | (35) | (38) | (29) | (9) | (111) |
| | | PHOENIX | | | |
| Higher-income | 0.615 | 0.231 | 0.154 | 0 | (56) |
| Low-poverty | 0.457 | 0.429 | 0.114 | 0 | (35) |
| Medium-poverty | 0.300 | 0.160 | 0.500 | 0.040 | (50) |
| High-poverty | 0.135 | 0.135 | 0.189 | 0.541 | (37) |
| SAMPLE SIZE | (52) | (34) | (40) | (22) | (148) |

SAMPLE: Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Figures represent the distribution among destination neighborhoods of households beginning in the specified origin category. Rows add to approximately 1.00.

of lesser low-income concentration (71 percent in Pittsburgh and 78 percent in Phoenix). The overall picture is one of gradual movement, generally into less concentrated areas.

The patterns of movement for Control households shown in Table 2-7 can be used to project a simulated or "expected" final distribution of neighborhoods occupied by Experimental households, given their initial neighborhoods. The Control households' transition probabilities between each pair of neighborhood categories are applied to the initial distribution of Experimental households to project a final distribution of Experimental households. Thus

$$(1) \qquad N_{e,f,m} = \Sigma P_{c,n,m} N_{e,o,n}$$

where

$N_{e,f,m}$ = the estimated number of Experimental households in the $m^{th}$ neighborhood category in the final time period,

$P_{c,n,m}$ = the proportion of Control households originally in category n who moved to category m, and

$N_{e,o,n}$ = the number of Experimental households in the $n^{th}$ neighborhood category in the original time period.

The estimated final distribution of Experimental households based on Control households is compared to the actual final distribution and tested for chi-squared goodness of fit in Table 2-8.[1] In general, the Experimental households' patterns of neighborhood change did not differ substantially from those of Control households.[2] The only statistically significant pattern occurs for the Percent of Rent households in Pittsburgh and concerns the distribution between two contiguous categories rather than a general tendency for the Experimental group to move to more (or less) concentrated

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[1]The chi-squared test in Table 2-8 can at best be regarded as informative with respect to the hypothesis that the underlying Control and Experimental parameters are the same; the test takes no account of the potential error involved in accepting the Control frequencies as the true parameters.

[2]The same analysis was performed for the various Housing Gap treatment groups (Minimum Standards, Minimum Rent), with no significant differences observed.

Table 2-8

DIFFERENCE BETWEEN ACTUAL AND EXPECTED DISTRIBUTION OF DESTINATION NEIGHBORHOOD TYPES FOR EXPERIMENTAL HOUSEHOLDS THAT MOVED

| TREATMENT TYPE | PERCENTAGE OF ACTUAL MINUS EXPECTED HOUSEHOLDS[a] Higher-Income | Low-Poverty | Medium-Poverty | High-Poverty | SAMPLE SIZE | CHI-SQUARED[b] |
|---|---|---|---|---|---|---|
| | | | PITTSBURGH | | | |
| Percent of Rent | -8.3% | 10.3% | -0.2% | -1.8% | (153) | 8.7* |
| Unconstrained | 4.4 | 2.8 | 3.2 | -10.0 | (25) | 1.8 |
| Housing Gap | -2.1 | -2.5 | -0.9 | 5.4 | (166) | 5.3 |
| | | | PHOENIX | | | |
| Percent of Rent | -6.4 | -1.4 | 3.9 | 3.9 | (181) | 5.4 |
| Unconstrained | 4.6 | -8.2 | 3.6 | 0 | (22) | 1.0 |
| Housing Gap | -7.2 | 2.1 | 5.1 | 0 | (235) | 6.2 |

SAMPLE: Experimental movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

a. Computed as actual households minus expected households divided by sample size (and expressed as a percentage).

b. Compares Experimental households' actual distribution with that simulated on the basis of Control households' behavior.

* Chi-squared statistic significant at the 0.05 level.

neighborhoods. The table indicates that the number of Percent of Rent households moving to higher-income areas was about 13 (8 percent of the sample) fewer than would have been expected on the basis of Control household behavior, while the number moving to low-poverty neighborhoods was about 16 more than expected. But the net effect of these moves is to have only 3 more households than expected in the two relatively unconcentrated neighborhood categories (higher-income and low-poverty) and 3 less than expected in the two concentrated categories (medium-poverty and high-poverty).

Although there was little difference in the neighborhood choices of Experimental and Control households that moved, it is conceivable that differential moving rates could lead to different final location patterns. To test this hypothesis, the analysis presented above was replicated including all households rather than only those that moved. No significant differences were observed. Mobility rates did not differ enough to generate an important effect on locational distribution.

The households with the most explicit incentive to change housing conditions were those in the Housing Gap plan whose housing at enrollment did not meet program requirements. These households could qualify for payments only by moving or by upgrading their existing residence. Table 2-9 compares the actual and expected locations of households that initially failed the requirements and subsequently moved (either in an attempt to qualify for payments or for other reasons). Once again, the analysis reveals no significant differences. The housing requirements apparently did not lead Experimental households to relocate in either more or less concentrated neighborhoods. The examination of movement across neighborhood categories thus reveals no more distinction between Experimental and Control households than did the earlier examination of average changes.

## 2.3 MULTIVARIATE ANALYSIS--METHOD

The final step in examining low-income concentration was a multivariate analysis. Like that described above, this analysis uses the observed behavior of Control households to project an expected pattern for Experimental households, and tests for a program effect by comparing the Experimental households' actual and expected behavior. In this case, however,

Table 2-9

DIFFERENCE BETWEEN ACTUAL AND EXPECTED DISTRIBUTION OF DESTINATION NEIGHBORHOOD TYPES FOR HOUSING GAP HOUSEHOLDS THAT FAILED HOUSING REQUIREMENTS AT ENROLLMENT AND SUBSEQUENTLY MOVED

| TREATMENT TYPE | PERCENTAGE OF ACTUAL MINUS EXPECTED HOUSEHOLDS[a] Higher-Income | Low-Poverty | Medium-Poverty | High-Poverty | SAMPLE SIZE | CHI-SQUARED[b] |
|---|---|---|---|---|---|---|
| | | | PITTSBURGH | | | |
| All Housing Gap | -1.5% | -4.9% | 5.0% | 1.3% | (115) | 0.8 |
| Minimum Standards | -5.1 | -3.4 | 5.1 | 3.6 | (70) | 2.4 |
| Minimum Rent | 5.6 | -3.1 | -6.0 | 3.6 | (45) | 1.6 |
| | | | PHOENIX | | | |
| All Housing Gap | -6.7 | 4.2 | 3.4 | -0.8 | (172) | 3.9 |
| Minimum Standards | -9.1 | 6.5 | 4.9 | -2.3 | (80) | 4.4 |
| Minimum Rent | -11.6 | 2.0 | 9.1 | 0.5 | (92) | 5.0 |

SAMPLE: Housing Gap movers that failed their housing requirements at enrollment and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

a. Computed as actual households minus expected households divided by sample size (and expressed as a percentage).

b. Compares Experimental households' actual distribution with that simulated on the basis of Control households' behavior.

regression analysis is used to predict an expected level of low-income concentration on the basis of a number of demographic and other household characteristics.

A regression equation for the final low-income concentration of Control households was estimated in the form

$$(2) \qquad LIHC_t^C = X_t^C \beta^C + \varepsilon_t^C$$

where

$LIHC^C$ = final low-income concentration for Control households, and

$\beta^C$ = regression coefficient for Control households on each of the independent variables $X_i$.[1]

This equation was used to predict expected behavior for Experimental households,

$$(3) \qquad LIHC_t^P = X_t^E \hat{\beta}^C$$

where

$LIHC_t^P$ = the predicted final low-income concentration for Experimental households, and

$\hat{\beta}^C$ = designates estimated values based on the Control households.

The effect of the housing allowance program appears in this procedure as the deviation of the actual final low-income concentration for Experimental households ($LIHC_t^E$) from the predicted concentration ($LIHC_t^P$). The deviation is assessed by examining the mean residual ($\bar{R}$), defined as

$$(4) \qquad \bar{R} = \text{Mean}[LIHC_t^E - LIHC_t^P]$$

---

[1] Since low-income household concentration, although continuous, is limited to values between 0 and 1.0, in theory it would be desirable either to include this restriction in the estimating procedure or to use a transformed variable that is not restricted (for example, the logistic transform f(LIHC) = ln(LIHC/1-LIHC). Since most values of LIHC lie in the 0.2 to 0.8 range, however, use of Ordinary Least Squares should not materially affect the results.

where a bar denotes the mean value.[1]

The reduced equation for Control households was estimated from a general list of factors likely to influence neighborhood choice and available in the data; the final equation contains only those variables with important relationships in this particular data base. The objective was a parsimonious prediction equation, not a full model of the factors influencing the choice of locations.

This procedure capitalizes on the fact that the data were obtained in an experimental design with random assignment rather than undertake an inevitably massive effort to develop or adapt a dynamic model of locational shifts.

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[1] Under the specification

$$(i) \qquad LIHC_t^E = \delta R + X_t^E \beta + \varepsilon_t^E$$

where

$\delta = 1$ if Experimental

$\varepsilon \sim N(0, \sigma^2)$.

The estimated effect, R, is given by

$$(ii) \qquad \bar{R} = \text{Mean}\left[LIHC_t^E - X_E \hat{\beta}^C\right]$$

$$= \text{Mean}[R + X_E(\beta - \hat{\beta}_C) + \varepsilon_E].$$

Then $\bar{R}$ is distributed normally with mean, R, and variance

$$(iii) \qquad \sigma_\varepsilon^2 \left[\frac{1}{N_E} + \bar{X}_E' (X_C'X_C)^{-1} \bar{X}_E\right]$$

where $\bar{X}_E$ is the mean value of $X_E$. In fact, $\bar{R}$ was tested using the approximation

$$(iv) \qquad \hat{\sigma}_\varepsilon^2 \left[\frac{1}{N_E} + \frac{1}{N_C}\right]$$

where $\hat{\sigma}_\varepsilon^2$ was estimated from the residual of both the Experimental and Control households. The term in brackets will be exact only if $\bar{X}_E$ equals $\bar{X}_C$. Otherwise, the bracketed term in (iii) will be smaller than the bracketed term in (iv)--i.e., underestimate the variance. On the other hand, the estimate of $\sigma_\varepsilon^2$ is biased above the true value. For a further discussion of these points see Appendix IV.

To construct a site-specific model that would predict period-to-period changes in the locational distribution of particular population segments would require much more elaborate behavioral modeling and probably considerably more observations than those available from the experiment. Fortunately, a straightforward comparison of the Experimental and Control households' behavior accomplishes much of the same purpose--that is, it allows a determination of whether a population offered the housing allowance program made substantially different choices from those of an equivalent population without a program, controlling for those factors clearly associated with locational choice in the population and the environment under study. If substantial differences were found, the absence of a refined model would make it difficult to know precisely the reasons for or implications of the difference. But for the more basic question, the experimental design allows a quite confident answer.

The set of variables examined for possible inclusion in the predictor equations is shown in Table 2-10. A reduced equation was developed, entering groups of variables in approximately the order shown in the table, and excluding variables making little or no contribution to the equation's explanatory power. Superscripts in Table 2-10 indicate the variables retained in the final predictor equations. Details on the equations and the procedures used are presented in Appendix IV.

Like the analyses of earlier sections, the multivariate analysis does not reveal important program effects. The findings of the analysis are summarized in Table 2-11, which pools the data for Pittsburgh and Phoenix.[1] None of the differences is significant at the 0.05 level. All of the differences are small, indicating that average low-income concentration of Experimental households after moving was within 3 percentage points of the level predicted by Control households' behavior.

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[1] An F-test failed to reject a hypothesis of homogeneity of effects (not unreasonably, since the effect in both sites appears to be zero). Appendix V contains separate analyses for Phoenix and Pittsburgh. The only marked difference from the pooled-site results is that Unconstrained households in Pittsburgh showed significantly (but still only marginally) greater deconcentration than predicted (about 5 percentage points). The difference for Unconstrained households in Phoenix was in the same direction, but quite small (-0.5) and not significant.

Table 2-10

VARIABLES CONSIDERED IN
DEVELOPING PREDICTOR EQUATIONS

1. Demographic Variables
   - Black head of household[a,b]
   - Spanish American head of household[b]
   - Elderly head of household
   - Sex of head of household[a]
   - Household size
   - Education of household head[b]
   - Household per capita income[b]
   - Variance of income
   - Welfare status[b]
   - Married/not married head of household
   - Presence of children
   - Presence of relatives in household

2. Mobility Variables
   - Length of time in present dwelling unit
   - Number of recent moves
   - Automobile ownership[a]

3. Satisfaction Variables
   - Satisfaction with dwelling unit
   - Satisfaction with neighborhood[a]

4. Neighborhood Variables
   - Low-income concentration at enrollment[a,b]
   - Percentage black in Census tract[b]
   - Percentage Spanish American
   - Rate of crimes against persons
   - Rate of crimes against property
   - Presence of litter
   - Presence of abandoned units[b]
   - Presence of abandoned cars
   - Presence of landscaping
   - Adequacy of street maintenance
   - City or suburban location
   - Index of rent quality[c]
   - Neighborhood hedonic subindex[d]

5. Housing Variables
   - Rent
   - Rent burden (rent as a fraction of income)
   - Persons per bedroom
   - Pass/fail Minimum Standards physical requirements

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a. Included in the Pittsburgh predictor equation.

b. Included in the Phoenix predictor equation.

c. The proportion of rental units in the Census tract with complete plumbing facilities and rent above C* (estimated cost of modest, standard existing housing).

d. A value obtained by regressing rent on certain unit and neighborhood characteristics.

Table 2-11

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL LOW-INCOME CONCENTRATION
(PITTSBURGH AND PHOENIX POOLED)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 946) = 1.381) | | | | | | |
| Percent of Rent versus Control | 1.070 | -0.371 | 1.441 | 1.363 | (304) | (239) |
| Housing Gap versus Control | 1.353 | -0.371 | 1.724 | 1.703 | (375) | (239) |
| Minimum Standards versus Control | 1.431 | -0.371 | 1.802 | 1.469 | (170) | (239) |
| Minimum Rent versus Control | 1.289 | -0.371 | 1.660 | 1.426 | (205) | (239) |
| C* High versus Control | 0.413 | -0.371 | 0.784 | 0.518 | (90) | (239) |
| Unconstrained versus Control | -3.284 | -0.371 | -2.913 | -1.480 | (46) | (239) |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 408) = 0.415) | | | | | | |
| Housing Gap versus Control | 1.066 | 0.171 | 0.895 | 0.722 | (266) | (160) |

SAMPLE: Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth County Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

In short, the analysis does not support the idea that a housing allowance would reduce the concentration of low-income households in a community. The earlier cross-sectional analysis suggested that dramatic population shifts should not be expected to result from the relatively small changes in households' financial circumstances represented by a housing allowance. The behavior of participants in the Demand Experiment conforms to the suggestion. They provide no evidence that a housing allowance would significantly alter existing patterns of economic concentration.[1]

---

[1]It is possible, however, that the effect of a housing allowance could be important relative to that of other forms of housing assistance. This would be the case if, for example, the location of public housing units in heavily low-income areas were found to cause an <u>increase</u> in average concentration levels. Comparisons with other housing programs in the Demand Experiment sites are considered in another analysis (forthcoming).

# CHAPTER 3

## CHANGES IN CONCENTRATION OF BLACK HOUSEHOLDS

The housing allowance has been supported by some as a tool for racial integration, and opposed by others who feared it would produce "block busting" or a massive movement of minorities from central city to suburbs. The analysis in this and the following chapter therefore seeks to determine whether the housing allowance program caused substantial deconcentration among participating minority households.[1] This chapter deals with black households in Pittsburgh and Phoenix and Chapter 4 with Spanish American households in Phoenix.[2]

For the most part, the analyses of racial and ethnic concentration parallel those of low-income concentration. Exceptions arise mainly because the number of minority group households is considerably smaller than the full population. The small number of cases, particularly in the Control groups, precludes the multivariate procedure used to analyze changes in low-income concentration, so a simpler regression model is tested. Experimental households are subdivided only into Housing Gap and Percent of Rent households, with no separate analysis of the treatment variations within these groups.[3]

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[1]Note that the analysis does not attempt to model the ultimate effect of an allowance program on racial residential patterns. The movements of Experimental and Control households are compared to determine whether there is any evidence of differential behavior resulting from the program. Such differential behaviors, if identified in this analysis, would signal the possibility of a longer-term effect on the racial composition of neighborhoods, but the data collected in the Demand Experiment would not allow estimation of such an ultimate effect without extensive modeling.

[2]For this analysis, the categories of white, black, and Spanish American are defined to be mutually exclusive. Following the census convention, households whose heads have a Spanish surname are classified as Spanish American.

[3]The Unconstrained group is included with the other plans with a Housing Gap payment formula.

The analysis of black households' concentration focuses on the percentage of the population in the Census tract that is black, based on the 1970 Census.[1] For some analyses, this measure is subdivided into four categories:

> Black neighborhoods. Tracts with 50 percent or more black population.
>
> Boundary neighborhoods. Tracts with 15 to 49.9 percent black population directly adjacent to black neighborhoods.
>
> Black enclaves. Tracts with 15 to 49.9 percent black population not directly adjacent to black neighborhoods. For most analyses, boundary neighborhoods and black enclaves are combined.
>
> White neighborhoods. All tracts with less than 15 percent black population.

The maps on the following pages show the initial locations of black and white households that remained actively enrolled after one year of the experiment. It is apparent from these maps that black households in both Pittsburgh and Phoenix were enrolled in locations very different from white households.

In Pittsburgh, although the large black population is segregated in separate neighborhoods, these neighborhoods do not form a single contiguous black concentration. There are 11 distinct black neighborhood areas in Pittsburgh and two in Phoenix. The largest one in Pittsburgh, in which a large fraction of black Demand Experiment households lived, is the Homewood-Brushton section in the eastern portion of the city, adjacent to Wilkinsburg, together with portions of Wilkinsburg. In Phoenix, the two black neighborhood

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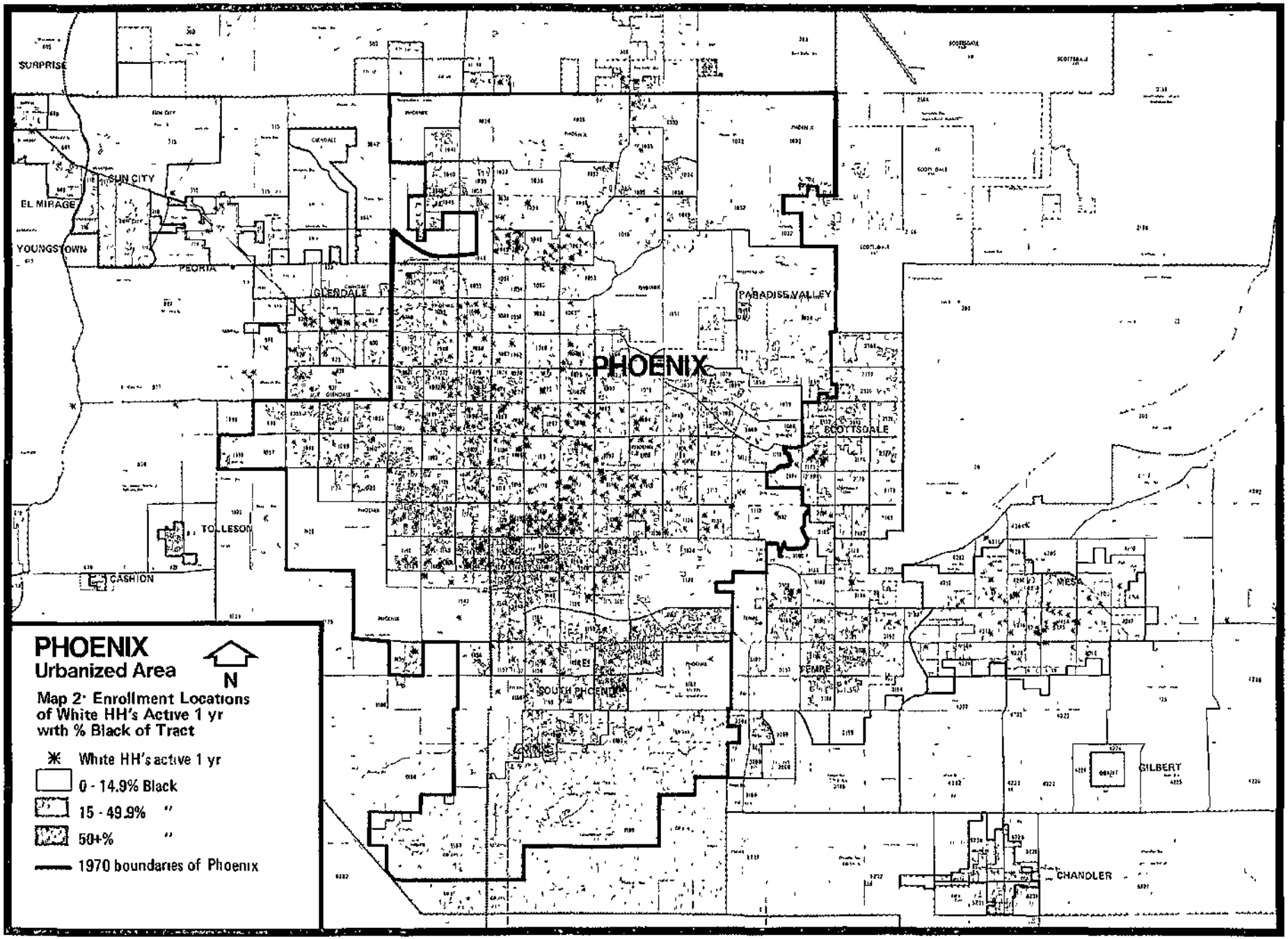
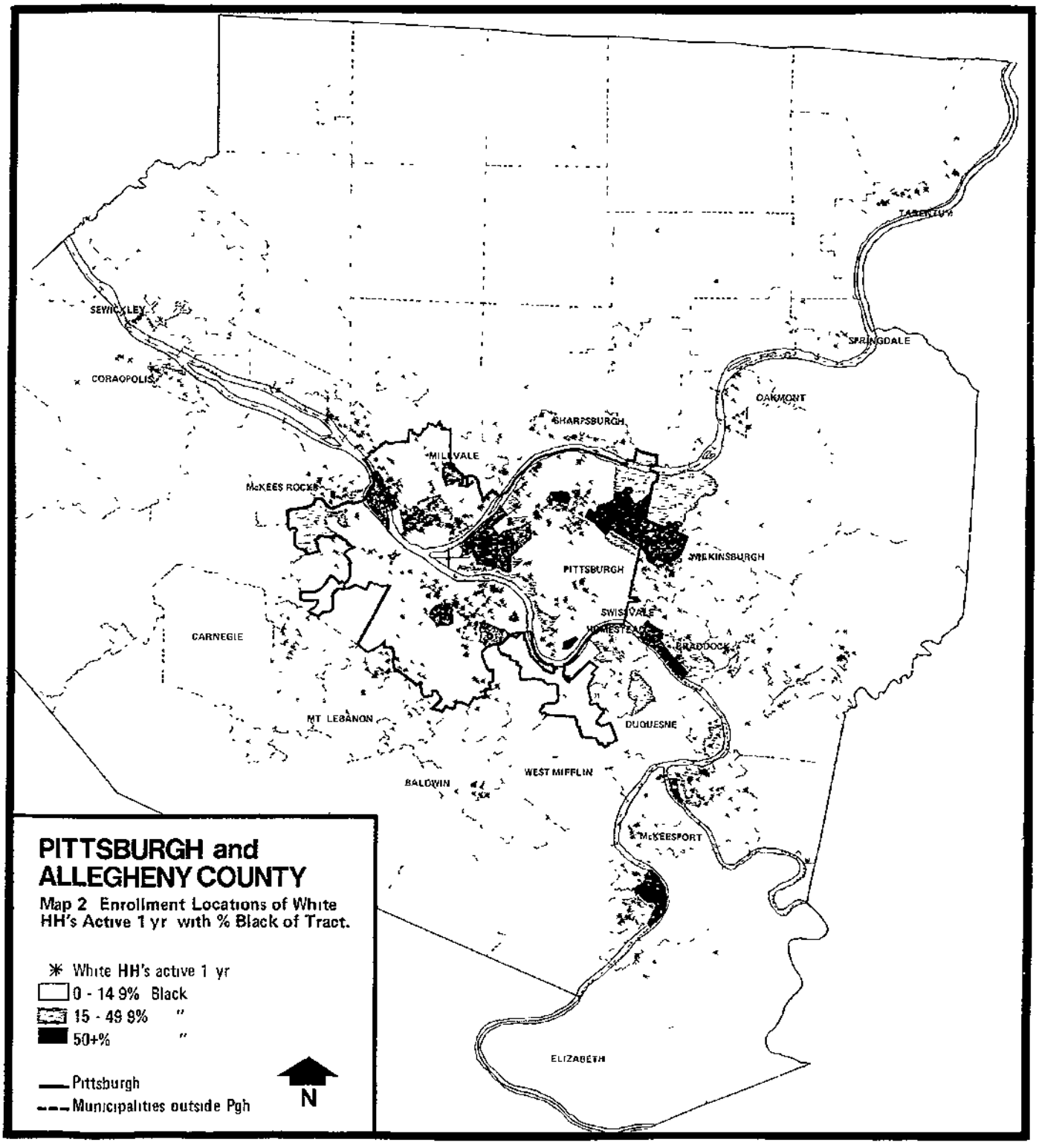
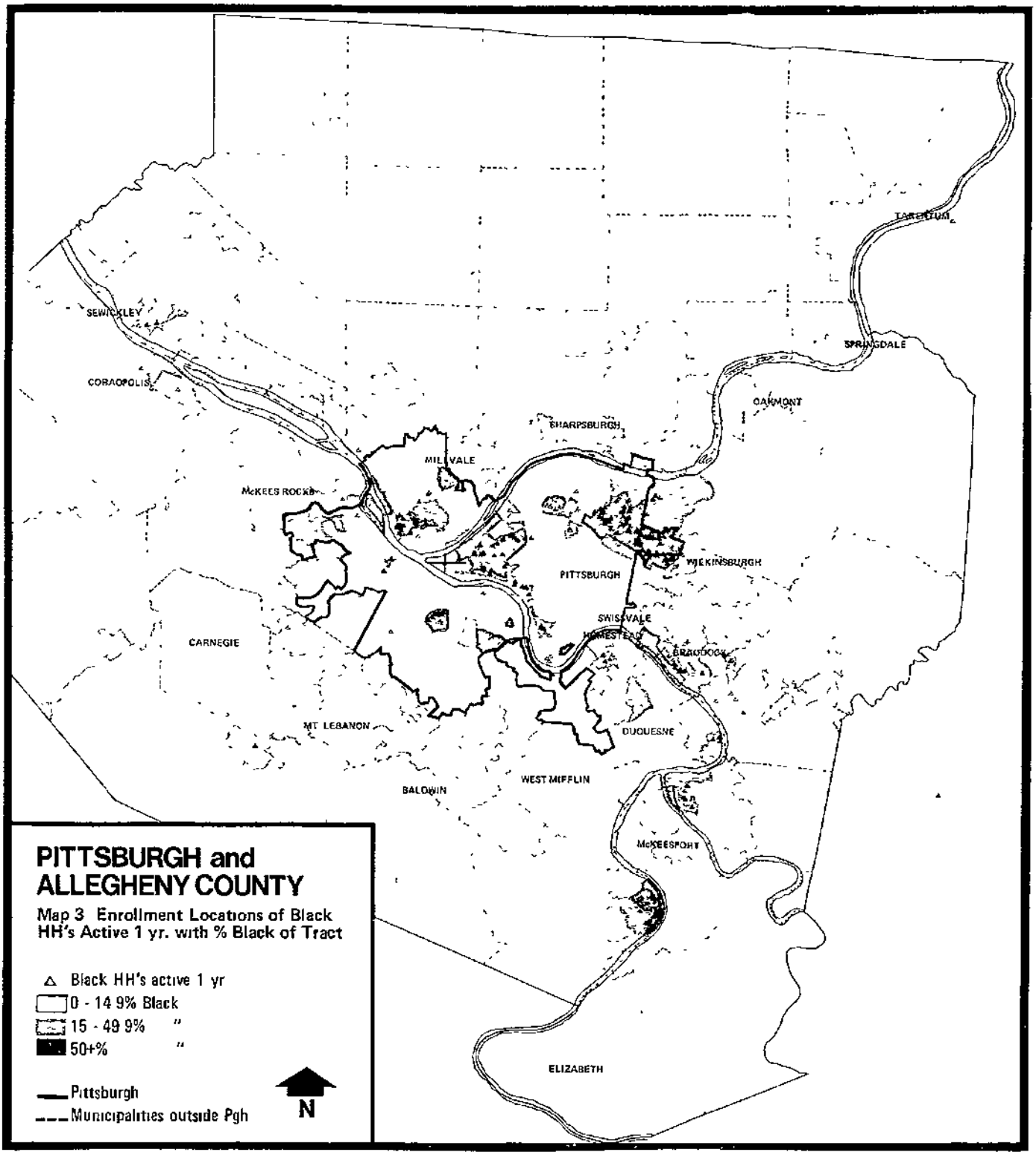
[1] The characterization is approximate, of course, as a descriptor of the Census tracts in which households in the Demand Experiment were located during the period of observation (late 1973 through early 1975). Informal discussions with knowledgeable persons at both sites indicate that in all likelihood the intervening changes in racial concentration did not markedly diminish black concentrations in tracts with high black concentrations in 1970. Boundary tracts, that is, those adjacent to tracts with high percentage of black population, may have had increases in racial concentration since 1970. The 1970 Census tract concentrations may therefore underestimate the racial concentration of boundary tracts; changes for black households that moved in the experiment may consequently be overestimated, if they moved from highly concentrated tracts to boundary tracts.



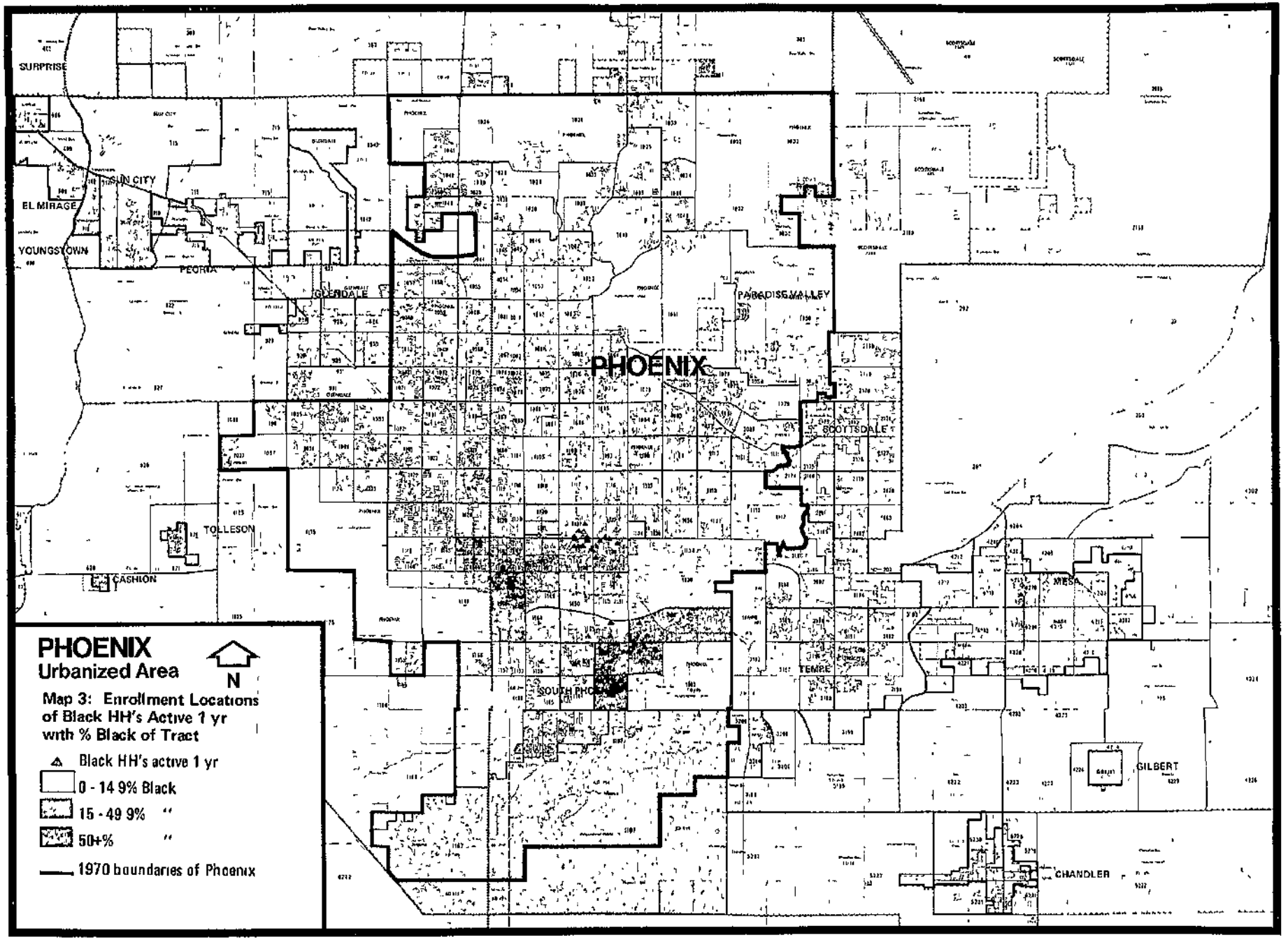

scale· 1 inch = 3.7 miles




scale 1 inch = 4 miles




scale 1 inch = 4 miles




scale. 1 inch = 3.7 miles

Table 3-1

MEAN PERCENTAGE BLACK IN INITIAL TRACTS
OF ENROLLED HOUSEHOLDS BY RACE AND TREATMENT GROUP

| TREATMENT TYPE | RACIAL/ETHNIC GROUP | | |
|---|---|---|---|
| | Black | White | Spanish American |
| | PITTSBURGH | | |
| Control households | 47.1% | 5.6% | -- |
| Standard deviation | 31.0 | 12.3 | |
| (Sample size) | (63) | (255) | |
| Percent of Rent households | 63.2 | 5.3 | -- |
| Standard deviation | 31.0 | 12.3 | |
| (Sample size) | (87) | (317) | |
| Housing Gap households | 53.7 | 6.7 | -- |
| Standard deviation | 30.8 | 13.3 | |
| (Sample size) | (124) | (383) | |
| Total households | 55.2 | 5.9 | -- |
| Standard deviation | 31.4 | 12.8 | |
| (Sample size) | (274) | (955) | |
| | PHOENIX | | |
| Control households | 31.8% | 4.1% | 9.0% |
| Standard deviation | 23.8 | 10.2 | 14.1 |
| (Sample size) | (27) | (180) | (69) |
| Percent of Rent households | 42.5 | 2.0 | 7.1 |
| Standard deviation | 26.1 | 5.6 | 9.8 |
| (Sample size) | (26) | (190) | (76) |
| Housing Gap households | 42.3 | 2.8 | 9.7 |
| Standard deviation | 21.3 | 8.3 | 17.3 |
| (Sample size) | (26) | (250) | (132) |
| Total households | 38.7 | 2.9 | 8.8 |
| Standard deviation | 24.0 | 8.2 | 14.8 |
| (Sample size) | (79) | (620) | (277) |

SAMPLE: Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, and Initial Household Report Forms.

areas are physically close to each other in South Phoenix (this portion of the city also has high concentrations of Spanish American households).

The patterns of racial segregation suggested by the maps are not noticeably different from those of households that remained active after two years; the patterns for this group are numerically illustrated in Table 3-1. Black households participating in the experiment in Pittsburgh lived in Census

[illegible]

Among the black households, Control households began the experiment in [illegible] in Pittsburgh began in more concentrated neighborhoods than Housing Gap households. The implications of these patterns for the analysis are discussed in a later section.

## 3.1 EXPECTED CHANGE IN BLACK CONCENTRATION

Given the initial patterns of substantial racial concentration, most arguments have been that the subsidy might allow black households to leave the ghetto (although some have feared that discrimination would make such movement impossible) and there has been some speculation that the allowance could finance "white flight" to the neighborhoods with even fewer black households.

A crude impression of the possible effects can be obtained from a cross-sectional analysis of the relationship between household income, rent, and

[illegible]

[1] This difference appears to have arisen largely by chance in the sample of enrolled households in Pittsburgh. In Phoenix, however, some of the difference appears to reflect differential attrition of Experimental and Control households. This suggests that estimated effects for Experimental households in Phoenix may be biased downward by a few percentage points (see Appendix VI).

the percentage of the Census tract's population that is black.[1] Table 3-2 uses this analysis to estimate changes in the mean percentage black, assuming in the first case that the housing allowance goes directly into increased rent, and in the second case that the allowance is treated as a simple increase in income. The cross-sectional analysis suggests that the effect of allowances on racial concentration would be small. For black households, spending the entire subsidy on increased rent might produce a reduction in black concentration that would be 5 or 6 percentage points greater for Experimental than Control households. If the subsidy were treated as income, the expected difference would be less than 1 percentage point.

## 3.2 MEAN CHANGE IN BLACK CONCENTRATION

This section examines the average changes in black household concentration experienced by participants in the Demand Experiment.[2]

Because the initial locations of black and white households were so different, the analysis considers patterns of change for black and white households separately, with primary attention to black households. As in the analysis of low-income concentration, much of the analysis is restricted to households that moved during their two years of participation in the experiment. For analyses based exclusively on black households that moved, the sample size is too small to allow separate consideration of all of the treatment groups defined in the analysis of low-income concentration; thus the present analysis only separates the Housing Gap and Percent of Rent groups of households, without looking at subdivisions of either group.

On the average, participants in the Demand Experiment experienced quite small changes in the racial concentration of their neighborhoods, as shown in Table 3-3. For white and Spanish American households, the average percentage black of the neighborhoods occupied at the end of two years declined by less than 2 percentage points from the initial neighborhood average. All of the differences between Experimental and Control groups are small and none is statistically significant.

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[1] The analysis regresses the level of black concentration on income and on rent in separate equations.

[2] For an analysis of search patterns of black households in Pittsburgh see Vidal, 1978.

Table 3-2

CROSS-SECTIONAL ESTIMATES OF EXPECTED CHANGES IN BLACK CONCENTRATION FOR BLACK HOUSEHOLDS

| | PITTSBURGH | | PHOENIX | |
|---|---|---|---|---|
| | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS |
| Mean monthly payment (Sample size) | $50 (205) | $10 (63) | $64 (52) | $10 (27) |
| Mean initial black concentration | 57.6% | 47.1% | 42.4% | 31.8% |
| Change in black concentration if payment used entirely for increased housing expenditures | -6.0 | -1.2 | -7.6 | -1.2 |
| Difference in estimates | -4.8 | | -6.4 | |
| Change in black concentration if payment is treated as ordinary income | -0.6 | -0.1 | -0.8 | -0.1 |
| Difference in estimates | -0.5 | | -0.7 | |

SAMPLE: Black Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, Initial Household Report Forms, and payments file.

Table 3-3

MEAN CHANGE IN BLACK CONCENTRATION
FOR EXPERIMENTAL AND CONTROL HOUSEHOLDS

| TREATMENT TYPE | BLACK HOUSEHOLDS | WHITE HOUSEHOLDS | SPANISH AMERICAN HOUSEHOLDS | TOTAL |
|---|---|---|---|---|
| | | PITTSBURGH | | |
| Experimental households | -4.0 | -0.6 | -- | -1.4 |
| Standard deviation | 23.2 | 7.5 | | 13.0 |
| (Sample size) | (211) | (698) | | (909) |
| Control households | 2.6 | -0.3 | -- | 0.3 |
| Standard deviation | 16.8 | 7.1 | | 9.8 |
| (Sample size) | (63) | (254) | | (317) |
| | | PHOENIX | | |
| Experimental households | -2.6 | -0.1 | -1.7 | -0.8 |
| Standard deviation | 23.8 | 7.5 | 14.1 | 11.7 |
| (Sample size) | (52) | (438) | (207) | (697) |
| Control households | 3.1 | -1.5 | -1.9 | -1.1 |
| Standard deviation | 26.3 | 8.5 | 7.7 | 11.3 |
| (Sample size) | (27) | (180) | (69) | (276) |

SAMPLE: Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Experimental/Control differences not significant at the 0.05 level in a two-tailed t-test.

Black Experimental households experienced somewhat larger reductions in the average level of black concentration than did white or Spanish American households. Although not significant, these are within the range of expected changes developed in the cross-sectional analysis (Table 3-2). Subsequent analysis will indicate, however, that this distinction between Experimental and Control households results mainly from the small sample size and relatively low initial concentration levels for Control households (note that black Control households increased their average concentration) and it does not represent an effect of the housing allowance program.

The patterns of initial concentration and changes in concentration are shown in Table 3-4, which breaks out the major treatment groups and households that moved during the experiment. The pattern of slight deconcentration for white participants is much the same as that seen in Table 3-3.

The patterns for black households are considerably more varied, however. In Phoenix, black Percent of Rent households as well as Control households show a small increase in the average black concentration in their neighborhoods, while Housing Gap households register a small decrease. In Pittsburgh, the Percent of Rent households that moved experienced a very large average change --they reduced their average level of black concentration by some 25 percentage points. The difference between that change and the 8-point increase in concentration for Control households is statistically significant. Not coincidentally, the Percent of Rent households also had a significantly greater initial concentration of black households in their Census tracts. The average concentration for Percent of Rent and Control households tended to converge during the two years of the experiment, and among the households that moved, the average for the Percent of Rent group moved below the average for Control households.

Two points are suggested by these data. First, black households' locational choices are not unidirectional with respect to black concentration. Even though the average move reduces concentration, it is clear that numerous households moved to more concentrated locations. Second, there is some evidence that the direction of change depends on the household's initial location. In particular, those groups in Table 3-4 that showed increases

Table 3-4

MEAN CHANGES IN BLACK CONCENTRATION FOR WHITE AND BLACK HOUSEHOLDS BY TREATMENT GROUP AND MOBILITY STATUS

| HOUSEHOLD GROUP | WHITE HOUSEHOLDS | | | BLACK HOUSEHOLDS | | |
|---|---|---|---|---|---|---|
| | MEAN INITIAL CONCENTRATION | MEAN CHANGE IN CONCENTRATION | SAMPLE SIZE | MEAN INITIAL CONCENTRATION | MEAN CHANGE IN CONCENTRATION | SAMPLE SIZE |
| | | | PITTSBURGH | | | |
| ALL HOUSEHOLDS | | | | | | |
| Control households | 5.6% | -0.3 | (254) | 47.1% | 2.6 | (63) |
| Housing Gap households | 6.7 | -0.7 | (382) | 53.7 | -1.5 | (124) |
| Percent of Rent households | 5.3 | -0.4 | (317) | 63.2** | -7.6** | (87) |
| TOTAL | 5.9 | -0.5 | (952) | 55.2 | -2.5 | (274) |
| HOUSEHOLDS THAT MOVED | | | | | | |
| Control households | 6.2 | -1.0 | (89) | 42.2 | 7.7 | (21) |
| Housing Gap households | 6.8 | -1.9 | (141) | 51.9 | -3.7 | (49) |
| Percent of Rent households | 5.6 | -1.1 | (127) | 65.8** | -25.3** | (26) |
| TOTAL | 6.2 | -1.4 | (357) | 53.5 | -7.1 | (96) |
| | | | PHOENIX | | | |
| ALL HOUSEHOLDS | | | | | | |
| Control households | 4.1 | -1.5 | (180) | 31.8 | 3.1 | (27) |
| Housing Gap households | 2.8 | -0.4 | (248) | 42.3 | -5.9 | (26) |
| Percent of Rent households | 2.0 | 0.4 | (190) | 42.5 | 0.7 | (26) |
| TOTAL | 2.9 | -0.5 | (618) | 38.7 | -0.6 | (79) |
| HOUSEHOLDS THAT MOVED | | | | | | |
| Control households | 4.7 | -3.0 | (92) | 30.2 | 4.1 | (20) |
| Housing Gap households | 2.5 | -0.7 | (144) | 39.6 | -4.3 | (19) |
| Percent of Rent households | 2.0 | 0.6 | (116) | 40.8 | 1.2 | (16) |
| TOTAL | 2.9 | -0.9 | (352) | 36.5 | -0.9 | (55) |

SAMPLE: Black and white Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

** Significantly different from Control households at the 0.01 level.

in the average concentration level were almost uniformly the groups with the lowest average concentration in their initial neighborhoods.[1]

Both of these patterns can be seen more clearly by examining changes within groups of households initially located in similar neighborhoods. Table 3-5 presents the average change in concentration for black households that moved, looking separately at households initially living in black, boundary, and white neighborhoods.

The table again shows that the change in concentration by black households varied substantially by neighborhood type at enrollment. Households starting in black neighborhoods in both Pittsburgh and Phoenix achieved a mean deconcentration of about 21 percentage points. Households beginning in boundary neighborhoods had small increases in concentration (5 percentage points in Pittsburgh and less than 1 point in Phoenix), while those initially living in white neighborhoods increased their concentration substantially (29 percentage points in Pittsburgh and 20 in Phoenix).

One implication of this pattern of positive and negative changes in black concentration is that an unequal initial distribution of treatment groups across the neighborhood categories could distort the mean differences in deconcentration between Experimental and Control households. It is appropriate therefore to examine the differences in mean changes for treatment groups <u>within</u> each neighborhood type, as presented in Table 3-5. These data indicate few substantial differences; only that within the black neighborhood category in Pittsburgh--a 35 percentage point difference between Percent of Rent and Control households--is statistically significant.

## Changes Across Neighborhood Categories

A more detailed picture of the patterns of positive and negative changes in black concentration for black households that moved is presented in Table 3-6. The table illustrates the very small number of cases involved in the

[1] This sort of regression toward the mean is not unexpected. To the extent that black households' choice of location with respect to racial concentration is not completely dominated by their current location, the new location of each household will tend to be closer to the average for all black households than its original location. Hence, households that start out in neighborhoods with exceptionally high (or low) concentrations will tend to show larger reductions (or increases) than other households.

Table 3-5

CHANGES IN BLACK CONCENTRATION FOR BLACK HOUSEHOLDS
THAT MOVED BY TREATMENT TYPE AND INITIAL NEIGHBORHOOD TYPE

| INITIAL NEIGHBORHOOD TYPE[a] | TREATMENT TYPE | PITTSBURGH | | | PHOENIX | | |
|---|---|---|---|---|---|---|---|
| | | MEAN INITIAL CONCENTRATION | MEAN CHANGE | SAMPLE SIZE | MEAN INITIAL CONCENTRATION | MEAN CHANGE | SAMPLE SIZE |
| Black | Control households | 73.0% | 0.3 | (8) | 71.8% | -26.3 | (4) |
| | Housing Gap households | 73.4 | -16.3 | (28) | 65.7 | -30.7 | (6) |
| | Percent of Rent households | 76.9 | -35.4* | (20) | 75.2 | -5.6 | (5) |
| | TOTAL | 74.6 | -20.8 | (56) | 70.5 | -21.1 | (15) |
| Boundary | Control households | 38.2 | 0.2 | (5) | 32.7 | 4.2 | (9) |
| | Housing Gap households | 28.6 | 5.9 | (16) | 36.7 | -8.8 | (9) |
| | Percent of Rent households | 39.0 | 8.0 | (3) | 30.3 | 5.2 | (9) |
| | TOTAL | 31.9 | 5.0 | (24) | 33.2 | 0.2 | (27) |
| White | Control households | 8.5 | 26.3 | (6) | 3.3 | 21.4 | (7) |
| | Housing Gap households | 6.4 | 35.8 | (5) | 7.3 | 27.5 | (4) |
| | Percent of Rent households | 9.0 | 20.5 | (2) | 2.0 | 0 | (2) |
| | TOTAL | 7.8 | 29.1 | (13) | 4.3 | 20.0 | (13) |

SAMPLE: Black Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

a. The enclave category is excluded because only nine black households that moved were in that neighborhood type at enrollment.

* Significantly different from Control households at the 0.05 level.

Table 3-6

ORIGIN-DESTINATION MATRICES FOR BLACK HOUSEHOLDS THAT MOVED BY MAJOR TREATMENT TYPES--PITTSBURGH

| INITIAL NEIGHBORHOOD TYPE | FINAL NEIGHBORHOOD TYPE | | | SAMPLE SIZE |
|---|---|---|---|---|
| | White | Enclave/Boundary | Black | |
| | CONTROL HOUSEHOLDS | | | |
| White | 2 | 2 | 2 | (6) |
| Enclave/Boundary | 1 | 5 | 1 | (7) |
| Black | 1 | 0 | 7 | (8) |
| (Sample size) | (4) | (7) | (10) | (21) |
| | HOUSING GAP HOUSEHOLDS | | | |
| White | 2 | 1 | 2 | (5) |
| Enclave/Boundary | 1 | 12 | 3 | (16) |
| Black | 6 | 1 | 21 | (28) |
| (Sample size) | (9) | (14) | (26) | (49) |
| | PERCENT OF RENT HOUSEHOLDS | | | |
| White | 1 | 0 | 1 | (2) |
| Enclave/Boundary | 0 | 3 | 1 | (4) |
| Black | 5 | 6 | 9 | (20) |
| (Sample size) | (6) | (9) | (11) | (26) |

SAMPLE: Black Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

Table 3-6 (continued)

ORIGIN-DESTINATION MATRICES FOR BLACK HOUSEHOLDS
THAT MOVED BY MAJOR TREATMENT TYPES--PHOENIX

| INITIAL NEIGHBORHOOD TYPE | FINAL NEIGHBORHOOD TYPE | | | SAMPLE SIZE |
|---|---|---|---|---|
| | White | Enclave/Boundary | Black | |
| | CONTROL HOUSEHOLDS | | | |
| White | 3 | 2 | 1 | (6) |
| Enclave/Boundary | 3 | 4 | 2 | (9) |
| Black | 1 | 1 | 2 | (4) |
| (Sample size) | (7) | (7) | (5) | (19) |
| | HOUSING GAP HOUSEHOLDS | | | |
| White | 1 | 2 | 1 | (4) |
| Enclave/Boundary | 5 | 1 | 3 | (9) |
| Black | 1 | 5 | 0 | (6) |
| (Sample size) | (7) | (8) | (4) | (19) |
| | PERCENT OF RENT HOUSEHOLDS | | | |
| White | 2 | 0 | 0 | (2) |
| Enclave/Boundary | 2 | 5 | 2 | (9) |
| Black | 0 | 1 | 4 | (5) |
| (Sample size) | (4) | (6) | (6) | (16) |

SAMPLE: Black Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

analysis. It also shows a substantial flow of households in both directions and a strong tendency for people to move without changing neighborhood categories. More than two-thirds of the black households that moved in Pittsburgh and half of those that moved in Phoenix chose neighborhoods within the same category of black concentration.

The table also shows more clearly the patterns of movement which produced (in Table 3-5) the significant difference between Percent of Rent and Control households initially living in black neighborhoods in Pittsburgh. While 7 of 8 Control households initially living in black neighborhoods stayed within that category, 11 of 20 Percent of Rent households left the black neighborhoods for areas of lesser black concentration. (Thus, while the difference in Table 3-5 is statistically significant, the small number of cases makes it rather unreliable; if one additional Control household had moved from the black to white neighborhood categories, the difference would no longer be significant at the 0.05 level.)[1]

The similarity of neighborhood exchange patterns for Experimental and Control households can be tested by using the Control group's experiences to project "expected" distributions of Experimental households in Pittsburgh. This analysis, as shown in Table 3-7, indicates that the patterns for Housing Gap households are not significantly different from those that would be expected on the basis of Control households' behavior. Among the Percent of Rent households, significantly fewer are found in black neighborhoods than would be predicted.[2] (Again, the small number of cases is a problem; different behavior by two Control households would eliminate the significant finding.)

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[1] Thus, for example, while the difference in mean concentrations shown in Table 3-5 is significant assuming that the concentrations of movers are drawn at random from a normally distributed set of concentrations, one might instead pose a model that starts with the probability of moving out of the initial neighborhood category. If the probability that a household in a black neighborhood changes category is in fact that observed for Control and Percent of Rent households (12/28 = 0.43), then the probability of observing seven or more Control households not changing categories is 0.156 ($8 \times 0.43 \times 0.57^7 + 8 \times 0.57^8$), small but not significant at the 0.10 level.

[2] As commented earlier, these significance tests are at best indicative.

Table 3-7

COMPARISON OF ACTUAL AND SIMULATED FINAL NEIGHBORHOOD DISTRIBUTIONS FOR BLACK EXPERIMENTAL HOUSEHOLDS THAT MOVED PITTSBURGH

| NEIGHBORHOOD TYPE | INITIAL DISTRIBUTION | ACTUAL FINAL DISTRIBUTION | SIMULATED FINAL DISTRIBUTION | CHI-SQUARED |
|---|---|---|---|---|
| | | HOUSING GAP | | |
| Black | 28 | 26 | 29 | |
| Other | 21 | 23 | 20 | 1.12 |
| (Sample size) | (49) | (49) | (49) | |
| | | PERCENT OF RENT | | |
| Black | 20 | 11 | 19 | |
| Other | 6 | 15 | 7 | 12.09** |
| (Sample size) | (26) | (26) | (26) | |

SAMPLE: Black Experimental movers in Pittsburgh active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

** Chi-squared test significant at the 0.01 level.

In sum, the patterns of change in black concentration seen thus far are somewhat ambiguous with respect to the effect of the housing allowance. There is no evidence of a significant effect for white households, for black households in Phoenix, or for black Housing Gap households in Pittsburgh. Black Percent of Rent households in Pittsburgh show significantly greater deconcentration than Control households in bivariate analysis, but the small number of cases and the differences in initial black concentration levels for the two groups diminish confidence in the finding.

## 3.3 MULTIVARIATE ANALYSIS

The patterns observed above are complicated by the apparently strong influence of initial neighborhood concentration on the extent and direction of the change in final concentration. In order to control more precisely for initial neighborhood characteristics and for other factors that might influence the observed change in black concentration, a series of multivariate analyses was performed. The relatively small number of black Control households that moved (21 in Pittsburgh and 20 in Phoenix) precludes the technique used to analyze treatment effects with respect to low-income concentration. Instead, a more conventional, single-equation multiple regression technique was used.[1]

The variables considered for inclusion in the regression equation included the level of black concentration and low-income concentration in the initial neighborhood, a set of basic demographic descriptors, variables included in the reduced-form predictor equation for low-income concentration, and treatment variables. The demographic variables were age, sex, education, and marital status of head of household; and household size and income. Variables considered on the basis of the analysis of low-income concentration were automobile ownership and satisfaction with the initial neighborhood (from the Pittsburgh equation), and welfare status and the presence of abandoned buildings in the initial neighborhood (from the Phoenix equation).

[1] As with the analysis of low-income household concentration, the limited range of the dependent variable might suggest the desirability of using some transform of racial concentration as the dependent variable.

In addition to the treatment variable, four independent variables were retained in the reduced Pittsburgh equation and three in the Phoenix equation, as shown in Tables 3-8 and 3-9.

The basic sample included all black households that moved during the two years of the experiment. The sample was varied to test specific treatments. The complete sample was used for an overall Experimental/Control comparison. Separate equations were estimated on samples made up of Percent of Rent and Control households, and of Housing Gap and Control households.[1]

The equations estimated are presented in Tables 3-8 and 3-9. All three equations have significant F-statistics in Pittsburgh, but only the Percent of Rent equation is significant in Phoenix. None of the models is particularly powerful, however: the adjusted $R^2$ ranges between 0.17 and 0.24 for the significant equations.

The initial level of black concentration is the only variable that is significant in all of the significant models, and is the only one to enter both the Pittsburgh and Phoenix equations. Automobile ownership and household size are also significant in some of the Pittsburgh equations, with greater deconcentration occurring among households with automobiles and among small households.

The treatment variables are not statistically significant in any equation. The effect for the Percent of Rent plan in Pittsburgh, observed to be significant in bivariate analyses, is reflected in the relatively high value of the regression coefficient, but the coefficient is not significant. The signs of the treatment variable coefficients are generally in the hypothesized direction--that is, they would imply that the housing allowance leads people to neighborhoods where the black concentration is a few percentage points lower than the neighborhoods they would otherwise choose. (The exception is the Percent of Rent plan in Phoenix, where the estimated coefficient--not significantly different from zero--would imply that the program would induce a choice of neighborhoods with 1 percentage point greater concentration.)

[1] The bivariate analyses shown earlier raise the possibility that a program effect might exist only for households initially living in black neighborhoods. A test of that possibility finds no effect significant at the 0.05 level. See Appendix VII.

Table 3-8

REDUCED EQUATIONS FOR FINAL CONCENTRATION OF BLACK HOUSEHOLDS THAT MOVED--PITTSBURGH
(t-Statistics in Parentheses)

| | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON |
|---|---|---|---|
| Treatment type | -0.075<br>(0.970) | -0.062<br>(0.759) | -0.138<br>(1.316) |
| Initial black concentration | 0.330**<br>(3.064) | 0.393**<br>(3.038) | 0.423*<br>(2.634) |
| Initial automobile ownership (1 = Yes) | -0.201**<br>(2.706) | -0.154<br>(1.530) | -0.219*<br>(2.268) |
| Initial household size (persons) | 0.033*<br>(2.095) | 0.030†<br>(1.700) | 0.024<br>(0.883) |
| Initial age of household head (years) | 0.003<br>(1.284) | 0.003<br>(1.013) | 0.003<br>(1.058) |
| Constant | 0.161 | 0.130 | 0.157 |
| $R^2$ | 0.210 | 0.231 | 0.270 |
| $R^2$ adjusted | 0.166 | 0.171 | 0.181 |
| F-statistic of regression | 4.777*** | 3.844** | 3.037* |
| Standard error | 0.295 | 0.300 | 0.295 |
| Sample size | (96) | (70) | (47) |

SAMPLE: Black Experimental and Control movers in Pittsburgh active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0.01 level.
*** Significant at the 0.001 level.

Table 3-9

REDUCED EQUATIONS FOR FINAL CONCENTRATION
OF BLACK HOUSEHOLDS THAT MOVED--PHOENIX
(t-Statistics in Parentheses)

| | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON |
|---|---|---|---|
| Treatment type | -0.025<br>(0.339) | -0.052<br>(0.636) | 0.011<br>(0.126) |
| Initial black concentration | 0.435**<br>(2.994) | 0.176<br>(1.032) | 0.621**<br>(3.610) |
| Initial low-income concentration | -0.004<br>(1.149) | -0.008*<br>(2.133) | -0.001<br>(0.152) |
| Welfare recipient (1 = Yes) | -0.078<br>(1.044) | -0.169†<br>(1.920) | 0.0003<br>( 0 ) |
| Constant | 0.456 | 0.802 | 0.190 |
| $R^2$ | 0.166 | 0.179 | 0.322 |
| $R^2$ adjusted | 0.100 | 0.082 | 0.235 |
| F-statistic of regression | 2.495† | 1.851 | 3.681* |
| Standard error | 0.260 | 0.252 | 0.254 |
| Sample size | (55) | (39) | (36) |

SAMPLE: Black Experimental and Control movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes or in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0.01 level.

These results make it impossible to say conclusively whether or not a housing allowance program can be expected to have any effect on the concentration of the low-income black population. The small observed differences, while insignificant in this analysis, might be significant with a larger sample. If the program does have a tendency to reduce black household concentration, however, the Demand Experiment suggests that the effect is quite small.

## REFERENCES

Vidal, Avis, The Search Behavior of Black Households in Pittsburgh in the Housing Allowance Demand Experiment, Cambridge, Mass., Abt Associates Inc., July 1978 (revised June 1980).

# CHAPTER 4

## CHANGES IN CONCENTRATION OF SPANISH AMERICAN HOUSEHOLDS

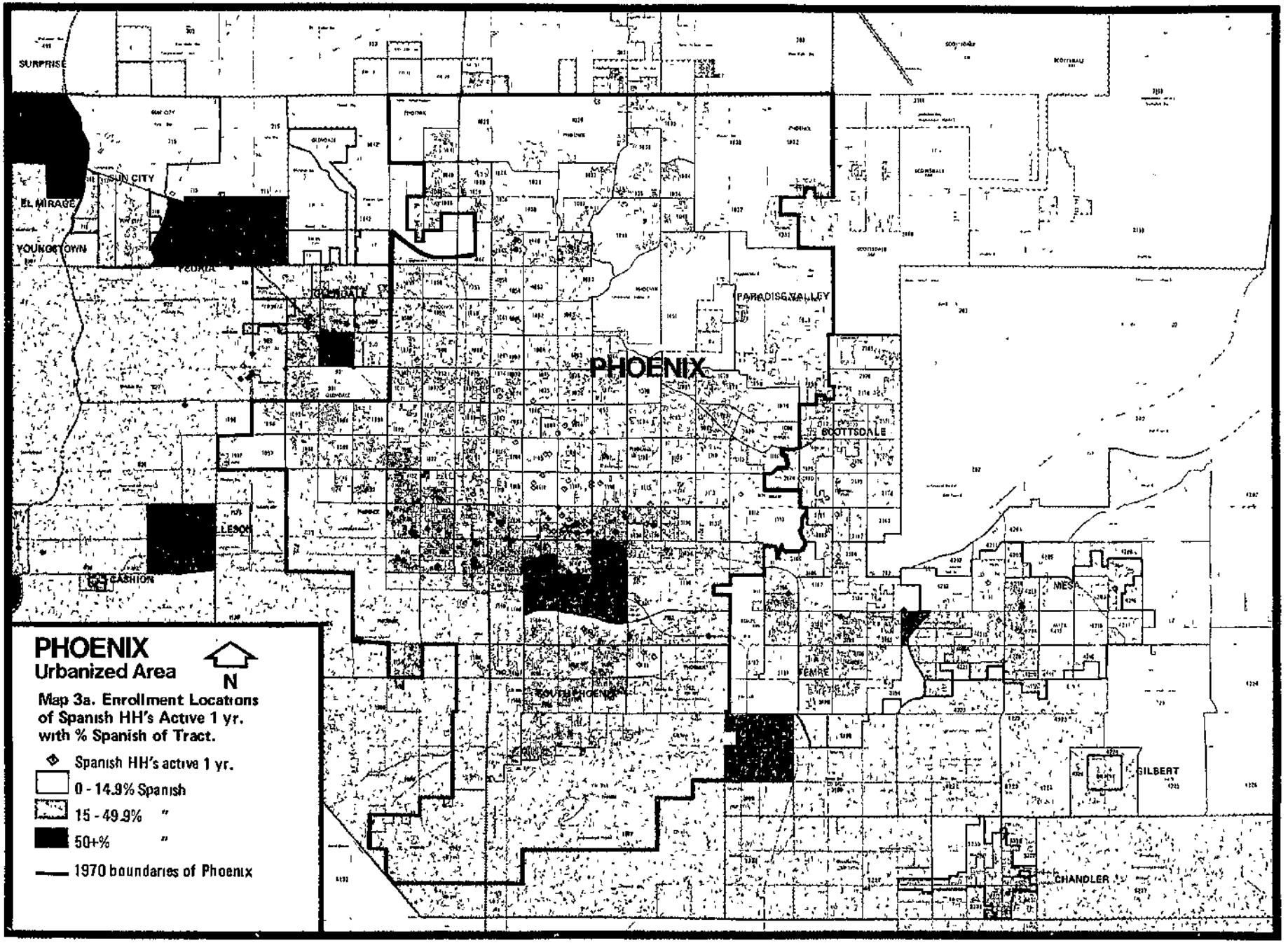
The second minority group with substantial representation in the Demand Experiment is Spanish American households residing in Phoenix. This chapter examines the question of whether the housing allowance influenced these households to change their patterns of geographic concentration. This analysis closely parallels the analysis of changes in the concentration of black households. Not only are the conceptual issues similar, but the small sample size (in particular, the number of Spanish American households that moved) requires analytic procedures similar to those used for black households.

The measure of concentration used here is the percentage of population in the Census tract that is Spanish American as reported in the 1970 census.[1] For some of the analysis this measure is divided into four categories:

> Spanish American neighborhoods. Tracts with 50 percent or more Spanish American population.
>
> Boundary neighborhoods. Tracts with 15 to 49.9 percent Spanish American population directly adjacent to Spanish American neighborhoods.
>
> Spanish American enclaves. Tracts with 15 to 49.9 percent Spanish American population not adjacent to Spanish American or Boundary neighborhoods. Most analyses combine the boundary and enclave categories.
>
> Non-Spanish American neighborhoods. All tracts with less than 15 percent Spanish American population.

The map on the following page shows the initial locations of households that remained actively enrolled after one year of participation in the experiment. It is apparent that Spanish Americans were enrolled in locations very different from white households. However, a comparison of this map with the map of Phoenix black enrollees (Chapter 3) shows that the area of greatest Spanish American concentration is bounded on both the north and south by the two areas of black concentration. The two minority groups

[1] Spanish Americans are identified by Spanish surnames.




scale 1 inch = 1 mile

overlap substantially in the northern area of black concentration.[1] In general, Spanish American households are distributed in a wide swath across the southern half of Phoenix; they appear substantially less concentrated than black households.

The patterns of ethnic concentration suggested by the maps are numerically illustrated in Table 4-1. Spanish Americans participating in the experiment lived in Census tracts at the time of enrollment where an average of 41 percent of the population was Spanish American. White households lived in tracts with an average of only 17 percent Spanish American. Black households, in contrast, lived in tracts with nearly as high a proportion of Spanish American populations (34 percent) as the tracts occupied by Spanish American households in the sample. The figures in Table 4-1 reveal no substantial differences among treatment groups in initial concentration levels.

## 4.1 EXPECTED CHANGE IN SPANISH AMERICAN CONCENTRATION

Expectations about the impact of a housing allowance program on Spanish American households have not been predominently stated in the literature. In general, it is fair to assume that the expectations about dispersion of minority concentrations apply to Spanish American as well as black households, although the latter group is usually the one mentioned. Analysis of the Kansas City demonstration found less out-of-tract movement for Spanish American than for black households, however (Phipps, 1973).

As in earlier chapters, an empirical expectation about the impact of an allowance program can be generated by means of a cross-sectional analysis of the relationship between household income, rent, and the percentage of Spanish Americans in Census tracts. In effect, this analysis assumes that people will treat the subsidy either as general income or as a specific means to increase their rent, and that they will move to neighborhoods with an average Spanish American concentration equal to their new income (or rent) level. The results of this analysis are presented in Table 4-2.

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[1] However, so many Spanish Americans live outside the central area of minority overlap that the mean percentage of black concentration in tracts occupied by Spanish American households in the sample is only 9 percent (Table 3-1).

Table 4-1

MEAN PERCENTAGE SPANISH AMERICAN
IN INITIAL TRACTS OF ENROLLED HOUSEHOLDS

| TREATMENT TYPE | RACIAL/ETHNIC GROUP | | |
|---|---|---|---|
| | Spanish American | White | Black |
| Control households | 44.7% | 17.4% | 35.8% |
| Standard deviation | 24 | 16 | 16 |
| (Sample size) | (69) | (180) | (27) |
| Housing Gap households | 38.0 | 16.7 | 33.2 |
| Standard deviation | 27 | 16 | 13 |
| (Sample size) | (132) | (250) | (26) |
| Percent of Rent households | 43.6 | 16.1 | 34.0 |
| Standard deviation | 24 | 15 | 19 |
| (Sample size) | (76) | (190) | (26) |
| Total households | 41.2 | 16.7 | 34.3 |
| Standard deviation | 26 | 16 | 16 |
| (Sample size) | (277) | (620) | ((79) |

SAMPLE: Experimental and Control households in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, and Initial Household Report Forms.

Table 4-2

CROSS-SECTIONAL ESTIMATES OF
EXPECTED CHANGES IN SPANISH AMERICAN
CONCENTRATION FOR SPANISH AMERICAN HOUSEHOLDS

| | EXPERIMENTAL HOUSEHOLDS | | CONTROL HOUSEHOLDS |
|---|---|---|---|
| Mean monthly payment<br>(Sample size) | $71<br>(208) | | $10<br>(69) |
| Mean initial Spanish American concentration | 40.0 | | 44.7 |
| Change in Spanish American concentration if payment used entirely for increased housing expenditures | -8.4 | | -1.2 |
| Difference in estimates | | -7.2 | |
| Change in Spanish American concentration if payment is treated as ordinary income | -0.9 | | -0.1 |
| Difference in estimates | | -0.8 | |

SAMPLE: Spanish American Experimental and Control households in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, Initial Household Report Forms, and payments file.

The cross-sectional analysis suggests that, for Spanish Americans, spending the subsidy exclusively on rent might produce a reduction in Spanish concentration that would be 7 percentage points greater for Experimental than for Control households. If the subsidy were treated as income, the expected difference would be less than 1 percentage point. These small expected differences are very similar to those estimated for black households in the cross-sectional analysis of black concentration.

## 4.2 MEAN CHANGE IN SPANISH AMERICAN CONCENTRATION

On average, every group of Experimental and Control households experienced small reductions in the average level of Spanish American concentration, as shown in Table 4-3. The change was greatest for Spanish American households, with an average deconcentration of about 4 percentage points for Experimental households and 5 points for the Control group. White and black households made smaller changes, with average reductions in Spanish American concentration of 1 to 2 percentage points. The Experimental/Control differences are uniformly small and insignificant at this overall level. Note that the Experimental/Control difference for Spanish American households is in the opposite direction from that predicted in the cross-sectional analysis (Table 4-2).

Table 4-4 decomposes the group averages, presenting the means for the two major allowance plans and for households that moved. The main effect of this decomposition is to reveal a marked difference in average deconcentration for Spanish American households in the two Experimental treatment groups. The Housing Gap households that moved chose neighborhoods with an average Spanish American concentration 9 percentage points lower than their initial neighborhoods--a level approximately equivalent to the Control households' deconcentration. Spanish American Percent of Rent households, in contrast, had a mean deconcentration of less than 1 percentage point, a difference from Control households that is significant at the 0.1 level.

The level of deconcentration is sufficiently small for black and white households, and sufficiently undifferentiated by treatment group, that subsequent analyses will focus solely on Spanish American households.

Table 4-3

MEAN CHANGES IN SPANISH AMERICAN CONCENTRATION
FOR EXPERIMENTAL AND CONTROL HOUSEHOLDS

| TREATMENT TYPE | SPANISH AMERICAN HOUSEHOLDS | WHITE HOUSEHOLDS | BLACK HOUSEHOLDS |
|---|---|---|---|
| Experimental households | -4.0 | -0.8 | -2.1 |
| Standard deviation | 19.7 | 10.5 | 12.7 |
| (Sample size) | (207) | (438) | (52) |
| Control households | -4.8 | -1.6 | -0.9 |
| Standard deviation | 16.9 | 7.6 | 14.0 |
| (Sample size) | (69) | (180) | (27) |

SAMPLE: Experimental and Control households in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Experimental/Control differences not significant at the 0.05 level in a two-tailed t-test.

Table 4-4

MEAN DECONCENTRATION FOR SPANISH AMERICAN, WHITE, AND BLACK HOUSEHOLDS BY TREATMENT GROUP AND MOBILITY STATUS

| HOUSEHOLD GROUP | SPANISH AMERICAN HOUSEHOLDS | | | WHITE HOUSEHOLDS | | | BLACK HOUSEHOLDS | | |
|---|---|---|---|---|---|---|---|---|---|
| | Mean Initial Concentration | Mean Change in Concentration | Sample Size | Mean Initial Concentration | Mean Change in Concentration | Sample Size | Mean Initial Concentration | Mean Change in Concentration | Sample Size |
| ALL HOUSEHOLDS | | | | | | | | | |
| Control households | 44.7 | -4.7 | (69) | 17.4 | -1 6 | (180) | 35.8 | -0.9 | (27) |
| Housing Gap households | 38.0 | -6.1 | (132) | 16.7 | -1.1 | (250) | 33.2 | -1.8 | (26) |
| Percent of Rent households | 43.4 | -0.3 | (16) | 16.1 | -0.5 | (190) | 34.0 | -2.4 | (26) |
| TOTAL | 41.2 | -4.2 | (277) | 16.7 | -1.0 | (620) | 34.3 | -1.7 | (79) |
| HOUSEHOLDS THAT MOVED | | | | | | | | | |
| Control households | 42 8 | -10.3 | (32) | 16.3 | -3.1 | (92) | 35.9 | -1.3 | (20) |
| Housing Gap households | 36.9 | -9.2 | (87) | 15.9 | -1.9 | (146) | 32.5 | -2.5 | (19) |
| Percent of Rent households | 38.7 | -0.5 | (46) | 17.0 | -0.8 | (116) | 33.3 | -3.9 | (16) |
| TOTAL | 38.5 | -7.0 | (165) | 16.4 | -1.8 | (354) | 33.9 | -2.5 | (55) |

SAMPLE Experimental and Control households in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing

DATA SOURCES· 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

## 4.3 EXCHANGE AMONG NEIGHBORHOOD TYPES

Spanish American households enrolled in neighborhoods with different levels of ethnic concentration exhibit markedly different patterns of deconcentration. For example, the data in Table 4-5 show that movers starting in Spanish American neighborhoods achieved a mean deconcentration of 24 percentage points, while those starting in Boundary neighborhoods had negligible change (+0.4 percent) and those starting in non-Spanish American neighborhoods increased their concentration by an average of 6 percentage points.[1]

The data in Table 4-5 also permit a comparison among treatment groups within each neighborhood type. The only marked difference among treatment groups is found in the Spanish American neighborhoods, where Percent of Rent households had substantially less average deconcentration than Housing Gap or Control households (not quite significant at the 0.05 level).

The patterns of movement between neighborhood types can be seen more clearly in Table 4-6, which describes origin and destination neighborhoods in terms of the major categories defined above. This display reveals patterns quite similar to those observed in the earlier analysis of black households' concentration. A substantial number of households makes positive as well as negative changes in Spanish American concentration. A high proportion of households moved to neighborhoods similar to the ones in which they began (over 60 percent in all three treatment groups did not change neighborhood categories).

The difference observed earlier between Percent of Rent and Control households beginning in Spanish American neighborhoods is clearly visible as a difference in the proportion of households who left the Spanish American neighborhood category. Eight of 15 Control households initially living in Spanish American neighborhoods moved out of that category (as did an even higher proportion of Housing Gap households), but only 2 of 15 households in the Percent of Rent plan behaved similarly. A closer examination of the data suggests that this difference is not simply the result of differing

[1] As in the analysis of black concentration, this simply indicates that Spanish American households' selection of neighborhoods (in terms of ethnic concentration) is not completely dominated by their previous neighborhoods.

Table 4-5

CHANGES IN SPANISH AMERICAN CONCENTRATION
FOR SPANISH AMERICAN HOUSEHOLDS THAT MOVED
BY TREATMENT TYPE AND INITIAL NEIGHBORHOOD TYPE

| INITIAL NEIGHBORHOOD TYPE[a] | TREATMENT TYPE | MEAN INITIAL CONCENTRATION | MEAN CHANGE | SAMPLE SIZE |
|---|---|---|---|---|
| Spanish American | Control households | 65.1 | -22.8 | (15) |
| | Housing Gap households | 73.0 | -33.1 | (28) |
| | Percent of Rent households | 68.5 | -7.0 | (15) |
| | TOTAL | 69.8 | -23.7 | (58) |
| Boundary | Control households | 28.5 | -0.3 | (12) |
| | Housing Gap households | 27.1 | 0.0 | (37) |
| | Percent of Rent households | 29.6 | 1.3 | (23) |
| | TOTAL | 28.1 | 0.4 | (72) |
| Non-Spanish American | Control households | 9.8 | 3.4 | (5) |
| | Housing Gap households | 7.0 | 5.6 | (21) |
| | Percent of Rent households | 9.0 | 7.0 | (8) |
| | TOTAL | 7.9 | 5.6 | (34) |

SAMPLE: Spanish American Experimental and Control movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

NOTE: Experimental/Control differences not significant at the 0.05 level.

a. The enclave category is excluded because only one Spanish American household that moved was in that neighborhood type at enrollment.

Table 4-6

ORIGIN-DESTINATION MATRICES FOR SPANISH AMERICAN HOUSEHOLDS THAT MOVED BY MAJOR TREATMENT TYPES

| INITIAL NEIGHBORHOOD TYPE | FINAL NEIGHBORHOOD TYPE: Non-Spanish American | Boundary | Spanish American | SAMPLE SIZE |
|---|---|---|---|---|
| | CONTROL HOUSEHOLDS | | | |
| Non-Spanish American | 4 | 1 | 0 | (5) |
| Boundary | 2 | 8 | 1 | (11) |
| Spanish American | 0 | 8 | 7 | (15) |
| SAMPLE SIZE | (6) | (17) | (8) | (31) |
| | HOUSING GAP HOUSEHOLDS | | | |
| Non-Spanish American | 17 | 3 | 1 | (21) |
| Boundary | 7 | 29 | 1 | (37) |
| Spanish American | 6 | 12 | 10 | (28) |
| SAMPLE SIZE | (30) | (44) | (12) | (86) |
| | PERCENT OF RENT HOUSEHOLDS | | | |
| Non-Spanish American | 5 | 3 | 0 | (8) |
| Boundary | 4 | 15 | 3 | (22) |
| Spanish American | 2 | 0 | 13 | (15) |
| SAMPLE SIZE | (11) | (18) | (16) | (45) |

SAMPLE: Spanish American Experimental and Control movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

preferences about classes of neighborhoods, but is also strongly influenced by a decision about whether to leave the specific neighborhood occupied at the time of enrollment. Of the 15 Percent of Rent households that lived in Spanish American neighborhoods at enrollment and that subsequently moved, 11 (73 percent) moved to another housing unit in the same Census tract. In no other group (defined by treatment and initial neighborhood category) did as many as half of the households move within the Census tract. This may imply that the difference between Percent of Rent and Control households results from a chance grouping in the Percent of Rent category of households that were strongly interested in remaining in their initial neighborhood.

The difference between Experimental and Control households' patterns of movement among neighborhoods can be further examined by using the patterns for Control households to project an "expected" distribution of Experimental households, using procedures described in Chapter 2. Table 4-7 displays the results of this analysis, showing the actual and expected distributions and chi-squared tests for significant differences.

The analysis finds fewer Housing Gap households in Spanish American neighborhoods than would be expected on the basis of Control households' patterns, and a larger than expected number of Percent of Rent households in such neighborhoods. Only the difference for Percent of Rent households is significant. It should be noted, however, that the small number of cases makes such findings very sensitive to the behavior of a few households: if two additional Percent of Rent households had left the Spanish American neighborhood category, the difference would not have been statistically significant.

## 4.4 MULTIVARIATE ANALYSIS

As in the analysis of black concentration, a multiple regression approach is used to examine further the possibility of a program effect. Variables considered for inclusion in the equation were treatment variables, initial Spanish American and low-income concentration, demographic variables (age, sex, education, and marital status of the household head; household size and income), and variables suggested by the analysis of low-income concentration (welfare status and the presence of abandoned buildings in the neighborhood). A variable describing whether the interviewer would have classified the

Table 4-7

COMPARISON OF ACTUAL AND SIMULATED
FINAL NEIGHBORHOOD DISTRIBUTIONS FOR
SPANISH AMERICAN EXPERIMENTAL HOUSEHOLDS THAT MOVED

| NEIGHBORHOOD TYPE | INITIAL DISTRIBUTION | ACTUAL FINAL DISTRIBUTION | SIMULATED FINAL DISTRIBUTION | CHI-SQUARED |
|---|---|---|---|---|
| | | HOUSING GAP HOUSEHOLDS | | |
| Spanish American | 28 | 12 | 17 | |
| Other | 58 | 74 | 69 | 1.64 |
| SAMPLE SIZE | (86) | (86) | (86) | |
| | | PERCENT OF RENT HOUSEHOLDS | | |
| Spanish American | 15 | 16 | 9 | |
| Other | 30 | 29 | 36 | 7.06** |
| SAMPLE SIZE | (45) | (45) | (45) | |

SAMPLE: Spanish American Experimental movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

** Chi-squared test significant at the 0.01 level.

respondent as Spanish American was added to the list used elsewhere.[1]

The basic sample included all Spanish American households that moved during their two years in the experiment. Tests of specific allowance plans excluded Percent of Rent households (to test the Housing Gap plan) and Housing Gap households (to test the Percent of Rent plan).

Table 4-8 presents the three equations estimated. All are statistically significant, and explain a somewhat higher proportion of the variance than the models estimated for black concentration (adjusted $R^2$ ranging from 0.27 to 0.33).

As in the analysis of black concentration, the initial concentration level is the only consistently significant variable. Household size is significant for Housing Gap households, with the smaller households having a greater tendency to reduce their level of Spanish American concentration. In the Experimental/Control test on the full sample, the interviewer's classification of the respondent also was significant; those respondents not classified as Spanish American by the interviewers had higher levels of deconcentration.

The pattern with respect to the treatment variables is inconsistent. Comparing all Housing Gap households to Controls, there is no significant treatment effect, implying that the overall level of deconcentration in a community with a Housing Gap allowance program would not differ significantly from the pattern that would occur in the program's absence. The test of the Percent of Rent allowance plan shows no treatment effect significant at the 0.05 level, but the coefficient is significant at the 0.10 level. Moreover, the coefficient is positive, indicating that Control households were likely to have higher levels of deconcentration than Percent of Rent households. As suggested above, this result may reflect a fortuitously high incidence of households with strong ties to their immediate neighborhood among Percent of Rent households.

Hence, the main conclusion from these analyses is that there is no support for the hypothesis that a housing allowance program would reduce the concentration of Spanish American households.

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[1] Spanish surname is obviously an imperfect indicator of individuals' ethnic origins. A subjective judgment by an interviewer is not necessarily more accurate, but provides a useful complement to the conventional classification.

Table 4-8

REDUCED EQUATIONS FOR FINAL CONCENTRATION OF SPANISH AMERICAN HOUSEHOLDS THAT MOVED (t-Statistic in Parentheses)

| | EXPERIMENTAL/ CONTROL COMPARISON | HOUSING GAP/ CONTROL COMPARISON | PERCENT OF RENT/ CONTROL COMPARISON |
|---|---|---|---|
| Treatment type | 0.037 | 0.003 | 0.096† |
| | (0.896) | (0.063) | (1.910) |
| Initial Spanish American Concentration | 0.387*** | 0.332*** | 0.484*** |
| | (5.860) | (4.627) | (4.561) |
| Welfare recipient (1 = Yes) | 0.042 | 0.029 | 0.072 |
| | (1.238) | (0.773) | (1.428) |
| Abandoned buildings in initial neighborhood (1 = Yes) | -0.073 | -0.078 | -0.017 |
| | (1.170) | (0.891) | (0.226) |
| Appear Spanish American (1 = Yes) | 0.077* | 0.048 | 0.082 |
| | (2.137) | (1.251) | (1.350) |
| Initial household size (persons) | 0.018* | 0.022** | 0.014 |
| | (2.406) | (2.664) | (1.092) |
| Education of head (Years) | -0.004 | -0.003 | -0.010 |
| | (0.951) | (0.647) | (1.279) |
| Constant | 0.079 | 0.111 | 0.028 |
| $R^2$ | 0.333 | 0.315 | 0.391 |
| $R^2$ adjusted | 0.302 | 0.270 | 0.325 |
| F-statistic regression | 10.68*** | 6.970*** | 5.959*** |
| Standard error | 0.197 | 0.186 | 0.202 |
| Sample Size | (158) | (111) | (73) |

SAMPLE: Spanish American Experimental and Control movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes or in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0.01 level.
*** Significant at the 0.001 level.

## REFERENCES

Phipps, Antony, "Locational Choice in the Kansas City, Missouri, Housing Allowance Demonstration," Kansas City, Missouri, Chamber of Commerce, 1973.

# CHAPTER 5

## OTHER ISSUES IN THE CHOICE OF NEIGHBORHOODS

The analysis of Demand Experiment participants' locational changes has primarily addressed the question of whether a housing allowance might be expected to alter patterns of economic and minority concentration. These issues, which fundamentally concern the spatial distribution of the population, have also been most prominent in the public discussion of housing allowance effects on locational choice.

Apart from the population distribution issue, it is interesting to ask whether a housing allowance program would allow individual households to improve their circumstances by moving to better or more desirable neighborhoods. A thorough answer to the question would require a much deeper analysis of individuals' preferences and subjective judgments than is possible within the context of this report.[1] It is useful, however, to examine some characteristics of households' locational changes that might signal differential behaviors by Experimental and Control households. This chapter presents summary comparisons of the two groups in terms of the distances moved, change in the distance between home and work, moves from central city to suburbs, and a set of possible indicators of neighborhood quality.

Because this analysis focuses on possible improvements for individuals participating in a program rather than changes in the overall population distribution, the comparisons are based on a slightly different sample than that in earlier analyses. Among Experimental households in the Housing Gap plan, some had met the housing requirements and were receiving allowance payments at the end of the two years, and others were not receiving payments.[2] In previous analyses, both groups were included, thus representing a whole population to whom the program was available.[3] The present analyses include

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[1] Some of these issues are addressed in Naplor and Phipps (1980).

[2] About 54 percent of the Housing Gap households in Pittsburgh and 57 percent in Phoenix were receiving allowances at the end of two years.

[3] This procedure can dilute the effect of the program on those that actually participated in it, since not all households offered enrollment accepted and remained in the experiment.

only those households that met requirements and received payments; thus, the participants in a housing allowance program are compared to a population not offered such a program.[1]

Distance Moved

If the allowance materially expanded the physical dimensions of the housing market to which households had access, Experimental households would be expected to move longer distances than Control households. Table 5-1 gives no strong evidence of such an effect. On the average, in fact, Control households moved slightly farther than Experimental households in both Pittsburgh and Phoenix, but the difference is not statistically significant. Nor is there any evidence of an effect on the percentage of households changing Census tracts; about a quarter of the households in all four groups chose housing units within their initial Census tracts.

Journey to Work

Working households offered a housing allowance might take advantage of the subsidy to move to locations nearer their jobs. Table 5-2 provides no support to this hypothesis, however. On the average, households that moved made very little change in the distance of their journey to work. The difference between Experimental and Control groups are not significant, and the direction of the difference is opposite in the two sites (Pittsburgh Experimental households go somewhat farther from work, while Phoenix Experimental households move slightly closer).

Central City or Suburbs

Some early opposition to the housing allowance concept was sparked by concern that an allowance program might support a migration of poor people from the central city to the suburbs. The analysis reported in previous chapters

[1] If there were a substantial self-selection bias--that is, if the households choosing to participate in a Housing Gap program differed significantly in their locational behavior from those that did not choose to participate--this comparison might show an apparent Experimental/Control difference even without a real program effect. Hence, this comparison is an oversensitive test of the null hypothesis, and any statistically significant differences will require further investigation to determine whether the effect represents self-selection or behaviors induced by the program.

Table 5-1

DISTANCE MOVED

| | PITTSBURGH | | PHOENIX | |
|---|---|---|---|---|
| | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS | EXPERIMENTAL HOUSEHOLDS | CONTROL HOUSEHOLDS |
| Mean number of miles moved | 1.6 (292) | 2.1 (118) | 3.1 (367) | 3.4 (154) |
| Percentage remaining within initial Census tract | 26% (294) | 28% (121) | 26% (372) | 24% (158) |

SAMPLE: Full Payment Experimental movers and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

Table 5-2

CHANGES IN DISTANCE TO WORK
FOR WORKING HOUSEHOLDS

| | CHANGE IN MEAN DISTANCE TO WORK (Miles) | |
|---|---|---|
| TREATMENT TYPE | Pittsburgh | Phoenix |
| Experimental households | 0.2 (179) | -0.3 (30) |
| Control households | -0.1 (90) | 0.1 (93) |

SAMPLE: Full Payment Experimental movers and Control movers that worked and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

has indicated that there was no substantial program-induced movement to higher-income neighborhoods or to predominantly nonminority neighborhoods. Nonetheless, there are suburban Census tracts with low-income concentrations and racial concentrations similar to those inside the city, and households might use the allowance to move to such tracts.

Both Experimental and Control households showed a greater tendency to move from central city to suburban locations than in the opposite direction, as shown in Table 5-3. This trend was somewhat more pronounced in Phoenix than in Pittsburgh (a higher proportion of the Pittsburgh low-income population was already located in the suburbs). In neither Pittsburgh nor Phoenix, however, was there a significant difference between the behavior of Experimental and Control households.

## Neighborhood Quality

Perhaps the most general hypothesis about program effects on neighborhood choice is that people would use the subsidy to move to neighborhoods of better quality. But the generality of the hypothesis precludes a single, simple test. To some households, low-income concentration or racial concentration might be measures of quality, as might the distance to work or central city/suburban location. Some further measures are presented in Table 5-4.

> Rent quality index. The proportion of rental units in the Census tract with complete plumbing facilities and rent above the estimated cost of modest, standard existing housing at the site (C*).
>
> Crimes against persons. The annual number of reported crimes against persons (assaults, murders, manslaughters, rapes) as a proportion of the total tract population.
>
> Crimes against property. The annual number of crimes against property (burglaries, larcenies, robberies) as a proportion of the total tract population.
>
> Neighborhood hedonic index. An index reflecting an estimated value of particular neighborhoods obtained by regressing market rent on a series of unit and neighborhood characteristics.[1]

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[1] See Merrill (1977).

Table 5-3

CITY/SUBURBAN LOCATIONAL CHOICES

| HOUSEHOLD TYPE | PERCENTAGE OF THOSE INITIALLY IN THE CENTRAL CITY MOVING TO THE SUBURBS | PERCENTAGE OF THOSE INITIALLY IN THE SUBURBS MOVING TO THE CENTRAL CITY |
|---|---|---|
| | PITTSBURGH | |
| Experimental households | 18% | 12% |
| Control households | 19 | 12 |
| | PHOENIX | |
| Experimental households | 33 | 6 |
| Control households | 29 | 6 |

SAMPLE: Full Payment Experimental movers and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

Table 5-4

CHANGES IN NEIGHBORHOOD QUALITY INDICATORS

| NEIGHBORHOOD QUALITY INDICATORS | PITTSBURGH INITIAL SCORE | PITTSBURGH SAMPLE SIZE | PITTSBURGH MEAN CHANGE | PHOENIX INITIAL SCORE | PHOENIX SAMPLE SIZE | PHOENIX MEAN CHANGE |
|---|---|---|---|---|---|---|
| LOW INCOME CONCENTRATION | | | | | | |
| Experimental households | 35.6 | (237) | -2.5 | 38.9 | (324) | -5.1 |
| Control households | 34.9 | (83) | -4.4 | 40.1 | (109) | -7.0 |
| BLACK CONCENTRATION | | | | | | |
| Experimental households | 15.5 | (237) | -3.0 | 6.8 | (324) | -1.1 |
| Control households | 12.5 | (83) | -1.1 | 10.2 | (109) | -2.0 |
| SPANISH AMERICAN CONCENTRATION | | | | | | |
| Experimental households | --- | --- | --- | 23.0 | (324) | -2.5 |
| Control households | --- | --- | --- | 24.9 | (109) | -5.1 |
| RENT QUALITY INDEX | | | | | | |
| Experimental households | 38.7 | (237) | 0.4 | 30.6 | (324) | 4.7 |
| Control households | 37.5 | (83) | 2.0 | 30.2 | (109) | 1.5 |
| RATE OF CRIMES AGAINST PERSONS | | | | | | |
| Experimental households | 7.3 | (237) | -0.7 | 10.4 | (324) | -2.3 |
| Control households | 6.4 | (83) | -0.5 | 12.3 | (109) | -4.0 |
| RATE OF CRIMES AGAINST PROPERTY | | | | | | |
| Experimental households | 29.3 | (237) | -1.9 | 86.4* | (324) | -5.0* |
| Control households | 27.3 | (83) | -0.3 | 96.2 | (109) | -16.1 |
| NEIGHBORHOOD HEDONIC INDEX | | | | | | |
| Experimental households | 1.6 | (237) | 2.0 | 1.7 | (324) | 5.7 |
| Control households | 1.8 | (83) | 1.8 | 0.5 | (109) | 6.5 |

SAMPLE: Full Payment Experimental movers and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, payments file, and Housing Evaluation Forms.

* Experimental/Control difference significant at the 0.05 level.

Low-income concentration and minority concentration measures are included to present results on the sample excluding Housing Gap households not receiving full payments.

In addition to the simple comparison of means in Table 5-4, the procedures described in Chapter 2 to contrast Experimental and Control households' behavior (comparing mean residuals of Experimental and Control groups on a predictor equation estimated from the Control group) were used to explore these four indicators of neighborhood quality.[1] Tables summarizing the results of those analyses are presented in Appendix V.

In general, Table 5-4 and the multivariate analyses conform to patterns observed in previous analyses. Both Experimental and Control households that moved show some average improvement on the quality indicators, but the Experimental/Control differences are small, inconsistent in direction, and rarely statistically significant. The only statistically significant difference in Table 5-4 (change in the rate of crimes against property in Phoenix) results from the difference in initial positions; the multivariate analysis, which controls for initial neighborhood characteristics, shows no significant difference on this variable.

The mean residual contrasts (Appendix V) for the most part show no significant effects. An interesting exception is the Minimum Rent households in Phoenix, with significantly greater increases than Control households on the rent quality index and neighborhood hedonic index. It may be that Minimum Rent requirements induced households to move to neighborhoods in which relatively higher proportions of the housing would meet the Minimum Rent requirement--i.e., to more expensive neighborhoods. The effect in Phoenix is consistent with the hypothesis, although it is quite small (the hedonic index suggests an effect equivalent to about $2 in monthly rent). In Pittsburgh, however, the hedonic effect is only $0.24, the rent quality index effect is in the opposite direction, and neither effect is significant. Thus, while it is possible that a Minimum Rent requirement may provide some incentive to move to more expensive neighborhoods, the effect shown in the data is neither large nor consistent.

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[1] Change in minority concentration is examined by the procedure described in Chapters 3 and 4.

For the measures of black and Spanish American concentration, the regression analyses presented in Chapters 3 and 4 were replicated for the subsample of Housing Gap households receiving full payments after two years. For black households, there was no significant effect. The equation for Spanish American households, however, showed a significantly greater deconcentration for Experimental than Control households. Given the results seen in Chapter 4, this probably reflects an artificial effect of the housing requirements: although the housing allowance did not seem to induce households to change their locational behaviors (i.e., there was no effect for the full group of households offered the Housing Gap plan), the housing requirements appear to have screened out households that stayed in the heavily Spanish American neighborhoods.[1] Given the small number of households in the analysis and the absence of more general patterns of significant effects, however, any such interpretation must be considered speculative.

More generally, the analyses presented in this chapter do not indicate that the housing allowance program induced households to "improve" their neighborhood conditions along any of the dimensions measured here. The choices made by households participating in the program do not differ markedly from the choices made by Control households, at least in the aggregate.

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[1]The mean initial concentration for all Housing Gap households that moved was 37 percent, with a mean deconcentration of 9 points. The initial mean for those receiving full payments after two years was 32 percent, with a mean deconcentration of 12 points. Those not receiving full payments, then, began in more concentrated neighborhoods and experienced less deconcentration than those receiving full payments.

REFERENCES

Merrill, Sally R., Hedonic Indices as a Measure of Housing Quality, Cambridge, Mass., Abt Associates Inc., December 1977 (revised June 1980).

Napior, David and Antony Phipps, Subjective Assessment of Neighborhoods in the Housing Allowance Demand Experiment, Cambridge, Mass., Abt Associates Inc., June 1980.

# CHAPTER 6
# CONCLUSIONS

The analyses presented in this report have focused principally on the question of whether the housing allowance program, as implemented in the Demand Experiment, led to a reduction in the geographic concentration of low-income and minority households. Although the public debate on housing allowances has revealed both hopes and fears that a housing allowance would lead to major relocations of the low-income and minority populations in a community, analysis of census data suggests that no large effects should be expected. Consistent with this suggestion, the analyses of Demand Experiment data have found little or no evidence of such an effect.

A number of similarities can be seen in the patterns of movement with respect to low-income concentration and minority concentration. In both cases, the average change for households in the Demand Experiment was a very small reduction in the average level of concentration. In neither case was the change in concentration significantly different for Experimental and Control households.

The small average change in both low-income and minority concentration did not mean that there were no households making substantial changes in the character of their neighborhoods. Rather, the average was the result of a substantial number of increases in concentration and a slightly larger number of decreases.

The only strong pattern in the data was the relationship between the initial level of low-income and minority concentration and the final level. In multivariate analyses, the initial level of concentration was the only variable that proved to be a significant predictor of the final concentration level in all significant equations.

None of these analyses produced strong or consistent evidence of an effect of the housing allowance program. In the multivariate analysis of changes in low-income concentration, none of the major treatment categories demonstrated a statistically significant effect. Likewise, the multivariate

analysis of black and Spanish American concentration revealed no effects for the major treatment groups that were significant at the 0.05 level.[1]

The analyses presented here do not prove conclusively that the housing allowance program has no effect on low-income or minority deconcentration. The number of cases in many of the analyses was very small, and there are a number of ambivalent patterns in the data. It is quite possible that rather small effects or conditional effects could exist, but that a larger number of cases and perhaps a longer observation period would be required to measure the effects conclusively. It seems safe to believe, however, that the housing allowance program did not have a strong effect on changes in low-income or minority concentration for Demand Experiment households.

Similarly, a limited analysis yields no strong evidence that a housing allowance leads participants to improve their neighborhood conditions, as measured by several possible indicators of neighborhood quality. Nearly all measures show modest average improvements for both Experimental and Control households, but there is no consistent pattern of program effects, and those few effects found to be statistically significant are small.

It appears, then, that participants in general use the freedom of locational choice inherent in a housing allowance program to choose the same neighborhoods they would have chosen in the absence of any program. This does not necessarily mean, however, that the effect of a housing allowance program would be indistinguishable from that of other forms of housing assistance. Programs offering housing only in particular locations, such as public housing, might alter the normal locational choice patterns of the participants, perhaps inducing higher levels of low-income or minority concentration. If so, a housing allowance and the fixed-location programs would represent important alternatives for community development policy.

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[1]Spanish American Housing Gap households receiving full payments at the end of the experiment were found to deconcentrate significantly more than Control households, but this appears to represent a self-selection difference between households who participate in the program and those that do not participate as discussed in Chapter 5. Percent of Rent households showed less deconcentration than Control households, a pattern which was significant at the 0.10 level. But this pattern was based on small numbers of households, and may reflect a special attachment of some Percent of Rent households to their original neighborhoods, as discussed in Chapter 4.

# APPENDIX I

## DESIGN OF THE DEMAND EXPERIMENT

This appendix presents a brief overview of the Demand Experiment's purpose, data collection procedures, experimental design, and sample allocation.

### I.1 PURPOSE OF THE DEMAND EXPERIMENT

The Demand Experiment is one of three experiments established by the U.S. Department of Housing and Urban Development (HUD) as part of the Experimental Housing Allowance Program.[1] The purpose of these experiments is to test and refine the concept of housing allowances.

Under a housing allowance program, money is given directly to individual low-income households to assist them in obtaining adequate housing. The allowance may be linked to housing either by making the amount of the allowance depend on the amount of rent paid or by requiring that households meet certain housing requirements in order to receive the allowance payment. The initiative in using the allowance and the burden of meeting housing requirements are therefore placed upon households rather than upon developers, landlords, or the government.

The housing allowance experiments are intended to assess the desirability, feasibility, and appropriate structure of a housing allowance program. Housing allowances could be less expensive than some other kinds of housing programs. Allowances permit fuller utilization of existing sound housing because they are not tied to new construction. Housing allowances may also be more equitable. The amount of the allowance can be adjusted to changes in income without forcing the household to change units. Households may also, if they desire, use their own resources (either by paying higher rent or by searching carefully) to obtain better housing than is required to qualify for the allowance. As long as program requirements are met, housing allowances offer households considerable choice in selecting housing most appropriate to their needs--for example, where they live (opportunity to locate near schools, near work, near friends

[1] The other two experiments are the Housing Allowance Supply Experiment and the Administrative Agency Experiment.

or relatives, or to break out of racial and socioeconomic segregation) or the type of unit they live in (single-family or multifamily). Finally, housing allowances may be less costly to administer. Program requirements need not involve every detail of participant housing. The burden of obtaining housing that meets essential requirements is shifted from program administrators to participants.

These potential advantages have not gone unquestioned. Critics of the housing allowance concept have suggested that low-income households may lack the expertise necessary to make effective use of allowances; that the increased supply of housing needed for special groups such as the elderly will not be provided without direct intervention; and that an increase in the demand for housing without direct support for the construction of new units could lead to a substantial inflation of housing costs.[1]

If housing allowances prove desirable, they could be implemented through a wide range of possible allowance formulas, housing requirements, nonfinancial support (such as counseling), and administrative practices. The choice of program structure could substantially affect both the program's costs and impact.

The Demand Experiment addresses issues of feasibility, desirability, and appropriate structure by measuring how individual households (as opposed to the housing market or administrative agencies) react to various allowance formulas and housing standards requirements. The analysis and reports are designed to answer six policy questions:

1. Participation

   Who participates in a housing allowance program? How does the form of the allowance affect the extent of participation for various households?

2. Housing Improvements

   Do households that receive housing allowances improve the quality of their housing? At what cost? How do households

[1] The issue of inflation is being addressed directly as part of the Housing Allowance Supply Experiment.

that receive a housing allowance seek to improve their housing--by moving, by rehabilitation? With what success?

3. Locational Choice

For participants who move, how does their locational choice compare with existing residential patterns? Are there non-financial barriers to the effective use of a housing allowance?

4. Administrative Issues

What administrative issues and costs are involved in the implementation of a housing allowance program?

5. Form of Allowance

How do the different forms of housing allowance compare in terms of participation, housing quality achieved, locational choice, costs (including administrative costs), and equity?

6. Comparison with Other Programs

How do housing allowances compare with other housing programs and with income maintenance in terms of participation, housing quality achieved, locational choice, costs (including administrative costs), and equity?

The Demand Experiment tests alternative housing allowance programs to provide information on these policy issues. While the experiment is focused on household behavior, it also offers data on program administration to supplement information gained through the Administrative Agency Experiment. Finally, the Demand Experiment gathers direct information on participants and housing conditions for a sample of households in conventional HUD-assisted housing programs at the two experimental sites for comparison with allowance recipients.

## I.2 DATA COLLECTION

The Demand Experiment was conducted at two sites--Allegheny County, Pennsylvania (Pittsburgh), and Maricopa County, Arizona (Phoenix). HUD selected these two sites from among 31 Standard Metropolitan Statistical Areas (SMSAs) on the basis of their growth rates, rental

vacancy rates, degree of racial concentration and housing costs. Pittsburgh and Phoenix were chosen to provide contrasts between an older, more slowly growing Eastern metropolitan area and a newer, relatively rapidly growing Western metropolitan area. In addition, Pittsburgh has a substantial black minority and Phoenix a substantial Spanish American minority population.

Most of the information on participating households was collected from:

Baseline Interviews, conducted by an independent survey operation before households were offered enrollment;

Initial Household Report Forms and monthly Household Report Forms, completed by participating households during and after enrollment, which provided operating and analytic data on household size and income and on housing expenditures.

Supplements to the Household Report Forms, completed annually by participating households after enrollment, which provide data on assets, income from assets, actual taxes paid, income from self-employment, and extraordinary medical expenses;

Payments and status data on each household maintained by the site offices;

Housing Evaluation Forms, completed by site office evaluators at least once each year for every dwelling unit occupied by participants, which provide information on housing quality;

Periodic Interviews, conducted approximately six, twelve, and twenty-four months after enrollment by an independent survey operation; and

Exit Interviews, conducted by an independent survey operation for a sample of households that declined the enrollment offer or dropped out of the program.

Surveys and housing evaluations were also administered to a sample of participants in other housing programs: Public Housing, Section 23/8 Leased Housing, and Section 236 Interest Subsidy Housing.

Since households were enrolled throughout the first ten months of operations, the operational phase of the experiment extended over nearly four years in total. Analysis will be based on data collected from households during their first two years after enrollment in the experiment. The experimental programs were continued for a third year

in order to avoid confusion between participants' reactions to the experimental offers and their adjustment to the phaseout of the experiment. During their last year in the experiment eligible and interested households were aided in entering other housing programs.

## I.3 ALLOWANCE PLANS USED IN THE DEMAND EXPERIMENT

The Demand Experiment tested a number of combinations of payment formulas and housing requirements and several variations within each of these combinations. These variations allow some possible program designs to be tested directly. More importantly, they allow estimation of key responses such as participation rates and changes in participant housing in terms of basic program parameters such as the level of allowances; the level and type of housing requirements; the minimum fraction of its own income that a household can be expected to contribute toward housing; and the way in which allowances vary with household income and rent. These response estimates can be used to address the policy questions for a larger set of candidate program plans, beyond the plans directly tested.[1]

### Payment Formulas

Two payment formulas were used in the Demand Experiment--Housing Gap and Percent of Rent.

Under the Housing Gap formula, payments to households constitute the difference between a basic payment level, C, and some reasonable fraction of family income. The payment formula is:

$$P = C - bY$$

where P is the payment amount, C is the basic payment level, "b" is the rate at which the allowance is reduced as income increases, and Y is

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[1] The basic design and analysis approach, as approved by the HUD Office of Policy Development and Research, is presented in Abt Associates Inc., Experimental Design and Analysis Plan of the Demand Experiment, Cambridge, Mass., August 1973, and in Abt Associates Inc., Summary Evaluation Design, Cambridge, Mass., June 1973. Details of the operating rules of the Demand Experiment are contained in Abt Associates Inc., Site Operating Procedures Handbook, Cambridge, Mass., April 1973.

the net family income.[1] The basic payment level, C, varies with household size, and is proportional to C*, the estimated cost of modest existing standard housing at each site.[2] Thus, payment under the Housing Gap formula can be interpreted as making up the difference between the cost of decent housing and the amount of its own income that a household should be expected to pay for housing.[3]

Under the Percent of Rent formula, the payment is a percentage of the household's rent. The payment formula is:

$$P = aR$$

where R is rent and "a" is the fraction of rent paid by the allowance. In the Demand Experiment the value of "a" remained constant once a household had been enrolled.[4]

Housing Requirements

The Percent of Rent payment formula is tied directly to rent: a household's allowance payment is proportional to the total rent. Under the Housing Gap formula, however, specific housing requirements are needed to tie the allowance to housing. Two types of housing requirement were used: Minimum Standards and Minimum Rent.

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[1] In addition, whatever the payment calculated by the formula, the actual payment cannot exceed the rent paid.

[2] The housing cost parameter, C*, was established from estimates given by a panel of qualified housing experts in Pittsburgh and Phoenix. For more detailed discussion regarding the derivation of C*, refer to Abt Associates Inc., Working Paper on Early Findings, Cambridge, Mass., January 1975, Appendix II.

[3] As long as their housing met certain requirements (discussed below), Housing Gap households could spend more or less than C* for housing, as they desired, and hence contribute more or less than "b" of their own income. This is in contrast to other housing programs, such as Section 8 (Existing).

[4] Five values of "a" were used in the Demand Experiment. Once a family had been assigned its "a" value, the value generally stayed constant in order to aid experimental analysis. In a national Percent of Rent program, "a" would probably vary with income and/or rent. Even in the experiment, if a family's income rose beyond a certain point, the value of "a" dropped rapidly to zero. Similarly, the payment under Percent of Rent could not exceed C* (the maximum payment under the modal Housing Gap plan), which effectively limited the rents subsidized to less than C*/a.

Under the Minimum Standards requirement, participants received the allowance payment only if they occupied dwellings that met certain physical and occupancy standards. Participants occupying units that did not meet these standards either had to move or arrange to improve their current units to meet the standards. Participants already living in housing that met standards could use the allowance to pay for better housing or to reduce their rent burden (the fraction of income spent on rent) in their present units.

If housing quality is broadly defined to include all residential services, and if rent levels are highly correlated with the level of services, then a straightforward housing requirement (one that is relatively inexpensive to administer) would be that recipients spend some minimum amount on rent. Minimum Rent was considered as an alternative to Minimum Standards in the Demand Experiment, in order to observe differences in response and cost and to assess the relative merits of the two types of requirements. Although the design of the experiment used a fixed minimum rent for each household size, a direct cash assistance program could employ more flexible structures. For example, some features of the Percent of Rent formula could be combined with the Minimum Rent requirement. Instead of receiving a zero allowance if their rent is less than the Minimum Rent, households might be paid a fraction of their allowance depending on the fraction of Minimum Rent paid.

## Allowance Plans Tested

The three combinations of payment formulas and housing requirements used in the Demand Experiment were Housing Gap Minimum Standards, Housing Gap Minimum Rent, and Percent of Rent. A total of 17 allowance plans were tested.

The twelve Housing Gap allowance plans are shown in Table I-1. The first nine plans include three variations in the basic payment level, C (1.2C*, C*, and 0.8C*) and three variations in housing requirements (Minimum Standards, Minimum Rent Low (0.7C*), and Minimum Rent High (0.9C*)). The value of "b"--the rate at which the allowance is reduced as income increases--is 0.25 for each of these plans. The next two

plans have the same level of C (C*) and use the Minimum Standards Housing Requirement, but use different values of "b". In the tenth plan the value of "b" is 0.15, and in the eleventh plan, 0.35. Finally, the twelfth plan is unconstrained, that is, it has no housing requirement. This unconstrained plan allows a direct comparison with a general income-transfer program.

Eligible households that did not meet the housing requirement were still able to enroll. They received full payments whenever they met the requirements during the three years of the experiment. Even before meeting the housing requirements, such households received a cooperation payment of $10 per month as long as they completed all reporting and interview requirements.

Within the Housing Gap design, the average effects of changes in the allowance level or housing requirements can be estimated for all the major responses. In addition, interactions between the allowance level and the housing requirement can be assessed. Responses to variations in the allowance/income schedule (changes in "b") can be estimated for the basic combination of the Minimum Standards housing requirement and payments level of C*.

The Percent of Rent allowance plans consist of five variations in "a" (the proportion of rent paid to the household), as shown in Table I-1.[1] A demand function for housing is estimated primarily from the Percent of Rent observations. Demand functions describe the way in which the amount people will spend on housing is related to their income, the relative price of housing and other goods, and various demographic characteristics. Such functions may be used to simulate response to a variety of possible rent subsidy programs not directly tested within the Demand Experiment. Together with estimates of supply response, they may also be used to simulate the change in market prices and housing expenditures over time due to shifts in housing demand or costs.

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[1] Designation of multiple plans for the same "a" value reflects an early assignment convention and does not indicate that the households in these plans were treated differently for either payment purposes or analysis.

## Table I-1
## ALLOWANCE PLANS TESTED

**HOUSING GAP** (P = C - bY, where C is a multiple of C*)

| b VALUE | C LEVEL | HOUSING REQUIREMENTS | | | |
|---|---|---|---|---|---|
| | | Minimum Standards | Minimum Rent Low = 0.7C* | Minimum Rent High = 0.9C* | No Requirement |
| b = 0.15 | C* | Plan 10 | | | |
| b = 0.25 | 1.2C* | Plan 1 | Plan 4 | Plan 7 | |
| | C* | Plan 2 | Plan 5 | Plan 8 | Plan 12 |
| | 0.8C* | Plan 3 | Plan 6 | Plan 9 | |
| b = 0.35 | C* | Plan 11 | | | |

Symbols: b = Rate at which the allowance decreases as the income increases
C* = Basic payment level (varied by family size and also by site)

**PERCENT OF RENT** (P = aR)

| a = 0.6 | a = 0.5 | a = 0.4 | a = 0.3 | a = 0.2 |
|---|---|---|---|---|
| Plan 13 | Plans 14 - 16 | Plans 17 - 19 | Plans 20 - 22 | Plan 23 |

**CONTROL:**

| With Housing Information | Without Housing Information |
|---|---|
| Plan 24 | Plan 25 |

Control Groups

In addition to the various allowance plans, control groups were necessary in order to establish a reference level for responses, since a number of uncontrolled factors could also induce changes in family behavior during the course of the experiment. Control households received a cooperation payment of $10 per month. They reported the same information as families that received allowance payments, including household composition and income; they permitted housing evaluations; and they completed the Baseline Interview and the three Periodic Interviews. (Control families were paid an additional $25 fee for each Periodic Interview.)

Two control groups were used in the Demand Experiment. Members of one group (Plan 24) were offered a Housing Information Program when they joined the experiment and were paid $10 for each of five sessions attended. (This program was also offered to households enrolled in the experimental allowance plans but they were not paid for their attendance.) The other control group (Plan 25) was not offered the Housing Information Program.

All the households in the various allowance plans had to meet a basic income eligibility requirement. This limit was approximately the income level at which the household would receive no payment under the Housing Gap formula:

$$\text{Income Eligibility Limit} = \frac{C^*}{0.25}$$

In addition, households in plans with lower payment levels (Plans 3, 6, 9 and 11) had to have incomes low enough at enrollment to receive payment under these plans. Finally, only households with incomes in the lower third of the eligible population were eligible for enrollment in Plan 13, and only those in the upper two-thirds were eligible for Plan 23.

## I.4 FINAL SAMPLE

Final analysis of the impact of the housing allowance will be based on the first two years of experimental data. Thus, the key sample size

## Table I-2
## SAMPLE SIZE AFTER TWO YEARS

HOUSING GAP* (P = C - bY, where C is a multiple of C*)

| b VALUE | C LEVEL | HOUSING REQUIREMENTS | | | |
|---|---|---|---|---|---|
| | | Minimum Standards | Minimum Rent Low = 0.7C* | Minimum Rent High = 0.9C* | No Requirement |
| b = 0.15 | C* | Plan 10<br>PIT = 45<br>PHX = 36 | | | |
| b = 0.25 | 1.2C* | Plan 1<br>PIT = 33<br>PHX = 30 | Plan 4<br>PIT = 34<br>PHX = 24 | Plan 7<br>PIT = 30<br>PHX = 30 | |
| | C* | Plan 2<br>PIT = 42<br>PHX = 35 | Plan 5<br>PIT = 50<br>PHX = 39 | Plan 8<br>PIT = 44<br>PHX = 44 | Plan 12<br>PIT = 63<br>PHX = 40 |
| | 0.8C* | Plan 3<br>PIT = 43<br>PHX = 39 | Plan 6<br>PIT = 44<br>PHX = 35 | Plan 9<br>PIT = 43<br>PHX = 35 | |
| b = 0.35 | C* | Plan 11<br>PIT = 41<br>PHX = 34 | | | |

Total Housing Gap. 512 households in Pittsburgh, 421 households in Phoenix.

Symbols: b = Rate at which the allowance decreases as the income increases.
C* = Basic payment level (varied by family size and also by site)

PERCENT OF RENT (P = aR)

| a = 0.6 | a = 0.5 | a = 0.4 | a = 0.3 | a = 0.2 |
|---|---|---|---|---|
| Plan 13<br>PIT = 28<br>PHX = 21 | Plans 14 - 16<br>PIT = 109<br>PHX = 81 | Plans 17 - 19<br>PIT = 113<br>PHX = 66 | Plans 20 - 22<br>PIT = 92<br>PHX = 84 | Plan 23<br>PIT = 65<br>PHX = 46 |

Total Percent of Rent* 407 households in Pittsburgh, 298 households in Phoenix.

CONTROLS.

| With Housing Information | Without Housing Information |
|---|---|
| Plan 24<br>PIT = 159<br>PHX = 137 | Plan 25<br>PIT = 162<br>PHX = 145 |

Total Controls. 321 households in Pittsburgh, 282 households in Phoenix.

NOTE This sample includes households that were active, although not necessarily receiving payments, after two years of enrollment; households whose enrollment income was above the eligibility limits or that moved into subsidized housing or their own homes are excluded. While data on the excluded households may be useful for special analyses, particular analyses may also require the use of a still more restricted sample than the one shown here.

for this report and the other reports in this series is the number of households in the experiment at the end of the first two years. The two-year sample size is shown in Table I-2, and comprises households that were still active, in the sense that they were continuing to fulfill reporting requirements. The sample size for a particular analysis may be smaller. For example, analysis of the housing expenditures of movers uses only those households that moved during the first two years after enrollment.

APPENDIX II

VARIABLE DEFINITIONS AND SAMPLE DESCRIPTION

This appendix focuses on definitions of the variables and the major samples used in the analysis. Five categories of variables are discussed: location descriptors, other housing and neighborhood variables, mobility variables, household characteristics, and program variables.

## II.1 LOCATION DESCRIPTORS

All the variables related to location are ultimately derived from a household's residential address, which was determined at the time of completion of the Baseline and Periodic Interviews. The majority of Census tract assignments were obtained from local vendors who used standard geocoding programs. Further assignments were made manually by site and Cambridge staff using census maps.

Once the location by Census tract was known for enrollment and at the end of the second year, Fourth Count 1970 Census tract data were determined for each household.[1] All census variables used in this report, except the rent-quality index, were derived directly from census tapes with a minimum of computation.

### Low-Income Household Concentration

Every Census tract in Allegheny and Maricopa counties was characterized in terms of the percentage of households in the tract with annual incomes under $5,000, in 1970 dollars, in order to describe the economic concentration of Demand Experiment households. Four categories were then used to describe the neighborhoods that households lived in:

> Higher-income neighborhoods. Census tracts with low-income concentration less than 25 percent.
>
> Low-poverty neighborhoods. Those with low-income concentration from 25 to 34.9 percent.

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[1] Documentation of census data may be found in 1970 Census Users Guide, Parts I and II, U.S. Government Printing Office, Washington, D.C., 1970.

Medium-poverty neighborhoods. Those with low-income concentration from 35 to 49.9 percent.

High-poverty neighborhoods. Those with low-income concentration of 50 percent or more.

Racial/Ethnic Concentration

The analysis of black and Spanish American households' concentration focuses on the percentage of the population in the Census tract that is black or Spanish American, based on the 1970 census. These measures of racial/ethnic concentration are subdivided into four categories:

Black (Spanish American) neighborhoods. Census tracts with 50 percent or more black (Spanish American) population.

Boundary neighborhoods. Census tracts with 15 to 49.9 percent black (Spanish American) population directly adjacent to black (Spanish American) neighborhoods.

Black (Spanish American) enclaves. Census tracts with 15 to 49.9 percent black (Spanish American) population not adjacent to black (Spanish American) or boundary neighborhoods.

White (Non-Spanish American) neighborhoods. All tracts with less than 15 percent black (Spanish American) population.

Distance Moved

This represents the distance (in miles or fractions thereof) between the centroids of the census blocks from which the household has moved and its new location.

Distance From Home to Work

This variable represents the distance (in miles or fractions thereof) between the centroids of the census blocks of a household's residence and the place of current employment of the census head of household.

Rent Quality Index

The proportion of rental units in the Census tract with complete plumbing facilities and rent above the estimated cost of modest, standard existing housing at the site (C*).

Crimes Against Persons

The annual number of reported crimes against persons (assaults, murders, manslaughters, rapes) as a proportion of the total tract population.

Crimes Against Property

The annual number of crimes against property (burglaries, larcenies, robberies) as a proportion of the total tract population.

Neighborhood Hedonic Index

An index reflecting an estimated value of particular neighborhoods obtained by regressing market rent on a series of unit and neighborhood characteristics.

## II.2 OTHER HOUSING AND NEIGHBORHOOD VARIABLES

Satisfaction

In the Baseline and Periodic Interviews households were asked about satisfaction with their present unit and neighborhood. Both are measured on a four-point scale:

Very satisfied

Somewhat satisfied

Somewhat dissatisfied

Very dissatisfied.

Households in the first two categories were grouped together as being satisfied, and households in the last two categories as being dissatisfied.

Presence of Litter, Abandoned Cars, Landscaping and Abandoned Units; Adequacy of Street Maintenance

In the Baseline and Periodic Interviews, households were asked about neighborhood problems, facilities and services. Problems were measured on a three-point scale:

Big problem

Somewhat of a problem

Not a problem.

Facilities and services were measured on a four-point scale:

Good

Fair

Poor

Not available.

Rent

Analytic rent is basically defined as the monthly payment for an unfurnished dwelling unit including basic utilities. The adjustment formula is

$$\text{Adjusted Contract Rent} = (\text{Furnishing Adjustment Factor}) + (\text{Contract Rent} + \text{Utilities} + \text{Special Adjustments}) - (\text{Roomer Contribution Adjustment}).$$

If reported contract rent includes furnishings, the adjusted gross rent is reduced by an amount equal to the estimated price of those furnishings.

If the costs of utilities are not included in the household's contract rent, utilities adjustments are added to contract rent. Adjustments are made from site-specific tables for electricity, gas, heat, water, and garbage and trash collection if a household reports paying for a specific utility and if that payment is not included in contract rent. The amount of the adjustments depends on the number of rooms reported in the Housing Evaluation Form. No adjustment is made for any other utilities or services, such as parking.

Rent Burden

Standard measures related to rent burden are based on a rent-income ratio defined as follows:

$$\text{Rent-Income Ratio} = \frac{12 \times \text{Monthly Rent}}{\text{Annual Income}}.$$

The rent burden variable generally used in the Demand Experiment employs household disposable income (net income for analysis) as the denominator of the rent-income ratio.

## II.3 MOBILITY VARIABLES

### Move

Determination of a move during the two years of the experiment was based on comparison of the addresses at which the Initial Household Report Form and the First, Second and Third Periodic Interviews were given.[1] Households residing at a different address at any one of the interviews were counted as having moved (regardless of their response to interview questions on moving).

### Length of Time in Present Unit, Number of Recent Moves

The values for these variables were taken directly from responses to questions on the Baseline Interview.

## II.4 HOUSEHOLD CHARACTERISTICS

### Age of Head of Household

Age at the time of enrollment is derived from the date of birth of the person determined to be the head of household according to census definitions.

### Presence/Number of Children

Number of children is defined as the number of children under 18 years of age who are related to the head of the household (including stepchildren and foster children). Young children listed as cousins, grandchildren, etc. are not included.

### Sex of Head of Household

To determine sex of the head of household, the census convention is used. Under this convention, all households that contain both a head of household and a spouse are classified as having a male head of household. Therefore,

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[1] The First, Second and Third Periodic Interviews were conducted after approximately six months, one year and two years, respectively, of program participation. The Initial Household Report Form was completed as part of the enrollment process.

unless the household has a single female head, it is classified as having a male head of household.

Race/Ethnicity

The following categories of racial or ethnic identification have been used in this report:

Pittsburgh: white, black

Phoenix: white, black, Spanish American.

Race determination is based on interviewer observations of Baseline Interview respondents. There were relatively few American Indians, Orientals, and other nonwhites in the sample. Households were designated as Spanish American in Phoenix based on their surname according to census conventions.

Years of Education of Household Head

This variable is measured as the number of years of school completed by the census head of household.

Marital Status

Households were classified as married if both a household head and a spouse were present.

Per Capita Income

The income variable used in this report is an analytic definition of household income, which measures disposable income. The definition of income, referred to as "Net Income for Analysis," is an estimate of the annual income received by all household members 18 years of age or older. It is the sum of earned income and other income, net of taxes and alimony paid. Table II-1 shows how this definition of income compares with the definition used in determining eligibility in the experiment and the definition used by the census. Per capita income is computed as Net Income for Analysis divided by the size of the household (the household size definition used simulates that of the census).

Table II-1

COMPONENTS INCLUDED IN THE DEFINITION OF NET INCOME FOR ANALYSIS AND COMPARISON WITH CENSUS AND PROGRAM ELIGIBILITY DEFINITIONS

| COMPONENTS | NET INCOME FOR ELIGIBILITY | NET INCOME FOR ANALYSIS | CENSUS (GROSS INCOME) |
|---|---|---|---|
| I. GROSS INCOME | | | |
| A. Earned Income | | | |
| 1. Wages and Salaries | X | X | X |
| 2. Net Business Income | X | X | X |
| B. Income-Conditioned Transfers | | | |
| 1. Aid for Dependent Children | X | X | X |
| 2. General Assistance | X | X | X |
| 3. Other Welfare | X | X | X |
| 4. Food Stamps Subsidy | - | X* | - |
| C. Other Transfers | | | |
| 1. Supplemental Security Income (Old Age Assistance, Aid to the Blind, Aid to the Disabled) | X | X | X |
| 2. Social Security | X | X | X |
| 3 Unemployment Compensation | X | X | X |
| 4. Workmen's Compensation | X | X | X |
| 5. Government Pensions | X | X | X |
| 6. Private Pensions | X | X | X |
| 7. Veterans Pensions | X | X | X |
| D. Other Income | | | |
| 1 Education Grants | X | X | X |
| 2. Regular Cash Payments | X | X | X |
| 3. Other Regular Income | X | X | X |
| 4. Alimony Received | X | X | X |
| 5. Asset Income | X* | X* | X* |
| 6. Income from Roomers and Boarders | - | - | - |
| II GROSS EXPENSES | | | |
| A. Taxes | | | |
| 1. Federal Tax Withheld | X* | X* | - |
| 2. State Tax Withheld | X* | X* | - |
| 3. FICA Tax Withheld | X* | X* | - |
| B Work-Conditioned Expenses | | | |
| 1 Child Care Expenses | X | - | - |
| 2. Care of Sick at Home | X | - | - |
| 3. Work Related Expenses | X* | - | - |
| C. Other Expenses | | | |
| 1. Alimony Paid Out | X | X | - |
| 2. Major Medical Expenses | X | - | - |

*The amounts of these income and expense items are derived using data reported by the household. All other amounts are included in the income variables exactly as reported by the household.

Household Size

The definition of household size includes all persons living with the household except roomers and boarders.

Welfare Status

This variable indicates whether a household received any income from income-conditioned transfer programs.

## II.5 PROGRAM VARIABLES

Minimum Standards Requirement

The Minimum Standards requirement for Housing Gap households has two separate components--a series of physical requirements for the dwelling unit and an occupancy standard. Physical requirements were developed from elements of the American Public Health Association/Public Health Service, Recommended Housing Maintenance and Occupancy Ordinance (revised 1971). The requirements were grouped into 15 components made up of related items (see Table II-2).

The occupancy requirement sets a maximum of two persons for every adequate bedroom, regardless of age. An adequate bedroom is a room that can be completely closed off from other rooms and meets the program housing standards of ceiling height, light/ventilation, and electrical service. In addition, the room must meet the housing standards for the condition of room structure, room surface, floor structure, and floor surface. If the dwelling unit contains four or more adequate bedrooms, it is judged to meet occupancy standards. A studio or efficiency apartment is counted as a bedroom.

Roomers and boarders are added to household size when determining whether a household meets occupancy standards, as all the rooms in the dwelling unit are taken into account.

Program Status Variables

Current Status. Status of the household at the time of enrollment or at one year is defined as one of the following:

Table II-2

COMPONENTS OF MINIMUM STANDARDS
(Program Definition)

1. COMPLETE PLUMBING

Private toilet facilities, a shower or tub with hot and cold running water, and a washbasin with hot and cold running water will be present and in working condition.

2. COMPLETE KITCHEN FACILITIES

A cooking stove or range, refrigerator, and kitchen sink with hot and cold running water will be present and in working condition.

3. LIVING ROOM, BATHROOM, KITCHEN PRESENCE

A living room, bathroom, and kitchen will be present. (This represents the dwelling unit "core," which corresponds to an efficiency unit.)

4. LIGHT FIXTURES

A ceiling or wall-type fixture will be present and working in the bathroom and kitchen.

5. ELECTRICAL

At least one electric outlet will be present and operable in both the living room and kitchen. A working wall switch, pull-chain light switch, or additional electrical outlet will be present in the living room.[a]

6. HEATING EQUIPMENT

Units with no heating equipment; with unvented room heaters which burn gas, oil, or kerosene; or which are heated mainly with portable electric room heaters will be unacceptable.

7 ADEQUATE EXITS

There will be at least two exits from the dwelling unit leading to safe and open space at ground level (for multifamily building only). Effective November, 1973 (retroactive to program inception) this requirement was modified to permit override on case-by-case basis where it appears that fire safety is met despite lack of a second exit.

8. ROOM STRUCTURE

Ceiling structure or wall structure for all rooms must not be in condition requiring replacement (such as severe buckling or leaning).

9. ROOM SURFACE

Ceiling surface or wall surface for all rooms must not be in condition requiring replacement such as surface material that is loose, containing large holes, or severely damaged.

10 CEILING HEIGHT

Living room, bathroom, and kitchen ceilings must be 7 feet (or higher) in at least one-half of the room area.[a]

11. FLOOR STRUCTURE

Floor structure for all rooms must not be in condition requiring replacement (such as large holes or missing parts).

12 FLOOR SURFACE

Floor surface for all rooms must not be in condition requiring replacement (such as large holes or missing parts).

13. ROOF STRUCTURE

The roof structure must be firm.

14. EXTERIOR WALLS

The exterior wall structure or exterior wall surface must not need replacement. (For structure this would include such conditions as severe leaning, buckling, or sagging, and for surface conditions such as excessive cracks or holes.)

15. LIGHT/VENTILATION

The unit will have a 10 percent ratio of window area to floor area and at least one openable window in the living room, bathroom, and kitchen or the equivalent in the case of properly vented kitchens and/or bathrooms.[a]

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a This housing standard is applied to bedrooms in determining the number of adequate bedrooms for the program occupancy standard.

Active

Full Payments

Minimum Payments

Inactive, never reactivated in later cycles

Terminated.

Reasons for minimum payments are:

Household owns home

Household lives in subsidized housing

Rent receipt missing

Failure to meet housing requirement (Housing Gap Minimum Rent and Minimum Standards Groups only).

Reasons for inactive or terminated status are:

Move out of county

Ineligible household composition

Residing in institution

Cannot locate

Periodic Interview refused

Housing evaluation refused

Missing Household Report Forms

New household members refused to comply with requirements.

Additional reasons for termination are:

Household deceased

Ineligible split

Fraud

Received ineligible relocation benefits

Termination other (conflict of interest)

Reverification refused

Quit (voluntary termination).

## II.6 SAMPLES USED IN ANALYSIS

The basic analysis sample of households used in this report consists of households active at two years (the time of the Third Periodic Interview) that were not living in subsidized housing or their own homes and did not have enrollment incomes above the eligibility limits for their treatment group. This sample comprises about 1240 households in Pittsburgh and 1001 in Phoenix. Of these 457 in Pittsburgh and 590 in Phoenix moved at some time during their two years in the program; some of the analyses in this report use only those households that moved as their base sample.

## APPENDIX III

## CHANGES IN LOW-INCOME CONCENTRATION FOR DEMOGRAPHIC GROUPS

The analyses in Chapter 2 show little or no program effect on the change in low-income concentration for the participant population as a whole. It is also relevant to ask whether effects existed for particular population subgroups which were not visible for the whole population, either because there were counterbalancing patterns or because the effect pertained only to small groups. This appendix presents tables using several demographic variables to partition the population. The variables are:

> Life cycle, in which the groups are elderly-headed households; nonelderly, single head with children; nonelderly married couples with children; and nonelderly married couples with no children.
>
> Minority status, separating nonminority heads of household, black heads of household, and Spanish American heads of household (Phoenix only).
>
> Per capita income (household income divided by number of people in the household), dividing the population into those above and those below the median.

Tables III-1 and III-2 reveal no important effects. The Experimental/Control difference in change in low-income concentration is statistically significant at the 0.05 level in only one case: elderly households in Phoenix that moved. In that case, Experimental households experienced significantly less deconcentration than Control households. The difference for elderly households in Pittsburgh is in the same direction and comparatively large (6 percentage points), but not statistically significant. It must be noted, however, that both comparisons are based on very small numbers of Control households: 14 in Phoenix, 7 in Pittsburgh. Thus, while it is reasonable to consider the possible differential effect for elderly households as a hypothesis to be explored in other contexts, the number of cases does not allow a firm conclusion to be drawn from this analysis or the analysis to be pursued further.

Table III-1

MEAN VALUES OF INITIAL LOW-INCOME CONCENTRATION, CHANGE IN LOW-INCOME CONCENTRATION, AND MOBILITY RATE FOR EXPERIMENTAL AND CONTROL HOUSEHOLDS FOR VARIOUS DEMOGRAPHIC GROUPS--PITTSBURGH

| | ALL HOUSEHOLDS | | | MOVERS | |
|---|---|---|---|---|---|
| GROUP | INITIAL LOW-INCOME CONCENTRATION | CHANGE IN LOW-INCOME CONCENTRATION | MOBILITY RATE | INITIAL LOW-INCOME CONCENTRATION | CHANGE IN LOW-INCOME CONCENTRATION |
| ELDERLY HOUSEHOLDS | | | | | |
| Experimental | 35.2% (245) | -0.4 (244) | 21.2%* (245) | 35.4% (52) | -1.8 (52) |
| Control | 35.4 (68) | -0.8 (67) | 11.8 (68) | 36.3 (8) | -7.7 (7) |
| NONELDERLY HOUSEHOLDS | | | | | |
| Single head with children, Experimental | 36.0 (356) | -1.0 (355) | 44.4 (356) | 36.7 (158) | -2.3 (157) |
| Single head with children, Control | 35.6 (112) | -1.0 (112) | 44.8 (112) | 37.0 (49) | -2.3 (49) |
| Married couples with children, Experimental | 33.4 (233) | -1.6 (233) | 42.9 (233) | 35.1 (100) | -3.7 (100) |
| Married couples with children, Control | 31.1 (105) | -1.4 (105) | 41.0 (105) | 30.9 (43) | -3.3 (43) |
| Married couples, no children, Experimental | 39.3 (58) | -2.6 (53) | 47.2 (53) | 42.3 (25) | -5.6 (25) |
| Married couples, no children, Control | 38.5 (19) | -3.9 (19) | 42.1 (19) | 40.9 (8) | -9.2 (8) |
| NONMINORITY HOUSEHOLDS | | | | | |
| Experimental | 32.8 (700) | -1.1 (698) | 38.2 (701) | 34.0 (268) | -2.0 (267) |
| Control | 32.0 (255) | -1.4 (254) | 34.9 (255) | 32.6 (89) | -4.0 (88) |
| MINORITY HOUSEHOLDS | | | | | |
| Black, Experimental | 43.9 (211) | -1.0 (211) | 35.5 (211) | 44.4 (75) | -2.7 (75) |
| Black, Control | 40.9 (63) | -0.2 (63) | 33.3 (63) | 42.3 (21) | -0.6 (21) |
| LOW PER CAPITA INCOME HOUSEHOLDS | | | | | |
| Experimental | 36.1 (472) | -0.8 (472) | 40.9 (472) | 37.0 (193) | -1.9 (193) |
| Control | 36.5 (156) | -1.7 (156) | 43.6 (156) | 36.5 (68) | -3.8 (68) |
| HIGH PER CAPITA HOUSEHOLDS | | | | | |
| Experimental | 34.7* (423) | -1.2 (422) | 33.8** (423) | 35.2 (143) | -3.6 (143) |
| Control | 32.2 (153) | -0.9 (152) | 24.2 (153) | 33.6 (37) | -4.0 (36) |

SAMPLE Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

* t-statistic shows Experimental/Control difference significant at the 0.05 level.

** t-statistic shows Experimental/Control difference significant at the 0.01 level.

*** t-statistic shows Experimental/Control difference significant at the 0.001 level.

Table III-2

MEAN VALUES OF INITIAL LOW-INCOME CONCENTRATION, CHANGE IN LOW-INCOME CONCENTRATION, AND MOBILITY RATE FOR EXPERIMENTAL AND CONTROL HOUSEHOLDS FOR VARIOUS DEMOGRAPHIC GROUPS--PHOENIX

| | ALL HOUSEHOLDS | | | MOVERS | |
|---|---|---|---|---|---|
| GROUP | INITIAL LOW-INCOME CONCENTRATION | CHANGE IN LOW-INCOME CONCENTRATION | MOBILITY RATE | INITIAL LOW-INCOME CONCENTRATION | CHANGE IN LOW-INCOME CONCENTRATION |
| ELDERLY HOUSEHOLDS | | | | | |
| Experimental | 37.9%*** | -0.6 | 30.9% | 39.3% | -2.1* |
| | (178) | (178) | (178) | (55) | (55) |
| Control | 45.2 | -3.2 | 24.1 | 46.7 | -13.4 |
| | (58) | (58) | (58) | (14) | (14) |
| NONELDERLY HOUSEHOLDS | | | | | |
| Single head with children, Experimental | 39.4 | -4 4 | 71.3 | 39.7 | -6.1 |
| | (202) | (202) | (202) | (144) | (144) |
| Single head with children, Control | 39.8 | -3.6 | 65.1 | 40.2 | -5.6 |
| | (83) | (83) | (83) | (54) | (54) |
| Married couples with children, Experimental | 40.1 | -2.6 | 70.2** | 38.8 | -3.8 |
| | (235) | (233) | (235) | (165) | (163) |
| Married couples with children, Control | 38.1 | -3.5 | 54.6 | 38.1 | -6.4 |
| | (99) | (99) | (99) | (54) | (54) |
| Married couples, no children, Experimental | 36.2 | -3.4 | 83.5** | 36.4 | -4.0 |
| | (79) | (77) | (79) | (66) | (64) |
| Married couples, no children, Control | 35.6 | -3.9 | 57.9 | 35.3 | -6.7 |
| | (33) | (33) | (33) | (19) | (19) |
| NONMINORIY HOUSEHOLDS | | | | | |
| Experimental | 34.0 | -2.3 | 59.6 | 34.2 | -3.9 |
| | (440) | (438) | (440) | (262) | (260) |
| Control | 35.1 | -3.3 | 51.1 | 34.3 | -6.4 |
| | (180) | (180) | (180) | (92) | (92) |
| MINORITY HOUSEHOLDS | | | | | |
| Black, Experimental | 55.2 | -2.4 | 67.3 | 52.4 | -3.5 |
| | (52) | (52) | (52) | (35) | (35) |
| Black, Control | 52.7 | -2.1 | 74.1 | 51.7 | -2.8 |
| | (27) | (27) | (27) | (20) | (20) |
| Spanish American, Experimental | 45.4 | -3.8 | 63.9** | 44.4 | -6.0 |
| | (208) | (207) | (208) | (133) | (132) |
| Spanish American, Control | 47.7 | -4.6 | 46.4 | 46.9 | -9.8 |
| | (69) | (69) | (69) | (32) | (32) |
| LOW PER CAPITA INCOME HOUSEHOLDS | | | | | |
| Experimental | 42.5 | -3.7 | 67.3* | 41.4 | -5.5 |
| | (367) | (364) | (367) | (247) | (244) |
| Control | 43.7 | -3.4 | 56.2 | 42.6 | -6.0 |
| | (146) | (146) | (146) | (82) | (82) |
| HIGH PER CAPITA INCOME HOUSEHOLDS | | | | | |
| Experimental | 35.2 | -1 7 | 55.5 | 35.6 | -3.0 |
| | (344) | (343) | (344) | (191) | (190) |
| Control | 35.6 | -3.3 | 47.4 | 35.1 | -7.0 |
| | (133) | (133) | (133) | (63) | (63) |

SAMPLE Experimental and Control households active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES. 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

* t-statistic shows Experimental/Control difference significant at the 0.05 level.

** t-statistic shows Experimental/Control difference significant at the 0.01 level.

*** t-statistic shows Experimental/Control difference significant at the 0.001 level.

# APPENDIX IV

## METHOD USED IN MULTIVARIATE ANALYSIS[1]

This appendix briefly describes the methodology used in estimating treatment effects. The basic approach, presented in Section IV.1, is fairly standard. The actual computations used, described in Section IV.2, are somewhat less standard and result in only approximate statistical tests. These involve estimation of a "normal behavior" regression based on Control households, prior to estimating experimental effects. The equations estimated are presented in Section IV.3.

### IV.1 BASIC APPROACH

Two basic models for experimental effects are used in this report. Under both models, normal (nonexperimental) levels of response variable, $R_N$, are specified as some linear function of various household characteristics, X (often including previous levels of R):

(1) $$R_N = X\beta + \varepsilon$$

where

$R_N$ = normal (nonexperimental) levels of the response variable, R

X = some set of household characteristics

$\varepsilon$ = a stochastic term, iid $N(0,\sigma_\varepsilon^2)$

The experimental response is then specified either as constant (Model A) or as a function of X (Model B). Thus

(2A) $$R_E = R_N + \alpha$$

$$= X\beta + \alpha + \varepsilon$$

(2B) $$R_E = R_N + X\gamma$$

$$= X(\beta+\gamma) + \varepsilon$$

where

$R_E$ = the response level for Experimental households

$\alpha$, $\gamma$ = experimental response parameters.

[1] Sections IV.1 and IV.2 of this appendix were written by Stephen Kennedy.

Model A was used in cases where sample size did not permit estimation of Model B (racial and ethnic concentration).[1]

The equations for Model B for Experimental and Control households can be written together as

$$(3) \qquad \begin{pmatrix} R_C \\ R_E \end{pmatrix} = \begin{pmatrix} X_C & 0 \\ 0 & X_E \end{pmatrix} \begin{pmatrix} \beta \\ \beta + \gamma \end{pmatrix} + \begin{pmatrix} \varepsilon_C \\ \varepsilon_E \end{pmatrix}$$

Thus the OLS estimates of $\beta$ and $\gamma$ would be

$$(4) \qquad \begin{aligned} \hat{\beta} &= (X_C'X_C)^{-1} X_C'R_C \\ \hat{\gamma} &= (X_E'X_E)^{-1} X_E'R_E - (X_C'X_C)^{-1} X_C'R_C \end{aligned}$$

That is, $\hat{\gamma}$ is the difference between the estimated coefficients of X for Experimental and Control households. In fact, however, sample sizes are generally too small to allow investigation of interactions between the experimental effect and household characteristics. Instead, analysis has generally focused on the mean effect for the Experimental population.[2]

$$(5) \qquad \hat{\bar{\gamma}} = \frac{e'}{N_E} X_E \hat{\gamma}$$

where

$\hat{\bar{\gamma}}$ = the estimated mean effect

$\hat{\gamma}$ = the estimated value of $\gamma$

$e$ = a vector of ones

$N_E$ = the number of Experimental households

$X_E$ = the matrix of experimental characteristics

$\frac{e'X_E}{N_E}$ = the mean value of characteristics for Experimental households.

---

[1] The experiment consisted of a variety of different plans. The $\alpha$ and $\gamma$ terms can be estimated for each plan and combined or parameterized as desired. This is discussed further below. For the moment, the discussion considers only one experimental plan.

[2] Different effects were estimated for specific groups, such as blacks and whites, but not for the entire set of characteristics included in X.

Thus, as used in this report, the results of Model B were generally reduced to a single experimental effect, just as in Model A. The difference is simply that Model B allows for the possibility of interactions; the effects of the covariates, X, on normal behavior are fixed by the Control households. Thus in investigating estimated effects across different treatments or for a given treatment, there is less need to worry about possible problems due to correlation between characteristics and experimental treatments. If Model B is the correct model, then changes in the correlations across treatments can shift the estimate of $\beta$ under Model A. Specification of Model B where sample size permitted was used to provide a potentially cleaner pattern of effects across treatments, though focusing the analysis on $\bar{\gamma}$ still, of course, allows for the possibility that differences in estimated effects across experimental treatments reflect differences in the characteristics of households.[1]

## IV.2 ACTUAL ESTIMATION PROCEDURE

The estimation of $\hat{\bar{\gamma}}$ in Equation (5) does not require estimation of the entire system given by Equation (3). Based on Equation (4)

$$\hat{\bar{\gamma}} = \frac{e'X_E}{N_E}\hat{\gamma}$$

$$= \frac{(1,0\ldots0)\ X_E'X_E\hat{\gamma}}{N_E}$$

$$\hat{\bar{\gamma}} = \bar{R}_E - \bar{X}_E\hat{\beta}_C \tag{6}$$

where

$\bar{R}_E$ = the mean observed value of R for Experimental households

$\bar{X}_E$ = the vector of mean experimental characteristics

$\hat{\beta}_C = (X_C'X_C)^{-1}X_C'R_C$, the estimated value of $\beta$ based on Control households.

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[1] In actuality, of course, the lack of any substantial effect short-circuited extensive investigation of treatment differences.

Thus $\hat{\hat{\gamma}}$ may be calculated by first estimating $\beta$ based on Controls, then calculating the predicted value of normal behavior, $\hat{R}_N$, for Experimentals given by

$$\hat{R}_N = X_E \hat{\beta}_C \tag{7}$$

and then calculating $\hat{\hat{\gamma}}$ as the mean of the difference between actual and observed behavior. Thus the estimate $\hat{\hat{\gamma}}$ may be calculated even if there are not sufficient experimental observations to estimate the full interaction model of Equation (3).

In practice, this procedure allows a rapid and clean investigation of experimental effects for different experimental plans and selected demographic groups without constant re-examination of the underlying behavior. Its major drawback is in the specification of statistical tests.

Since $\hat{\gamma}$ is distributed $N\{\gamma, \sigma^2[(X_E'X_E)^{-1} + (X_C'X_C)^{-1}]\}$, $\hat{\hat{\gamma}}$ is distributed $N\{\bar{\gamma}, \sigma^2(\frac{1}{N_E} + \frac{1}{N_C} + d'(X_C'X_C)^{-1}d)\}$ where d is the difference between Experimental and Control mean values for X.[1] Thus an appropriate test statistic for $\hat{\hat{\gamma}}$ is

$$t = \frac{\hat{\hat{\gamma}}}{\hat{\sigma}^C_\varepsilon \left[\frac{1}{N_E} + \frac{1}{N_C} + d'(X_C'X_C)^{-1}d\right]^{1/2}} \tag{7}$$

$$\hat{\sigma}^C_\varepsilon = \left(\frac{\hat{\varepsilon}_C'\hat{\varepsilon}_C}{N_C - k}\right)$$

where

$\hat{\varepsilon}_C$ = the residual from the control equation used to estimate $\hat{\beta}_C$

$N_C - k$ = the degrees of freedom in the control equation.

In fact, the test statistics reported in this paper are different from Equation (7) in two ways. First, for computational convenience the term $d'(X_C'X_C)^{-1}d$ was dropped from the bracketed expression in Equation (7).

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[1] This follows from the presence of a constant term in X so that

$$e = (1,0\ldots0)X_E' = (1,0\ldots0)X_C'$$

Since $(X_C'X_C)^{-1}$ is positive definite, this term is positive, so that the reported t-statistic will be larger than the actual t-statistic unless the mean control and experimental values of X are the same (i.e., unless d equals zero).

The second difference refers to the use of the control regression alone to estimate $\hat{\sigma}_\varepsilon$. This is appropriate because the experimental residuals reflect differences between $X_E\gamma$ and $\bar{\gamma}$ and differences between $\hat{\beta}_C$ and the $(\widehat{\beta+\gamma})$ from Equation (3). This may be seen as follows. Had Equation (3) been estimated, the estimated residuals would have been given by

$$(8) \qquad \begin{cases} \hat{\varepsilon}_C = (I - X_C(X_C'X_C)^{-1}X_C')\varepsilon_C \\ \hat{\varepsilon}_E = (I - X_E(X_E'X_E)^{-1}X_E')\varepsilon_E \end{cases}$$

which allows various estimates of $\hat{\sigma}$, for example

$$(9) \qquad \begin{cases} \hat{\sigma}_C = \dfrac{\hat{\varepsilon}_C'\hat{\varepsilon}_C}{N_C-k} \\ \hat{\sigma}_E = \dfrac{\hat{\varepsilon}_E'\hat{\varepsilon}_E}{N_E-k} \\ \hat{\sigma}_A = \dfrac{\hat{\varepsilon}_C'\hat{\varepsilon}_C + \hat{\varepsilon}_E'\hat{\varepsilon}_E}{N_C + N_E - 2k} \end{cases}$$

all of which are unbiased estimates of $\sigma_\varepsilon$.

The observed residuals for Experimental households after taking account of $\hat{\bar{\gamma}}$ alone are

$$(10) \qquad \begin{cases} \hat{\hat{\varepsilon}}_E = (I - \dfrac{ee'}{N_E})(R_E - X_E\hat{\beta}_C \\ \qquad = (I - \dfrac{ee'}{N_E})(X_E(\beta-\hat{\beta}_C) + X_E\gamma + \varepsilon_E). \end{cases}$$

Noting that

$$(I - \frac{ee'}{N_E})(I - X_E(X_E'X_E)^{-1}X_E') = (I - X_E(X_E'X_E)^{-1}X_E').$$

This gives

$$\hat{\hat{\varepsilon}}_E = \hat{\varepsilon}_E + (I - \frac{ee'}{N_E})[X_E(X_E'X_E)^{-1}X_E'\varepsilon_E + X_E\gamma - X_E(X_C'X_C)^{-1}X_C'\varepsilon_C$$

$$= \hat{\varepsilon}_E + (I - \frac{ee'}{N_E})[X_E(\hat{\beta}_C - \hat{\beta}_E + \gamma - \hat{\gamma}_E)]$$

$$\hat{\hat{\varepsilon}}_E = \hat{\varepsilon}_E + (I - \frac{ee'}{N_E})[X_E(\hat{\beta}_C + \gamma - \widehat{(\beta+\gamma)}_E)] \quad (11)$$

where subscripts refer to estimators from the control and experimental regressions. Thus it is clear that $\hat{\hat{\varepsilon}}_E'\hat{\hat{\varepsilon}}_E$ is larger than $\hat{\varepsilon}_E'\hat{\varepsilon}_E$ (which is an unbiased estimate of $((N_E-k)\sigma^2)$, though the two will converge in probability asymptotically.

At the same time, the presumption that there is no stochastic element in the response (that $\varepsilon_E$ and $\varepsilon_C$ have the same variance) may be questioned. In fact, however, examination of estimates of variance based on the control residuals alone and on the pooled control and experimental residuals yielded no differences important enough to affect the test results.

## IV.3 ESTIMATION OF REDUCED EQUATIONS FOR CONTROL HOUSEHOLDS

The details of how households decide where to move are not well understood, although some progress has been made in recent years.[1] Furthermore, there is still considerable controversy over what specific factors influence the choice of neighborhood. Thus, the possibilities at this point of constructing a causal, behavioral model of neighborhood choice are slim and well beyond the scope of this analysis. The approach to determining "normal" behavior for purposes of this analysis is basically an empirical one that focuses on the fact that program effects are to be measured by statistically adjusted mean Experimental/Control differences in final low-income concentration (and other neighborhood outcomes).

In order to estimate the Control equation, a large number of variables that can reasonably be thought to be correlated with final low-income concentration were initially used in the regression. These variables can be categorized into seven groups:

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[1] Ingram et al., NBER Model; Birch et al., 1974.

Primary Demographic Variables
Secondary Demographic Variables
Mobility Variables
Primary Neighborhood Variables
Secondary Neighborhood Variables
Housing Variables
Satisfaction Variables

The individual variables in each group are listed in Table IV-1.

With such a large list of regression candidate variables, there are bound to be some that do not contribute significantly to the regression equation; the full list is not parsimonious. In the interest of dropping unimportant variables, the variables list was reduced in a stepwise manner. Variables were entered group by group in the order listed in the table: the primary demographic ones first; the satisfaction variables last. The significance level (0.05 level) of each primary demographic variable as the sole regressor was tested first and only those that passed the test were retained. Next, the secondary demographic variables were entered and the significance level (0.05 level) of each of their coefficients tested, controlling for the primary demographic variables, but not for the other secondary ones. Again, only those variables that passed the significance test were retained. Similar tests were then conducted for the mobility variables controlling for the primary and retained secondary demographic variables, and so forth. The reduced equations obtained by the process just described are shown in Tables IV-2 and IV-3.

Table IV-1

INDEPENDENT VARIABLES USED IN CONTROL REGRESSION EQUATION FOR FINAL LOW-INCOME CONCENTRATION

PRIMARY DEMOGRAPHIC VARIABLES[a]
- Black (1 if head is black; 0 otherwise)
- Spanish (1 if head is Spanish American; 0 otherwise - Phoenix only)
- Elderly (1 if head is 62 or over; 0 otherwise)
- Sex (1 if head is male; 0 otherwise)

SECONDARY DEMOGRAPHIC VARIABLES[a]
- Household size
- Education of head
- Household per capita income
- Variance of income
- Welfare status
- Married/not married
- Children/no children
- Relatives in household/no relatives

PRIMARY MOBILITY VARIABLES[a]
- Automobile ownership
- Length of time in present unit
- Number of previous moves

PRIMARY NEIGHBORHOOD VARIABLES[b]
- Initial low-income concentration

SECONDARY NEIGHBORHOOD VARIABLES[b]
- Percent black
- Percent Spanish (Phoenix)
- Crimes against person rate
- Crimes against property rate
- Presence/absence of litter
- Presence/absence of abandoned units
- Presence/absence of abandoned cars
- Presence/absence of landscaping
- Presence/absence of street maintenance
- City/suburb status
- Rent quality index
- Neighborhood hedonic index

HOUSING VARIABLES[a]
- Rent
- Rent burden
- Persons per bedroom
- Pass/fail Minimum Standards physical requirements

SATISFACTION VARIABLES[a]
- Satisfied/dissatisfied with housing unit
- Satisfied/dissatisfied with neighborhood

a. These variables are defined by the household's situation at enrollment (for household size, income, rent, rent burden, persons per bedroom, and Minimum Standards rating of dwelling unit) or at the Baseline Interview, conducted prior to enrollment (all other demographic and mobility variables).

b. These variables are defined by 1970 Census data for the tract in which a household lived at enrollment.

Table IV-2

REDUCED CONTROL EQUATIONS PREDICTING LOCATIONAL CHANGE ESTIMATED FOR CONTROL HOUSEHOLDS (PITTSBURGH)

| VARIABLE | β | STANDARD ERROR β | F |
|---|---|---|---|
| **FINAL LOW-INCOME CONCENTRATION** | | | |
| Automobile ownership | 0.23393 | 2.94212 | 0.006 |
| Satisfaction with neighborhood | 3.44421 | 2.72412 | 1.599 |
| Black head of household | -2.67369 | 3.91228 | 0.467 |
| Sex of head of household | 4.82242 | 2.69251 | 3.208 |
| Initial low-income concentration | 0.48814 | 0.11450 | 18.175 |
| Initial percent black | 19.16595 | 6.99522 | 7.507 |
| Constant | 6.45359 | | |
| **FINAL RENT-QUALITY INDEX** | | | |
| Education of head of household | 0.68890 | 0.99536 | 0.479 |
| Welfare status | -9.78871 | 5.06176 | 3.740 |
| Initial rent-quality index | 0.65979 | 0.09861 | 44.772 |
| Constant | 14.41282 | | |
| **FINAL NEIGHBORHOOD HEDONIC INDEX** | | | |
| Education of head of household | -0.11732 | 0.29950 | 0.153 |
| Welfare status | -3.08795 | 1.59569 | 3.745 |
| Initial neighborhood hedonic index | 0.58787 | 0.10595 | 30.784 |
| Constant | 6.19666 | | |
| **FINAL RATE OF CRIMES AGAINST PERSONS** | | | |
| Initial rate of crimes against persons | 0.62795 | 0.15970 | 15.460 |
| Presence of landscaping | 7.07593 | 3.00986 | 5.527 |
| Black head of household | 6.00624 | 2.83795 | 4.479 |
| Constant | 0.24212 | | |
| **FINAL RATE OF CRIMES AGAINST PROPERTY** | | | |
| Initial rate of crimes against property | 0.68020 | 0.20030 | 11.532 |
| Presence of landscaping | 33.09445 | 12.30139 | 7.238 |
| Black head of household | 22.20996 | 12.02042 | 3.414 |
| Constant | 1.07420 | | |

SAMPLE: Control households that moved and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits and those living in their own homes or subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, Initial Household Report Forms, Initial Housing Evaluations.

Table IV-3

REDUCED CONTROL EQUATIONS PREDICTING LOCATIONAL CHANGE ESTIMATED FOR CONTROL HOUSEHOLDS (PHOENIX)

| VARIABLE | β | STANDARD ERROR β | F |
|---|---|---|---|
| **FINAL LOW-INCOME CONCENTRATION** | | | |
| Black head of household | 4.30231 | 3.08238 | 1.948 |
| Spanish head of household | -0.85126 | 2.57280 | 0.109 |
| Education of head of household | -0.67438 | 0.33730 | 3.997 |
| Welfare status | 0.73373 | 2.45176 | 0.090 |
| Per capita income | -2.87027 | 1.07497 | 7.129 |
| Initial low-income concentration | 0.47971 | 0.07513 | 40.763 |
| Abandoned buildings in neighborhood | -8.78077 | 3.28566 | 7.142 |
| Constant | 33.99741 | | |
| **FINAL RENT QUALITY INDEX** | | | |
| Black head of household | -13.62098 | 5.80716 | 5.502 |
| Spanish head of household | -6.90358 | 5.12704 | 1.813 |
| Household size | -0.10676 | 1.27349 | 0.007 |
| Education of head of household | 1.05088 | 0.65973 | 2.537 |
| Sex of head of household | 13.36985 | 4.01635 | 11.081 |
| Welfare status | -11.19609 | 5.03189 | 4.951 |
| Per capita income | 3.61083 | 2.20003 | 2.694 |
| Household starts in suburbs | 12.67593 | 4.58120 | 7.656 |
| Initial rent-quality index | 0.37439 | 0.08242 | 20.632 |
| Constant | -9.57342 | | |
| **FINAL NEIGHBORHOOD HEDONIC INDEX** | | | |
| Black head of household | -3.47566 | 1.74315 | 3.976 |
| Spanish head of household | -0.55697 | 1.37477 | 0.164 |
| Household size | -0.21069 | 0.33380 | 0.398 |
| Education of head of household | 0.29802 | 0.17849 | 2.788 |
| Sex of head of household | 3.82559 | 1.11363 | 11.801 |
| Welfare status | -1.67775 | 1.34095 | 1.565 |
| Initial neighborhood hedonic index | 0.57444 | 0.08631 | 44.298 |
| Per capita income | 0.86785 | 0.59865 | 2.102 |
| Constant | 1.49310 | | |
| **FINAL RATE OF CRIMES AGAINST PERSONS** | | | |
| Black head of household | 3.21193 | 1.52370 | 4.444 |
| Household size | 0.39642 | 0.32972 | 1.446 |
| Education of head of household | -0.28653 | 0.17253 | 2.758 |
| Welfare status | 0.56835 | 1.29999 | 0.191 |
| Per capita income | -0.99793 | 0.61449 | 2.637 |
| Initial rate of crimes against persons | 0.16427 | 0.04551 | 13.029 |
| Abandoned buildings in neighborhood | -6.22592 | 1.75511 | 12.583 |
| Household starts in suburbs | -3.58787 | 1.29791 | 7.642 |
| Constant | 18.88436 | | |

Table IV-3
(continued)

| VARIABLE | β | Standard ERROR β | F |
|---|---|---|---|
| FINAL RATE OF CRIMES AGAINST PROPERTY | | | |
| Automobile ownership | -16.76887 | 7.07604 | 5.616 |
| Initial rate of crimes against property | 0.19179 | 0.06560 | 8.547 |
| Constant | 74.03926 | | |

SAMPLE: Control households that moved and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits and those living in their own homes or subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, Initial Household Report Forms, Initial Housing Evaluations.

## REFERENCES

Birch, David, Reilly Atkinson, Richard P. Coleman, William L. Parsons, Kenneth Rosen and Arthur P. Solomon, Models of Neighborhood Evolution, Cambridge, Mass., Joint Center for Urban Studies November 1974.

## APPENDIX V

## RESULTS OF ADDITIONAL MULTIVARIATE ANALYSIS OF CHANGE IN NEIGHBORHOOD CHARACTERISTICS

This appendix contains additional tables presenting multivariate analyses referenced at various points in the earlier text.

Table V-1 concerns the analysis of low-income concentration (Chapter 2). It is parallel to Table 2-11, the only difference being that the two sites are analyzed separately rather than together. As discussed in the text, the only significant effect is found for the Unconstrained group in Pittsburgh, which shows a deconcentration about 5 percentage points greater than would be expected on the basis of Control households' patterns.

Tables V-2, V-7, and V-8 parallel the analyses presented in Chapter 2 (low-income concentration), Chapter 3 (black household concentration) and Chapter 4 (Spanish American household concentration). The main difference is that the analyses in this appendix were based on the sample of households receiving full payments (that is, Housing Gap households that did not meet their housing requirements and were, therefore, not receiving full payments after two years were included in the earlier analyses, but are not included here). Tables V-3 through V-6 use the same procedure as that used in the analysis of low-income concentration (the contrast of mean residuals) to examine program effects on other possible measures of neighborhood quality. These analyses are also carried out on the full payments sample.[1] The analyses generally show no significant program effect. The one exception is the analysis of Spanish American concentration in which Housing Gap households

[1] For the analyses using the full payments sample, the reduction procedure described in Appendix IV was applied to estimate equations predicting low-income concentration, the rent quality index, the rate of crimes against persons, the rate of crimes against property, and the neighborhood hedonic index. In order to keep the samples comparable for all variables, cases with missing values of independent variables used for any of the five equations were excluded from the contrasts for all five. In the low-income concentration contrasts for all active households, cases were omitted only if they had missing values on one or more of the variables appearing in the particular reduced equation. Hence, the size of the sample in the full payment analyses is smaller than that for the all-active analysis, even in the non-Housing Gap plans.

receiving full payments show a significant program effect (Table V-6); Table V-9 extends that analysis to locate the effect more precisely, and finds that it exists for the Minimum Standards group (receiving full payments) but not Minimum Rent. As discussed in Chapter 5, the effect appears to be one of self-selection in program participation.

Table V-1

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL LOW-INCOME CONCENTRATION
FOR ALL ACTIVE HOUSEHOLDS
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 403) = 1.237) | | | | | | |
| Percent of Rent versus Control | 0.733 | 0.598 | 0.135 | 0.090 | 134 | 107 |
| Housing Gap versus Control | 1.977 | 0.598 | 1.379 | 0.953 | 156 | 107 |
| Minimum Standards versus Control | 3.013 | 0.598 | 2.415 | 1.385 | 74 | 107 |
| Minimum Rent versus Control | 1.043 | 0.598 | 0.445 | 0.263 | 82 | 107 |
| C* High versus Control | 4.469 | 0.598 | 3.871 | 1.685 | 33 | 107 |
| Unconstrained versus Control | -4.753 | 0.598 | -5.351 | -2.054 | 24 | 107 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 159) = 0.760) | | | | | | |
| Housing Gap versus Control | 2.263 | 1.786 | 0.477 | 0.262 | 108 | 69 |

SAMPLE: Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-1 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL LOW-INCOME CONCENTRATION
FOR ALL ACTIVE HOUSEHOLDS
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| **ALL HOUSEHOLDS THAT MOVED** (F(17, 525) = 1.378) | | | | | | |
| Percent of Rent versus Control | 1.335 | -1.157 | 2.492 | 1.691 | 170 | 132 |
| Housing Gap versus Control | 0.908 | -1.157 | 2.065 | 1.475 | 219 | 132 |
| Minimum Standards versus Control | 0.211 | -1.157 | 1.368 | 0.803 | 96 | 132 |
| Minimum Rent versus Control | 1.452 | -1.157 | 2.609 | 1.639 | 123 | 132 |
| C* High versus Control | -1.936 | -1.157 | -0.779 | -0.387 | 57 | 132 |
| Unconstrained versus Control | -1.681 | -1.157 | -0.524 | -0.179 | 22 | 132 |
| **HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS** (F(17, 231) = 1.082) | | | | | | |
| Housing Gap versus Control | 0.247 | -1.053 | 1.300 | 0.799 | 158 | 91 |

SAMPLE: Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-2

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL LOW-INCOME CONCENTRATION
FOR FULL PAYMENT HOUSEHOLDS
(PITTSBURGH)

| | MEAN RESIDUAL | | DIFFERENCE | T-TEST | EXPERIMENTAL SAMPLE SIZE | CONTROL SAMPLE SIZE |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | | | | |
| ALL HOUSEHOLDS THAT MOVED (F(17, 263) = 1.018) | | | | | | |
| Percent of Rent versus Control | 0.945 | -0.099 | 1.044 | 0.652 | 103 | 82 |
| Housing Gap versus Control | 1.487 | -0.099 | 1.586 | 0.929 | 79 | 82 |
| Minimum Standards versus Control | 1.379 | -0.099 | 1.478 | 0.606 | 26 | 82 |
| Minimum Rent versus Control | 1.540 | -0.099 | 1.639 | 0.858 | 53 | 82 |
| C* High versus Control | 6.023 | -0.099 | 6.122 | 2.068 | 16 | 82 |
| Unconstrained versus Control | -2.199 | -0.099 | -2.100 | -0.727 | 17 | 82 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 81) = 0.742) | | | | | | |
| Housing Gap versus Control | 0.958 | 0.076 | 0.882 | 0.401 | 45 | 54 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-2 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL LOW-INCOME CONCENTRATION
FOR FULL PAYMENT HOUSEHOLDS
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 370) = 1.291 | | | | | | |
| Percent of Rent versus Control | 1.298 | -1.237 | 2.535 | 1.543 | 137 | 109 |
| Housing Gap versus Control | -0.850 | -1.237 | 0.387 | 0.231 | 125 | 109 |
| Minimum Standards versus Control | -0.766 | -1.237 | 0.471 | 0.211 | 47 | 109 |
| Minimum Rent versus Control | -0.900 | -1.237 | 0.337 | 0.177 | 78 | 109 |
| C* High versus Control | -4.592 | -1.237 | -3.355 | -1.349 | 35 | 109 |
| Unconstrained versus Control | -2.324 | -1.237 | -1.087 | -0.326 | 17 | 109 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 139) = 0.674) | | | | | | |
| Housing Gap versus Control | -2.120 | -0.933 | -1.187 | -0.577 | 81 | 76 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-3

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL RENT QUALITY INDEX
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 249) = 0.690) | | | | | | |
| Percent of Rent versus Control | -1.442 | -0.231 | -1.211 | -0.362 | 100 | 76 |
| Housing Gap versus Control | -0.800 | -0.231 | -0.569 | -0.159 | 75 | 76 |
| Minimum Standards versus Control | 3.509 | -0.231 | 3.740 | 0.739 | 25 | 76 |
| Minimum Rent versus Control | -2.954 | -0.231 | -2.723 | -0.681 | 50 | 76 |
| C* High versus Control | -6.246 | -0.231 | -6.015 | -0.996 | 16 | 76 |
| Unconstrained versus Control | 1.501 | -0.231 | 1.732 | 0.287 | 16 | 76 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 74) = 0.622) | | | | | | |
| Housing Gap versus Control | 0.551 | -0.106 | 0.657 | 0.147 | 43 | 49 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-3 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL RENT QUALITY INDEX
(PHOENIX)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 343) = 1.251) | | | | | | |
| Percent of Rent versus Control | -0.395 | 0.806 | -1.201 | -0.405 | 133 | 100 |
| Housing Gap versus Control | 5.838 | 0.806 | 5.032 | 1.631 | 112 | 100 |
| Minimum Standards versus Control | 1.323 | 0.806 | 0.517 | 0.125 | 42 | 100 |
| Minimum Rent versus Control | 8.546 | 0.806 | 7.740 | 2.215 | 70 | 100 |
| C* High versus Control | 8.022 | 0.806 | 7.216 | 1.526 | 29 | 100 |
| Unconstrained versus Control | 6.548 | 0.806 | 5.742 | 0.951 | 16 | 100 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 123) = 0.616) | | | | | | |
| Housing Gap versus Control | 7.667 | 1.663 | 6.004 | 1.627 | 73 | 68 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-4

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL INCIDENCE OF CRIMES AGAINST PEOPLE
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 240) = 0.826) | | | | | | |
| Percent of Rent versus Control | -0.778 | -0.202 | -0.576 | -0.487 | 95 | 75 |
| Housing Gap versus Control | -0.024 | -0.202 | 0.178 | 0.141 | 73 | 75 |
| Minimum Standards versus Control | 1.061 | -0.202 | 1.263 | 0.714 | 25 | 75 |
| Minimum Rent versus Control | -0.590 | -0.202 | -0.388 | -0.274 | 48 | 75 |
| C* High versus Control | 3.297 | -0.202 | 3.499 | 1.615 | 15 | 75 |
| Unconstrained versus Control | -2.618 | -0.202 | -2.416 | -1.116 | 15 | 75 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 74) = 0.365) | | | | | | |
| Housing Gap versus Control | 0.159 | 0.178 | -0.019 | -0.009 | 42 | 50 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-4 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL INCIDENCE OF CRIMES AGAINST PEOPLE
(PHOENIX)

| | MEAN RESIDUAL | | DIFFERENCE | T-TEST | EXPERIMENTAL SAMPLE SIZE | CONTROL SAMPLE SIZE |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | | | | |
| ALL HOUSEHOLDS THAT MOVED (F(17, 365) = 1.157) | | | | | | |
| Percent of Rent versus Control | 0.596 | -0.188 | 0.784 | 0.935 | 134 | 108 |
| Housing Gap versus Control | 0.032 | -0.188 | 0.188 | 0.257 | 124 | 108 |
| Minimum Standards versus Control | 0.823 | -0.188 | 1.011 | 0.886 | 46 | 108 |
| Minimum Rent versus Control | -0.435 | -0.188 | -0.247 | -0.257 | 78 | 108 |
| C* High versus Control | -0.634 | -0.188 | -0.446 | -0.354 | 35 | 108 |
| Unconstrained versus Control | -0.667 | -0.188 | -0.479 | -0.284 | 17 | 108 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 137) = 0.608) | | | | | | |
| Housing Gap versus Control | -0.522 | -0.032 | -0.490 | -0.459 | 80 | 75 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-5

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL INCIDENCE OF CRIMES AGAINST PROPERTY
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 258) = 0.365) | | | | | | |
| Percent of Rent versus Control | -2.423 | -0.028 | -2.395 | -0.522 | 101 | 81 |
| Housing Gap versus Control | -2.345 | -0.028 | -2.317 | -0.473 | 77 | 81 |
| Minimum Standards versus Control | -1.104 | -0.028 | -1.076 | -0.153 | 25 | 81 |
| Minimum Rent versus Control | -2.942 | -0.028 | -2.914 | -0.533 | 52 | 81 |
| C* High versus Control | 3.430 | -0.028 | 3.458 | 0.411 | 16 | 81 |
| Unconstrained versus Control | -6.637 | -0.028 | -6.609 | -0.806 | 17 | 81 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 79) = 0.257) | | | | | | |
| Housing Gap versus Control | -2.006 | 2.849 | -4.855 | -0.591 | 44 | 53 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-5 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL INCIDENCE OF CRIMES AGAINST PROPERTY
(PHOENIX)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 365) = 0.887) | | | | | | |
| Percent of Rent versus Control | 4.256 | -0.582 | 4.838 | 1.023 | 134 | 108 |
| Housing Gap versus Control | 2.818 | -0.582 | 3.400 | 0.706 | 124 | 108 |
| Minimum Standards versus Control | 5.433 | -0.582 | 6.015 | 0.934 | 46 | 108 |
| Minimum Rent versus Control | 1.276 | -0.582 | 1.858 | 0.342 | 78 | 108 |
| C* High versus Control | 2.056 | -0.582 | 2.638 | 0.371 | 35 | 108 |
| Unconstrained versus Control | -12.946 | -0.582 | -12.364 | -1.295 | 17 | 108 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 137) = 0.879) | | | | | | |
| Housing Gap versus Control | 3.179 | -2.567 | 5.746 | 0.992 | 80 | 75 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-6

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL NEIGHBORHOOD HEDONIC INDEX
(PITTSBURGH)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 243) = 0.898) | | | | | | |
| Percent of Rent versus Control | 0.028 | -0.326 | 0.354 | 0.327 | 98 | 74 |
| Housing Gap versus Control | -0.438 | -0.326 | -0.112 | -0.096 | 73 | 74 |
| Minimum Standards versus Control | -1.215 | -0.326 | -0.889 | -0.530 | 23 | 74 |
| Minimum Rent versus Control | -0.081 | -0.326 | 0.245 | 0.191 | 50 | 74 |
| C* High versus Control | -3.093 | -0.326 | -2.767 | -1.428 | 16 | 74 |
| Unconstrained versus Control | 0.424 | -0.326 | 0.750 | 0.387 | 16 | 74 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 73) = 0.925) | | | | | | |
| Housing Gap versus Control | -1.488 | -0.385 | -1.103 | -0.803 | 42 | 49 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-6 (continued)

CONTRAST IN MEAN RESIDUALS FOR
PREDICTED FINAL NEIGHBORHOOD HEDONIC INDEX
(PHOENIX)

| | MEAN RESIDUAL | | | | EXPERIMENTAL | CONTROL |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL | CONTROL | DIFFERENCE | T-TEST | SAMPLE SIZE | SAMPLE SIZE |
| ALL HOUSEHOLDS THAT MOVED (F(17, 321) = 1.724) | | | | | | |
| Percent of Rent versus Control | -0.530 | 0.650 | -1.180 | -1.468 | 124 | 93 |
| Housing Gap versus Control | 2.095 | 0.650 | 1.445 | 1.731 | 105 | 93 |
| Minimum Standards versus Control | 1.063 | 0.650 | 0.413 | 0.366 | 38 | 93 |
| Minimum Rent versus Control | 2.680 | 0.650 | 2.030 | 2.161 | 67 | 93 |
| C* High versus Control | 3.916 | 0.650 | 3.266 | 2.620 | 29 | 93 |
| Unconstrained versus Control | 1.494 | 0.650 | 0.844 | 0.545 | 17 | 93 |
| HOUSEHOLDS INITIALLY FAILING HOUSING REQUIREMENTS (F(17, 118) = 0.784) | | | | | | |
| Housing Gap versus Control | 2.730 | 0.674 | 2.056 | 2.054 | 69 | 67 |

SAMPLE: Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

Table V-7

REDUCED EQUATIONS FOR FINAL BLACK CONCENTRATION OF BLACK HOUSEHOLDS THAT MOVED (FULL PAYMENTS) (t-Statistic in Parentheses)

| PITTSBURGH | | PHOENIX | |
|---|---|---|---|
| | HOUSING GAP-CONTROL COMPARISON | | HOUSING GAP-CONTROL COMPARISON |
| Treatment type | -0 072<br>(0 786) | Treatment type | -0 054<br>(0 487) |
| Initial black concentration | 0.338*<br>(2.217) | Initial black concentration | 0.285<br>(1 293) |
| Initial automobile ownership (1 = Yes) | -0.190†<br>(1.754) | Initial low-income concentration | -0.009†<br>(2.022) |
| Initial household size | 0.010<br>(0 427) | Welfare recipient (1 = Yes) | -0 147<br>(1.317) |
| Initial age of household head | 0 007†<br>(1.889) | | |
| Constant | 0 128 | Constant | 0.799 |
| $R^2$ | 0.240 | $R^2$ | 0.192 |
| $R^2$ adjusted | 0.157 | $R^2$ adjusted | 0.058 |
| F-Statistic of regression | 2.901* | F-Statistic of regression | 1.428 |
| Standard error | 0.298 | Standard error | 0.273 |
| Sample size | (52) | Sample size | (29) |

SAMPLE Black Experimental and Control movers that met housing requirements and were active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes or in subsidized housing

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

† Significant at the 0.10 level.

* Significant at the 0.05 level

Table V-8

REDUCED EQUATIONS FOR FINAL SPANISH AMERICAN CONCENTRATION OF SPANISH AMERICAN HOUSEHOLDS THAT MOVED (FULL PAYMENTS) (t-Statistic in Parentheses)

| PHOENIX | |
|---|---|
| | HOUSING GAP-CONTROL COMPARISON |
| Treatment type | -0 089*<br>(2.471) |
| Initial Spanish American concentration | 0.226**<br>(3 184) |
| Welfare recipient (1 = Yes) | 0 035<br>(1 012) |
| Abandoned buildings in initial neighborhood (1 = Yes) | -0.085<br>(1.214) |
| Appear Spanish (1 = Yes) | 0 007<br>(0.184) |
| Initial household size | 0.019*<br>(2 425) |
| Education of head (Years) | 0 003<br>(0.560) |
| Constant | 0 157 |
| $R^2$ | 0.339 |
| $R^2$ adjusted | 0.279 |
| F-Statistic of regression | 5 71*** |
| Standard error | 0.148 |
| Sample size | (86) |

SAMPLE Spanish American Experimental and Control movers that met housing requirements and were active at two years after enrollment excluding those with enrollment incomes over the eligibility limits, and those living in their own homes or in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

* Significant at the 0.05 level

** Significant at the 0 01 level

*** Significant at the 0 001 level.

Table V-9

REDUCED EQUATIONS FOR FINAL SPANISH AMERICAN CONCENTRATION
(HOUSING GAP HOUSEHOLDS IN PHOENIX THAT MOVED)

| | MINIMUM STANDARDS | | MINIMUM RENT | |
|---|---|---|---|---|
| | All Active | Full Payments | All Active | Full Payments |
| Treatment type (1 = Experimental) | 0.032<br>(0.61) | -0.119<br>(2.47)* | -0.041<br>(1.37) | -0.028<br>(0.93) |
| Initial Spanish concentration | 0.293<br>(2.72)** | 0.238<br>(2.35)* | 0.603<br>(9.79)** | 0.644<br>(10.4)** |
| Welfare recipient (1 = Yes) | 0.014<br>(0.25) | 0.018<br>(0.37) | 0.023<br>(0.72) | 0.015<br>(0.46) |
| Abandoned buildings in initial neighborhood (1 = Yes) | -0.082<br>(0.77) | -0.093<br>(1.12) | -0.043<br>(0.71) | -0.044<br>(0.75) |
| Initial household size (persons) | 0.027<br>(2.35)* | 0.020<br>(1.88)† | 0.007<br>(1.21) | 0.005<br>(0.83) |
| Education of head (years) | -0.021<br>(2.67)** | -0.006<br>(0.81) | -0.001<br>(0.28) | -0.003<br>(0.85) |
| Constant | 0.288 | 0.239 | 0.130 | 0.143 |
| $R^2$ adjusted | 0.383 | 0.349 | 0.515 | 0.553 |
| F-statistic of regression | 5.49** | 5.201** | 23.000** | 25.359** |
| Standard error | 0.199 | 0.155 | 0.161 | 0.155 |
| Sample size | (60) | (48) | (125) | (119) |

SAMPLE: Spanish American Experimental and Control movers active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, Initial and monthly Household Report Forms, and payments file.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0.01 level.

# APPENDIX VI

## MINORITY ATTRITION[1]

Analyses in Chapters 3 and 4 concern the change in minority concentration of minority households in the Demand Experiment. For both black and Spanish American households, Experimental/Control differences in the mean change in minority concentration appear to be associated with differences in the initial levels of concentration of Experimental and Control households.

If these differences in initial position arose by chance, then the multivariate analysis used in Chapters 3 and 4 is an appropriate method for estimating experimental effects. If, on the other hand, these differences reflect differences that arose during the experiment due to, for example, differential attrition, then estimated effects in Chapters 3 and 4 could be biased. This may be briefly seen as follows. Say that

$$(1) \qquad Y_{it} = X_i\beta + E\gamma + \varepsilon_{it}$$

$$\varepsilon_{it} = \eta_i + \theta_{it}$$

where

$Y_{it}$ = the concentration of the tract occupied by the $i^{th}$ household at time t

$X_i$ = a vector of demographic characteristics (assumed to be fixed over time)

$E$ = treatment characteristics

$\varepsilon_{it}$ = a stochastic term

$\eta_i$ = an unobserved individual difference, and

$\theta_{it}$ = an uncorrelated stochastic term.

This is the usual components of variance model (a further time trend term is often added to the components of $\varepsilon_{it}$). Notice that

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[1]This appendix was written by Stephen Kennedy. For a more detailed explication of the attrition models described, see Kennedy (1978).

$$(2)\qquad \begin{cases} E(\varepsilon_{it} | \varepsilon_{it-1}) = \rho\varepsilon_{it-1} \\ \rho = \dfrac{\sigma^2_\eta}{\sigma^2_\eta + \sigma^2_\theta} . \end{cases}$$

Thus Equation (1) can be rewritten to take account of initial position as

$$Y_{it} = X_1\beta + \rho\,\varepsilon_{it-1} + E\gamma + \delta_{it}$$

$$(3)\qquad Y_{it} = (1-\rho)X_1\beta + \rho Y_{it-1} + E\gamma + \delta_{it}.$$

(The term $E\gamma$ does not appear in $Y_{it-1}$.) This is essentially the form estimated in Chapters 3 and 4.

If differences between Experimental and Control households in the mean initial values of $Y_{it-1}$ reflect chance selection (or indeed any simple selection based solely on initial position), then estimates of $\gamma$ based on Equation (3) will be unbiased. Differences in initial position are taken account of in Equation (3) in the same way as differences in the other demographic covariates (the $X_1$). As long as the form of Equation (3) is correctly specified, such differences do not bias the estimate of $\gamma$.

Differences in initial position may also, however, reflect differential attrition during the experiment. Say, for example, that Experimental households with exceptionally high concentration values (large values of $\delta_{it}$ in Equation (3)) are more or less likely to stay in the experiment than similar Control households. In this case, the estimated value of $\gamma$ will be biased since

$$(4)\qquad E(\hat{\gamma}) = \gamma + E(\delta_{it} | E) > \gamma.$$

Due to serial correlation, the initial position of Experimental households would also be different, with

$$(5)\qquad E(\Delta\varepsilon_{t-1}) = \rho\Delta\varepsilon_t$$

where

$\Delta\varepsilon_t$ = the difference between the mean value of $\varepsilon_t$ for Experimental and Control households.

This difference will not be adequately controlled for by Equation (3). In effect Equation (3) adjusts the estimated experimental effect by $\rho\Delta\varepsilon_{t-1}$, whereas the bias of estimate ($\Delta\varepsilon_t$) is given by ($\Delta\varepsilon_{t-1}/\rho$).

In fact, the example offered by Equation (4) may be extreme. Households drop out from the experiment over time and there is no reason to assume that attrition would be based exclusively on neighborhood or other characteristics at the end of two years. Rather, it might be expected that attrition is affected by the stream of neighborhood values. If this is the case, differential attrition will over time tend to reflect differences in the individual component of variance, $\eta_i$, and affect initial and final concentration equally. Thus, in this case

$$\Delta\varepsilon_{t-1} = \Delta\varepsilon_t. \tag{5}$$

Equation (3) still does not completely correct for bias, however. Indeed, the appropriate correction would be $\Delta\varepsilon_{t-1}$.[1]

One way to sort out initial differences from those arising from differential attrition is to compare the initial position of enrolled households that did and did not remain active. Table VI-1 shows the mean percent of black or Spanish American population in the initial Census tracts (i.e., those occupied at enrollment) of the black and Spanish American households in the Demand Experiment. As the table indicates, most of the differences visible in the two-year group also characterized the full enrollee sample. For black households in Pittsburgh and Spanish American households in Phoenix, attrition exaggerated the pre-existing Experimental/Control differences by a few percentage points. For black households in Phoenix, the effect of attrition was somewhat greater--an initial three-point difference between Housing Gap and Control households was increased to a ten-pont difference between the groups active at two years.

In terms of bias, the model of Equation (5) gives the bias as

$$\Delta\mu^E - \Delta\mu^C \tag{6}$$

where

$\Delta\mu^i$ = the difference between the mean initial value for active households and the mean for all households for the $i^{th}$ group[2]

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[1]Thus, although cross-sectional estimates are biased under this model, first differences would not be--unless, of course, there were also differences in initial position apart from those induced by attrition.

[2]Note that bias is based on the difference between the selection (active) group and the entire population, not the difference between the active and inactive groups.

E,C = superscripts for Experimental and Control households.

Thus, based on Table VI-1, the potential bias in Experimental/Control comparisons would be

| | Pittsburgh | Phoenix |
|---|---|---|
| Percentage black | 2% | 7% |
| Percentage Spanish American | N/A | -2% |

where a positive number indicates a tendency to underestimate experimental effects by X percentage points. None of the numbers is large, though comparisons might miss a modest effect in Phoenix. Furthermore, when Equation (3) is used, at least some of the bias is absorbed through the $\rho Y_{t-1}$ term. Indeed, since $\rho$ generally had values of 0.3 and 0.4, the remaining bias would only be from 0.7 to 0.6 of the values shown above. Thus even in Phoenix the potential bias would only be to underestimate experimental effects on black concentration by about 4 percentage points.

Table VI-1

ATTRITION OF ENROLLED HOUSEHOLDS

BLACK CONCENTRATION - Mean percentage black in initial Census tracts

| | ALL ENROLLEES | ACTIVE AFTER TWO YEARS | NOT ACTIVE AFTER TWO YEARS | t[a] |
|---|---|---|---|---|
| | | PITTSBURGH | | |
| Control | 49% | 47% | 54% | |
| | (87) | (63) | (24) | |
| | | | | 0.81 |
| Experimental | 58 | 58 | 58 | |
| | (276) | (211) | (65) | |
| | | PHOENIX | | |
| Control | 35 | 32 | 41 | |
| | (41) | (27) | (14) | |
| | | | | 2.21 |
| Experimental | 38 | 42 | 30 | |
| | (82) | (52) | (30) | |

SPANISH AMERICAN CONCENTRATION - Mean percentage Spanish American in initial Census tracts

| | ALL ENROLLEES | ACTIVE AFTER TWO YEARS | NOT ACTIVE AFTER TWO YEARS | t[a] |
|---|---|---|---|---|
| | | PHOENIX | | |
| Control | 42% | 45% | 37% | |
| | (113) | (69) | (44) | |
| | | | | -1.03 |
| Experimental | 39 | 40 | 38 | |
| | (309) | (208) | (101) | |

SAMPLE: Experimental and Control enrollees, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline Interviews, and Initial Household Report Forms.

a. t-test for the significance of the difference between Experimental and Control attrition effects (attrition effect defined as difference in mean concentration for active and not active groups).

## REFERENCES

Kennedy, Stephen D., "Sample Selection and the Analysis of Constrained Transfers: Some Evidence from the Housing Allowance Demand Experiment," paper presented at the summer meetings of the Econometric Society, Boulder, Colorado, June 1978.

## APPENDIX VII

## A TEST OF POSSIBLE DIFFERENTIAL PROGRAM EFFECTS ON BLACK CONCENTRATION

Some of the tabulations presented in Chapter 3 raise the possibility that a housing allowance program might have differential effects on black household concentration, depending on the nature of a household's preprogram neighborhood. Table 3-5, for example, shows that black Experimental households starting in highly concentrated neighborhoods in Pittsburgh experienced substantially greater levels of deconcentration than did Control households (the difference was statistically significant in the case of Percent of Rent households). Differences between Experimental and Control households originating in less concentrated neighborhoods were smaller and not significant. This suggests a hypothesis that the housing allowance facilitates deconcentration for black households beginning in highly concentrated neighborhoods, but has no similar effect for other households.

To explore the hypothesis further, modified versions of the equations presented in Tables 3-8 and 3-9 were estimated. In the modified equations, the treatment group variable was replaced by two dummy variables: one variable took a value of one for Experimental households originating in black neighborhoods, and zero otherwise; the second took a value of one for Experimental households originating in any of the three less concentrated neighborhood categories, and zero otherwise. One set of equations was estimated with only this change. A second set also included a dummy variable that took a value of one for all households beginning in black neighborhoods, and zero otherwise (to control for possible confounding of the treatment effect with a general behavioral difference for households beginning in black neighborhoods). The results of this analysis are presented in Table VII-1 (Pittsburgh) and Table VII-2 (Phoenix).

No strong effect emerges from the analyses. In no case is either of the treatment variables significant at the 0.05 level. In Pittsburgh, the second equation shows an effect in the hypothesized direction that is significant at the 0.10 level for Percent of Rent households beginning in black neighborhoods. There is no consistent pattern to give confidence

in this effect, however. Not only are the other estimated treatment effects not significant, but examining the signs of nonsignificant estimates reveals a mixed pattern (for Percent of Rent households in Phoenix, for example, the direction of the estimated effect is opposite to that for Percent of Rent households in Pittsburgh). It is necessary to recall as well that the Experimental households beginning in black neighborhoods in Pittsburgh are being compared to only eight Control households and that Control households beginning in black neighborhoods are being compared to only five Percent of Rent households in Phoenix, a situation in which strong patterns would be desired before drawing firm conclusions.

Thus, these patterns of effects for special groups, although significant, may reflect special features of attachment to neighborhood as discussed in Chapter 3.

Table VII-1

REGRESSION ANALYSIS OF FINAL LEVEL OF BLACK CONCENTRATION
FOR BLACK HOUSEHOLDS THAT MOVED (PITTSBURGH)

| | EQUATION 1 | | | EQUATION 2 | | |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON |
| Experimental household beginning in black neighborhood | -0 073<br>(0.763) | -0.059<br>(0.563) | -0.193<br>(1.529) | -0 183<br>(1.615) | -0.159<br>(1.328) | -0.236†<br>(1.763) |
| Experimental household beginning in nonblack neighborhood | -0.077<br>(0.789) | -0.065<br>(0.622) | -0.042<br>(0.265) | -0.003<br>(0.032) | 0.001<br>(0.000) | -0.009<br>(0.055) |
| Household beginning in black neighborhood | not entered | not entered | not entered | 0 295†<br>(1 768) | 0.306<br>(1.665) | 0.197<br>(0.981) |
| Initial black concentration | 0.326†<br>(1.978) | 0 387*<br>(2.068) | 0.523*<br>(2.550) | 0.107<br>(0.523) | 0.104<br>(0.415) | 0.301<br>(0.984) |
| Initial automobile ownership | -0.202*<br>(2.639) | -0.155<br>(1.514) | -0 193<br>(1.870) | -0.199*<br>(2.628) | -0.145<br>(1.432) | -0.200†<br>(1.940) |
| Initial Household size | 0.033*<br>(2.080) | 0 030†<br>(1.686) | 0 027<br>(0.972) | 0.035*<br>(2.220) | 0.035†<br>(1 951) | 0.027<br>(0.964) |
| Initial age of household head | 0.003<br>(1.241) | 0 003<br>(0.998) | 0.002<br>(0.619) | 0.003<br>(1.440) | 0.004<br>(1.194) | 0 003<br>(0.840) |
| Constant | 0.163 | 0.133 | 0.131 | 0.119 | 0.092 | 0.126 |
| Adjusted $R^2$ | 0.156 | 0 158 | 0.174 | 0.176 | 0.181 | 0.173 |
| F-Statistic of regression | 3.937** | 3.154** | 2.612* | 3 901** | 3.176** | 2.375* |
| Standard error | 0.297 | 0.302 | 0.296 | 0.294 | 0.298 | 0.296 |
| Sample size | (96) | (70) | (47) | (96) | (70) | (47) |

SAMPLE. Black Experimental and Control movers in Pittsburgh active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes and in subsidized housing.

DATA SOURCES: 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0 01 level.

Table VII-2

REGRESSION ANALYSIS OF FINAL LEVEL OF BLACK CONCENTRATION
FOR BLACK HOUSEHOLDS THAT MOVED (PHOENIX)

| | EQUATION 1 | | | EQUATION 2 | | |
|---|---|---|---|---|---|---|
| | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON | EXPERIMENTAL-CONTROL COMPARISON | HOUSING GAP-CONTROL COMPARISON | PERCENT OF RENT-CONTROL COMPARISON |
| Experimental household beginning in black neighborhood | 0.010<br>(0.084) | -0 148<br>(1.045) | 0.132<br>(0.817) | 0 082<br>(0 528) | -0 104<br>(0.628) | 0.244<br>(1 407) |
| Experimental household beginning in nonblack neighborhood | -0 035<br>(0 438) | -0 021<br>(0.226) | -0 027<br>(0.281) | -0 063<br>(0 719) | -0.038<br>(0.391) | -0.082<br>(0.651) |
| Household beginning in black neighborhood | not entered | not entered | not entered | -0.173<br>(0.809) | -0.117<br>(0.522) | -0 361<br>(1.557) |
| Initial black concentration | 0.387†<br>(1.954) | 0.268<br>(1.315) | 0.509*<br>(2.385) | 0 554†<br>(1.932) | 0 396<br>(1.235) | 0.934*<br>(2.719) |
| Initial low-income concentration | 0.004<br>(1.052) | -0.009<br>(2.276) | -0.001<br>(0.205) | -0.005<br>(1.288) | -0.010*<br>(2.281) | -0 004<br>(0.828) |
| Welfare recipient | -0.080<br>(1.056) | -0.174†<br>(1.966) | -0.023<br>(0.241) | -0.087<br>(1.139) | -0.180†<br>(1.992) | -0.033<br>(0.352) |
| Constant | 0.460 | 0.830 | 0.249 | 0.502 | 0 862 | 0.352 |
| Adjusted $R^2$ | 0.084 | 0.074 | 0 229 | 0.077 | 0.053 | 0 264 |
| F-Statistic of regression | 1.985 | 1.606 | 3.083* | 1.752 | 1.354 | 3 096* |
| Standard error | 0.262 | 0.253 | 0 255 | 0.263 | 0 256 | 0.249 |
| Sample size | (55) | (39) | (36) | (55) | (39) | (36) |

SAMPLE: Black Experimental and Control movers in Phoenix active at two years after enrollment, excluding those with enrollment incomes over the eligibility limits, and those living in their own homes or in subsidized housing.

DATA SOURCES 1970 Census of Population and Housing (Fourth Count Tapes), Baseline and Periodic Interviews, and Initial and monthly Household Report Forms.

† Significant at the 0.10 level.
* Significant at the 0.05 level.
** Significant at the 0.01 level.