

HOUSING ASSISTANCE SUPPLY EXPERIMENT

A WORKING NOTE

This Note was prepared for the DEPARTMENT OF HOUSING AND URBAN DEVELOPMENT, under Contract No. H-1789. It is intended to facilitate communication of preliminary research results. Views or conclusions expressed herein may be tentative and do not represent the official opinion of the sponsoring agency.

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ELIGIBILITY AND PARTICIPATION RESEARCH
PLAN FOR THE HOUSING ASSISTANCE
SUPPLY EXPERIMENT

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PREFACE

This note was prepared for the Office of Policy Development and Research, U.S. Department of Housing and Urban Development (HUD). It presents a plan for analyzing eligibility and participation in both sites of the Housing Assistance Supply Experiment (HASE).

The HASE data base offers an unprecedented opportunity to jointly and dynamically study eligibility and participation. We have time-series data on participants from housing allowance program records and on nonparticipants from the annual survey of households.

This note attempts to identify the important policy issues concerning eligibility and participation, and to develop a framework for analyzing them. Methodological details will emerge as the research proceeds.

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SUMMARY

Analysis of the first two years of program data and the first two waves of landlord and household interviews conducted as part of the Housing Assistance Supply Experiment indicates that the program helps participants but has little effect on others. That evidence emphasizes our need to know who the program helps, who it misses, and why.

The research proposed here will describe the population of eligible households, contrasting their characteristics with those of ineligible households, and measure the participation of eligibles in the allowance program over time. We will then determine why households participate as they do by modeling the steps of participation individually. Differences in benefits and costs should explain differential participation by household type. Finally, we will link the individual models to predict overall participation rates, especially at steady state.

To track households as they move into and out of eligibility and the allowance program, we will divide the population into four states: (1) not eligible for the program; (2) eligible, not enrolled; (3) enrolled, not receiving payments; and (4) enrolled, receiving payments. The research will estimate the number of households in each state at different times, flows of households between states, and the distribution of durations of stay in each state.

The proposed research will draw on the four annual surveys of households in each site and five years of allowance program data. Using survey data, we will model the decision to apply to the program and estimate the population of eligible households (the denominator of participation rates) at various times. In addition, the movement of households into and out of eligibility, imperfectly observed from survey data, will help explain why participation rates are currently less than 50 percent. Allowance program records of all client transactions are an extremely rich source of data on program operations.

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I. INTRODUCTION

The Housing Assistance Supply Experiment (HASE) is part of the experimental housing allowance program begun in 1972 by the Office of Policy Development and Research, U.S. Department of Housing and Urban Development (HUD). The experiment entails operating a fullscale allowance program in two metropolitan sites (Brown County, Wisconsin, and St. Joseph County, Indiana), and monitoring market responses and program operations for about five years. The allowance program is designed to enable low-income households to afford decent, safe, and sanitary housing. Eligibility and participation research examines how well that program serves the needy population.

Participation rates below 50 percent have led many to ask who is not participating and why. The dynamics of participation are such that the participation rate cannot reach 100 percent for any conceivable population, and it will reach only 50 percent in the allowance program sites, according to a recent study.* Because households are continually moving into and out of eligibility and do not enroll the instant they become eligible, some will always be eligible but unenrolled. The amount of time a household spends eligible and enrolled relative to the time it is eligible measures the degree of participation.

If households with zero or low degrees of participation have the lowest allowance entitlements or shortest duration of eligibility, then they are also the least needy by program standards. But if some of the neediest households participate least, then we should know how their knowledge, attitudes, household characteristics, and housing conditions interact with program design and operations to inhibit their participation. We plan to thoroughly study how the housing allowance program elicits different participation by household type and need. Using those findings, we expect to make policy recommendations for improving program effectiveness.

* C. Peter Rydell, John E. Mulford, and Lawrence Kozimor, *Dynamics of Participation in a Housing Allowance Program*, The Rand Corporation, WN-10200-HUD, June 1978.

One's perception of housing problems influences his interpretation of the goal of affordable housing for everyone, and also his expectations of the effect of a housing allowance program. One view is that most low-income households consume enough housing but are overburdened by the required expenditure. The opposite view is that those households underconsume by occupying inadequate dwellings. Under the former belief, program designers would not try to force increases in housing expenditures with earmarking; rather, they would simply try to relieve strained budgets. Under the latter, one might either use earmarking to force increases in housing expenditures for participants or rely on the income effect, reasoning that underconsuming households desire more housing but simply lack the income to pay for it.

Program housing standards may increase consumption by giving an incentive to leave or repair substandard housing. However, because of its standards, the program may differentially benefit those already living in acceptable or almost acceptable housing rather than those in seriously substandard housing. Those most needing budgetary relief because they spend so much on housing are more likely to live in standard or near-standard housing than eligible but less burdened households. Overburdened households that join the program need make only modest increases in housing consumption to have their burden relieved. Those most needing improved housing must surmount the hurdle of housing standards. If they cannot or choose not to improve their housing, they will not benefit from the program.

If the housing standards are viewed as a way of limiting benefits to those whose housing is inadequate, then the above result is not perverse, just unfortunate. But if the standards are expected to increase the housing consumption of an underconsuming needy population, then they may have the perverse effect of helping the overburdened more than the underconsuming. To test that hypothesis, we will analyze the effects of both housing expenditures and housing quality on participation decisions.

The HASE data base offers an unprecedented opportunity to jointly and dynamically study eligibility and participation. Others have studied participants in government transfer programs but have lacked

data on nonparticipants.* Available data on nonparticipants have usually been cross-sectional.** We have time-series data on participants from allowance program records and on nonparticipants from the annual survey of households.

Because households move into and out of both eligibility and the allowance program, our study will include the entire population divided into four groups: (1) not eligible for the program (NE); (2) eligible, not enrolled (ENE); (3) enrolled, not receiving payments (ENRP); and (4) enrolled, receiving payments (ERP). Using the four-state accounting framework we will

- o Count the number of households in states 3 and 4 for each of the first four years of the allowance program in each site, and estimate the number of households in states 1 and 2 for the first three years (we may extrapolate for the fourth year).
- o Estimate the flow rate of households between states, and their duration in each. The nine flows are shown as arrows in Fig. 1.
- o Study the relationships between household characteristics, flow rates, and the probability of a household being in a particular state at a particular time.
- o Estimate the number of households per state and flow rates under steady-state conditions in order to estimate the cost of a similar housing allowance program elsewhere. The effect of program startup will distort our observations of the states in the early years; we will therefore explicitly model the effect of time since program inception on the state distribution and flow rates.***

* See, for example, C. Peter Rydell and others, *Welfare Caseload Dynamics in New York City*, The Rand Corporation, R-1441-NYC, October 1974.

** See, for example, David M. de Ferranti and others, *The Welfare and Nonwelfare Poor in New York City*, The Rand Corporation, R-1381-NYC, June 1974.

*** This effect will presumably diminish rapidly so that the extrapolation to the limit will involve only small changes from the observations of the last data year. However, our observations will also be

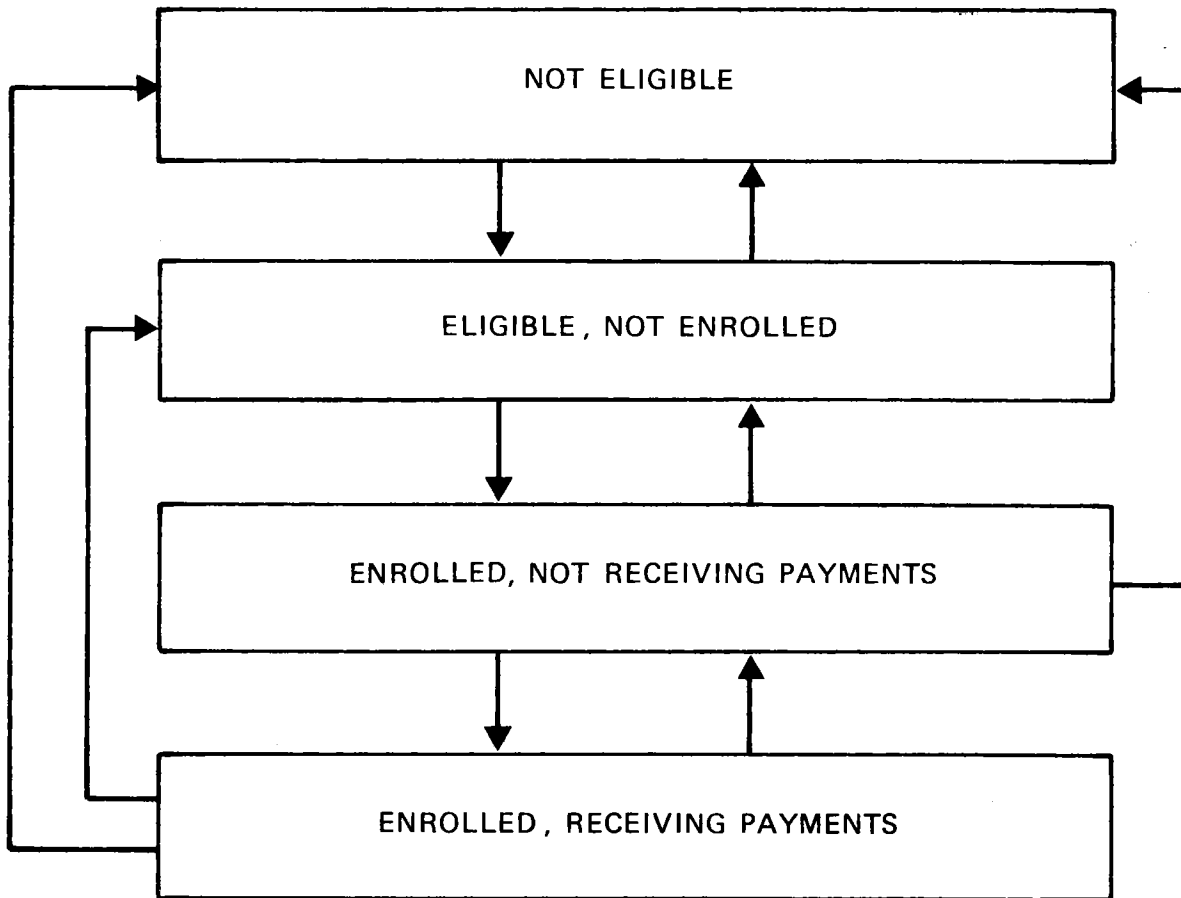


Fig. 1 — Eligibility and participation states and flows

- o Construct a model capable of estimating the effect marginal changes in program eligibility standards and benefits have on steady-state participation rates.

We will use the household survey data to estimate the size of the eligible and ineligible groups at the time of each survey, and the rate at which individuals move between the two. Housing allowance office (HAO) data give the number of people in each enrolled state, and the eligible, unenrolled group is calculated as the residual of the estimated eligible population. Participation rates will be estimated from

distorted by local fluctuations in employment that have occurred or will occur during the period. We plan no explicit modeling of that effect, so our steady-state estimates will correspond to only the observed portion of the local employment cycle.

a weighted average of (1) the ratio of the number of program participants (known from HAO data) to the estimated size of the eligible population* and (2) participation rates derived from participation models.

We will disaggregate all counts, flows, and durations by household characteristic and break out groups of special interest to HUD, such as the elderly, minorities, welfare recipients, renters, and homeowners. Moreover, our models will explicitly consider whether the groups of interest to HUD have characteristics or behavior that differentiate their participation patterns. Whenever the dissimilarities are important, we will include dummy variables for each group and test for interactions between explanatory variables and the groups.

We expect single models that include all groups to be better than separate models for each group. If, as hypothesized, some explanatory variables have exactly the same effect in each group, the most statistically efficient estimator of the effect can be obtained from a joint model. In addition, inadequate sample size will preclude a reliable estimate of the hypothesized different effects of other variables. Here is the classical dilemma of the tradeoff between the bias and variance of different statistical estimators. The random error in the estimate of the regression coefficient due to the smaller sample size will sometimes exceed the bias introduced by assuming that the regression coefficient is the same for each group.

* We will calculate separate participation rates for the two levels of participation--enrolled, not receiving payments; and enrolled, receiving payments.

II. ELIGIBILITY

OVERVIEW

The number and characteristics of eligible households are basic for modeling participation. But membership in the pool of eligibles turns over as individual households change status; and the size of the pool may change if inflows and outflows are imbalanced. We need careful measurements of the size and composition of the pool, how it changes during the experiment, and how individual households enter and leave it.

Our analysis of the household surveys in both sites^{*} showed the number of eligible households at baseline and who they were. About 20 percent of all households in each site were eligible. Young couples with young children, single heads of household with children, elderly singles, and elderly couples constituted 85 percent of the eligible households but only about 50 percent of all households in each site. Eligible owners slightly outnumbered eligible renters in Brown County; in St. Joseph County the ratio was more than 2 to 1.

We will expand the basic profile of the eligible population to consider degree of eligibility (or ineligibility) and housing condition. In addition, we will explore more fully how eligibility changes over time and how those changes affect a household's need for housing assistance. Finally, we will reflect on the appropriateness of the eligibility rules and entitlement formula in light of our findings.

We will look at the distribution of adjusted gross income by household size to see how the choice of R^* affects the number of eligibles.^{**} If many households are bunched around the eligibility cutoff, the pool of eligibles will change considerably with changes in R^* , and our estimates of the number of eligibles will be subject to large errors.

* For details, see Lawrence W. Kozimor, *Eligibility and Enrollment in the Housing Allowance Program: Brown and St. Joseph Counties Through Year 2*, The Rand Corporation, WN-9816-HUD, August 1978.

** R^* is the standard cost of adequate housing as defined by program regulations.

Our analysis of participation behavior will show whether those close to the cutoff are likely to participate.

We will develop measures of housing conditions, compare them for eligibles and near-eligibles over time, and assess how housing problems divide between overburden and underconsumption. Measures of housing condition should include space and quality dimensions. To retain comparability between data sources, we seek measures that can be computed from either household or HAO data.

We will estimate changes in and durations of eligibility for households by their characteristics and examine the resulting changes in size and composition of the pool of eligibles. Comparisons of individual households across survey waves will yield changes in income for non-movers.

Since changes in employment appear to cause most changes in eligibility status, we hope to be able to use the household survey's job history grid for those who have just moved into our sample to estimate their eligibility status for earlier waves (when they were not sampled). That procedure should allow us to estimate changes in eligibility for movers as well as nonmovers. To estimate its accuracy, we will compare nonmovers' actual eligibility at baseline with estimates of their eligibility based on wave 2 data. The extent of incomplete and inconsistent job history data is not yet known, but it may limit the procedure's reliability or even make it infeasible.

Based on the profile of a changing eligible population and its housing conditions, we will comment on the appropriateness of the allowance entitlement formula. The simplicity of the formula raises the question whether it can precisely discriminate housing assistance needs among households. It assumes that all households can afford exactly 25 percent of disposable income for housing regardless of life-cycle stage, household size, and level and stability of income. It also assumes that households of equal size need equal amounts of housing.

We expect that those standards diverge from many household's perceptions of their needs and ability to pay for housing. For example, an elderly couple may get used to living on a small budget, but a young household that has had a recent drop in income may feel unable to adjust to

the same low level of consumption. The latter household may also have fixed commitments such as car or furniture loans that strain their reduced income. Such a household feels it needs more housing than the elderly couple, but 25 percent of the reduced income seems excessive for housing. Such differences in perceived needs will probably explain different participation behavior; they are thus important even if not the basis for program eligibility rules.

RESEARCH TASKS

Eligibility Calculations and Flags

We will produce one set of eligibility flags using actual rules and R^* . Most of the work will repeat that done for baseline, with four exceptions. First, adjusted gross income must include income imputed from homeowner's equity. Although the procedure is straightforward, we must decide when to estimate missing data. Second, to better approximate the HAOs' determination of income eligibility, we will try to use the job history grid of the household survey to estimate monthly household income. Third, we will try to impute assets from rental income, since the HAO includes that asset category in the eligibility test. Fourth, we will try to assess the size of errors introduced by our lack of data on medical deductions and exempt earnings of fulltime students and minors.

Housing Conditions

We want to capture space and quality dimensions of housing circumstances and perhaps apply HAO standards to the household survey file. We must examine and work with the survey and HAO data before we can present details. In addition, we intend to incorporate related Design and Analysis Group (DAG) work and ideas.

Population Estimates

We will estimate the joint distribution of the probability of being eligible at survey wave t for $t = 1, 2, 3, 4$ for each site. The total number eligible at each wave and the number changing eligibility

between waves can be calculated directly from the joint distribution and the known population. If the data on job history shed light on changes in eligibility status over shorter periods than the time between survey waves, we will use shorter intervals.

The probability distribution is most easily estimated from the weighted mean of the observations. As usual, the weights will be the inverse of the fraction of all households in the strata for which we have information. They will differ from weights used previously, since we plan to obtain estimates of the eligibility at wave $t-1$ of those who moved into our sample between wave $t-1$ and t . The survey data also show the strata in which the movers resided at the time in question.

The weighting scheme assumes that all determinants of eligibility are highly correlated with the variables that define the strata. If not, it should be possible to improve on the simple estimates by using polytomous logit analysis to determine the relationship between household and housing characteristics and the probability of being eligible at each combination of points in time.*

An empirical Bayes procedure will be used to estimate the mean of each independent variable in each stratum. Weighting the Bayes estimates of strata means will produce the population means of the independent variables that, when plugged into the polytomous logit functions, will give the eligibility probability distribution. Similar procedures will yield the means of the independent variables for each population subcategory, and consequently the proportion of each group eligible at each wave and the rates of flow into and out of eligibility. It is also possible and perhaps desirable to directly estimate the proportion in each eligibility state using an empirical Bayes technique.

Before making firm decisions, we will examine crosstabulations of the distribution of population categories by stratum, to determine the magnitude of differences in population estimates that could result from

* See Daniel A. Relles, *Using Weights to Estimate Population Parameters from Survey Records*, The Rand Corporation, WN-10095-HUD, April 1978.

alternative techniques. If they appear to be small, we will use the simple weighted estimates. Otherwise, we will analyze part of the Brown County baseline and wave 2 data by selecting a sample from each stratum. Those data will be used to fit predictive models of the proportion of each major population category in each of the four combinations of eligible/not eligible at baseline and wave 2 using the three alternative methods: (1) simple weighting, (2) logit analysis, and (3) direct empirical Bayes estimates of eligibility.

We will test our predictions on the remainder of the sample to avoid overfitting. The test may identify procedural errors that, if corrected, would significantly improve the precision of the estimates. In that case, it will be necessary to verify the hypothesized improvement by similar predictive analysis on St. Joseph County data.

III. PARTICIPATION

DESCRIBING PARTICIPATION

We will organize the data to show what kinds of households join the allowance program, what paths they take through the program, and how long they stay. We will use three basic measures, all obtainable from HAO data, to describe participation:

- o Counts of households in the ENRP and ERP states at various times.
- o Flows into and out of ENRP and ERP.
- o Durations of stay in ENRP and ERP.

Dividing flows by counts of households yields flow rates, most notably:

- o Enrollment rate--fraction of unenrolled eligibles who enroll in a period.
- o Authorization rate--fraction of enrolled nonrecipients who are first authorized for payment during a period.
- o Termination rate--fraction of enrollees leaving the program in a period.

The enrollment rate requires an estimate of the pool of eligibles from household survey records; the others rely on HAO data only. We will calculate separate termination rates for each combination of origin (ENRP/ERP) and destination (eligible/not eligible).

Dividing counts of enrolled households by counts of those eligible yields participation rates. Since we have defined two levels of participation, we will need at least two participation rates: enrollee and recipient. The enrollee participation rate (P_E) is defined as $P_E = ee/e$, where ee = number of households in state ENRP or ERP, and e = number of households in state ENE, ENRP, or ERP. This rate reflects both knowledge of the program and its general acceptance by eligible households.

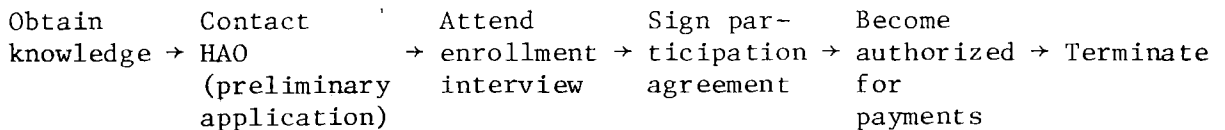
The recipient participation rate (P_R) is defined as $P_R = exp/e$, where exp = number of households in state ERP. This rate measures program service. Enrollees do not benefit from the allowance program until they receive payments. In fact, the possibility of enduring the tedious enrollment process without being rewarded by allowance payments is a negative aspect of the program. P_R measures the fraction of eligibles being helped by the program at any time. It is thus analogous to other government program participation rates.

At each survey wave, we will estimate participation rates to be the weighted average of two separate estimates: (1) the ratio of the number of households participating in the program (known from HAO data) to the estimated size of the eligible population and (2) direct estimates derived from models of the steps of participation. If the outcomes of the steps of participation are independent of the fact of being surveyed, then the two statistics are independent.

We will test that hypothesis by comparing the participation rates in waves 2, 3, and 4 of those surveyed in the previous wave with those not surveyed. Rough calculations suggest that the variances of all estimated participation rates will be of the same magnitude, so the combined estimate will have an error variance roughly half as large as either alone. Also, the two estimates can be compared for accuracy and may identify procedural errors.

MODELING PARTICIPATION

We plan to model participation as a multistage process whose steps can be modeled independently, at least for the first level of analysis:



The preliminary application and enrollment interview stages may be combined, depending on our findings as to whether they represent different decision types. Attending an enrollment interview and signing the participation agreement will also be combined if we find no significant differences. We separate them on the assumption that detailed information

about level of entitlement acquired during the enrollment interview may make the decision to sign an agreement different from the decision to attend an interview.

After enrollment, the process branches and has complex feedback loops (not shown on the above diagram). We will model the probability of an enrollee's dwelling failing the evaluation and the outcome of failure--repair, move, or do nothing (eventually terminate).

Terminations, which may occur at any time after enrollment, present a special problem for our analysis. The HAO records contain detailed reasons for terminating, but the major reason--failure to recertify--leaves us ignorant of a household's eligibility status at the time of termination.* To test the hypothesis that failing the housing evaluation causes eligible households to terminate, we must know whether a household was still eligible.

The eligibility status of households that fail to recertify is so crucial to our research that we urge a special study of a sample of such households. That study would require the effort and cooperation of DAG, the Survey Group, the Field and Program Operations Group, and the HAOs. Prompt action is essential to ensure the incorporation of the results into our research.

Decision To Apply

Many studies of public transfer programs implicitly assume that program information is available and costless to the eligible population. A priori, such an assumption seems unreasonable and probably reflects lack of data on the eligible population's access to such information. Clearly, an eligible household cannot find the HAO's telephone number without some program knowledge, much less assess its eligibility for aid. We plan to incorporate program information into the model as follows: We will first estimate the probability of having knowledge about the program if one is eligible ($P(K|E)$), then estimate the probability of applying if one is both knowledgeable and eligible ($P(A|K,E)$).

* For example, in three years of program operation in Brown County, 32 percent of all terminations and 69 percent of terminations by household that never received payments were failures to recertify.

The potential recipient applies in two distinct steps: (1) he completes a preliminary application; then (2) he attends the enrollment interview. Those who fill out a preliminary application but do not attend an interview may differ from those who do both. Perhaps the former do not follow through with an interview because they are borderline eligibles or because information about the program's housing or paperwork requirements (acquired from friends or telephone contact with the HAO) changes their calculations about the consequences of enrolling. We will determine whether each stage should be modeled separately by examining crosstabulations for those who went to the enrollment interview after completing a preliminary application and those who did not. If there are no differences between the two groups, a single stage will suffice.

One approach to explaining program knowledge assumes that those most knowledgeable about the program are those most likely to be exposed to program information, such as persons who are interested in local events, have a high school diploma or better, belong to several organizations, or have contact with program recipients. The second approach focuses on selective attention and assumes that those with a greater reason to know about the program (i.e., households with comparatively larger allowance entitlements or poorer housing conditions) will be more likely to obtain program information.

We will incorporate both approaches into a single model as follows:

$$P(K|E) = f(x_1, x_2) ,$$

where $P(K|E)$ = probability of obtaining some program knowledge given that the household is eligible,

x_1 = a vector of variables measuring exposure to program information,

x_2 = a vector of variables measuring attention to program information.*

* Additional details on how we construct the knowledge variable as well as the specific measures of x_1 and x_2 can be found in Phyllis L. Ellickson, *Public Knowledge and Evaluation of Housing Allowances: St. Joseph County, Indiana, 1975*, The Rand Corporation, R-2190-HUD, February 1978.

Modeling the decision to apply is somewhat trickier. We view it as a function of households' perceptions of the costs and benefits of applying. Their perceived alternatives may differ from their actual alternatives. The problem is measuring their perceptions. We will use whatever data on perceptions we have, such as attitudes toward government programs or perceived housing conditions. When we lack data, we will substitute objective measures of the costs and benefits of participating, reasoning that they are positively related to perceptions.

Many households may view the allowance program as a pure, or nearly pure, income supplement--either they do not expect to increase housing expenditures at all or their increases can be attributed to the normal demand effect of increased income. If such households were rational and had perfect information, they would calculate benefits as the present value of their allowance entitlement. We cannot compute the present value of allowances directly, but we can compute a household's entitlement and assess the potential duration of allowances from sources of income and job history.

Because many households probably do not know their allowance entitlement before applying, alternative measures such as income or a standard family budget divided by income might correlate with a household's perception of benefits better than actual allowance entitlement. If a household perceives a strong link between the program and housing expenditures, housing expenditure (rather than total household expenditures) divided by income may capture perceived benefits.

Some households may even view the allowance program as primarily a housing program and turn to it for relief when they see their housing deteriorating, although they would not seek aid purely to relieve a tight budget. Using questions from each previous survey of households, we can measure perceived housing quality for all those who have stayed in the survey panel from one year to the next. Survey data on the present dwelling will suffice for those who have moved into sampled units but have not applied for an allowance. However, those who have joined the program in order to move from inadequate housing pose a problem. Since the survey does not elicit data on their preenrollment

dwelling, we will have to use data from the HAO files to develop a measure of their household quality before applying.*

The major costs to households of applying include acquiring information, spending time, and enduring threats to one's pride or morale.** Since we are restricting our model to knowledgeable households, information costs need not enter the argument here. Time costs can be approximated by distance to the HAO. Because we suspect that the burden of traveling to the HAO may be greater for some eligible groups (such as the elderly and the disabled) than others, we will introduce an interaction term for those groups. To measure threats to one's pride or morale, we have a number of direct and indirect measures of attitudes toward receiving government aid--attitudes toward welfare recipients and toward the government helping the poor, whether or not the household already receives other transfer payments, and age and race.

We think that those most likely to apply are households with positive attitudes toward welfare and government help, those who already receive government aid, and those whose relatives or friends already receive allowances. For example, because blacks are disproportionately poor and more likely to know others who already receive aid, we expect them to be readier to apply than whites. Older people, on the other hand, should be less likely to apply, since they are more likely to feel threatened by the idea of dependence on government aid and less likely to be supported by a social network that approves of such aid.

* Incorporating perceived housing quality into the model of obtaining information also faces this constraint.

** We think it unlikely that the expected cost of repairs will affect the household's decision to apply. If we are right, the coefficient for perceived housing quality should be positive--i.e., it should reflect the perceived benefits of improving one's housing rather than the cost of repairing it. If the coefficient is insignificant, it could indicate that expected repair costs cancel the expected benefits of improving one's housing or that the housing component is not a salient benefit to prospective applicants. If the latter outcome occurs, we can determine which interpretation is most reasonable from clients' stated reasons for not applying.

We can use the model to explain the facts we already know--such as the underrepresentation of elderly people in the program and the overrepresentation of blacks--and those uncovered in later analyses. For example, we will investigate whether different responses are attributable to observed differences between groups (in knowledge, attitudes toward applying, income or housing characteristics), or whether they represent unique group responses to the program. To further illuminate the factors that affect an eligible household's response to the allowance program, we will present weighted marginals and crosstabulations of the following survey items:

- o Degree of program knowledge among specific target groups.
- o Reasons for not filling out a preliminary application.
- o Reasons for not enrolling.

Decision To Enroll

A few households that attend an enrollment interview and are found eligible refuse to sign the participation agreement--4 percent during the first three years in Brown County. They give reasons such as a small allowance entitlement, a large administrative burden, and an unwanted housing evaluation. All those reasons suggest that they considered the allowance too small to offset the inconvenience or irritation caused by program requirements.

Probability of Enrollment Dwelling Failure

A logit equation will be used, with the data restricted to those whose enrollment dwelling was evaluated. The population category variables will be entered to see if the housing standards differentially affect the population group. Size of household may be of particular importance because of the occupancy standards. We would like to have indicators of normal income, but will have to settle for proxies such as receiving income from unemployment insurance, or the HAO's decision to schedule a special recertification earlier than usual. Another possibly related attribute is whether the client values housing more or less than average; one possible proxy is the proportion of income spent for housing before joining the allowance program.

Outcome after Failure

A polytomous logit model will describe the clients who repaired, moved, or terminated.* We expect that the type of failure will be a major determinant of the outcome of the failure of the enrollment dwelling. For example, overcrowding will be less likely than other failures to lead to successful repair. The cost of possible repair should also be negatively related to the probability of successful repair. Cost data are available only for those who in fact repaired their dwelling. A regression of those costs on the types of failure, controlling for tenure, would yield cost estimates that are biased downwards but still may be the most effective way to develop a scale that separates the cheaply repaired housing failures from the more expensive. Some data exploration will be required to determine if this is a feasible approach. The alternative is to use simple, direct predictors of outcome, such as number of failures and systems that failed.

A history of mobility would be a good surrogate for the perceived personal costs of moving, but the only available information appears to be the time of moving into the enrollment dwelling. A quadratic or higher order polynomial in the length of time spent in the enrollment dwelling before enrollment will probably be necessary, since those who have just moved into their enrollment dwelling and those who have spent many years in it will probably be less likely to move than those who have spent a year or two there.

Another predictor of a renter's decision to move is the availability of alternative housing at satisfactory rent.** Even in a competitive market, some households will probably be getting bargains, whereas others will be paying above-average rents. We will try to use a hedonic index based on housing characteristics to estimate the average market rent

*The remaining possibility is that the client may indefinitely maintain his enrollment without receiving payments. However, only eight clients who enrolled in the program in Brown County during the first 12 months and an additional eleven who enrolled during the second 12 months are still ENRP at the end of the third program year. This option is thus exercised so infrequently that we will not formally model it.

** Owners so seldom move after enrollment that we will not model that outcome.

of housing units similar to each enrollee's unit and then enter the residual of the rent paid by the enrollee from that average into our outcome equation.

The decision to terminate from the program before receiving payments should be negatively correlated with the amount of the allowance benefit but positively related to indicators showing that normal income exceeds current income.

All determinants of outcome may differentially affect homeowners and renters. Household size and life-cycle stage may also interact with many of those determinants. The outcome equation will probably require more data exploration than most others to determine if the many interactions can be identified statistically.

We will also model the duration of time from failure of enrollment dwelling to outcome. The determinants of the duration resemble those for outcome. We have not yet decided which is the best approach to the problem. One possibility is to simply estimate the duration of time in the ENRP state, given outcome. That has the advantage of simplicity, and allows one to model termination as occurring at the discrete times when recertification is necessary, whereas decisions to move and repair can occur anytime.

An alternative strategy is to combine both the outcome and its duration in a single simultaneous equation system. Such a model is more likely to correspond to reality, in that some enrollees make incremental decisions. For example, after its dwelling fails, a household may explore alternatives, reevaluating them as it gathers information. The outcome and the time to reach it are thus determined jointly. By accounting for the simultaneity of the process that determines duration and outcome, we would avoid biased coefficients that might limit the ability to extrapolate from HASE to an allowance program with a different benefit or housing standard structure. Such a model may require some new computer software because of the multiple outcomes and the bunched timing of terminations. Software will be developed only if there is no satisfactory simpler alternative.

Duration in the ERP State

The primary determinants of duration in the ERP state should be those related to the probability of an eligible household becoming ineligible, such as life-cycle stage and other indicators of permanent income. However, housing standards will also play a role when the enrollee's dwelling fails recertification and he again must either repair or move. His willingness to accept those costs should be related to the size of his housing allowance as well as the size of the costs themselves.

Following termination the client becomes either ineligible or eligible, unenrolled. Knowing the distribution of terminations between the two categories as a function of major population categories is necessary for estimates of steady-state participation rates, and can be found only with new data on the reasons for failure to recertify.

Unified Participation Model

The preceding analysis of eligibles and participants will produce estimates of the number of households in each state over time. The flows between the states will be modeled either directly--as in the case of eligibility--or by using one or more of the decision models. Therefore, the analysis of the decision processes will show how the flows between states are related to characteristics of the population, time since program inception, and program parameters.

Our approach to analyzing the dynamics of the system will be similar to the Markov model described earlier by Rydell, Mulford, and Kozimor,^{*} but *will not* assume that flow rates must be constant over time and *will* show how flow rates are related to program parameters. The model will produce participation rates, disaggregated by category of eligibles, as a function of time since program inception. We also hope to predict participation rates under alternative benefit structures and housing standards.

^{*} *Dynamics of Participation in a Housing Allowance Program.*

IV. SCHEDULING

Eligibility and participation research will draw extensively on the household survey and HAO files. Figure 2 shows the periods covered by all waves for the two types of files in the two sites. In Brown County, the overlap between survey and HAO periods ends with the third year of HAO data; years 4 and 5 of HAO data have no corresponding survey data. In St. Joseph County, the fourth survey wave coincides with the first half of the fourth year of HAO operation; the last year-and-a-half of HAO data has no corresponding survey data.

The availability of data files and the critical path of research tasks constrain our schedule. We cannot produce the final results until we have all the data, and we cannot execute some tasks until we complete others.

All four waves of household survey files will not be in analysis condition until February 1980, and we will not have the fifth year of HAO records for St. Joseph County until some months later. Our research need not stagnate until 1980, however. We will develop and test methodology on three years of data while awaiting data for the final years.

Availability of household survey files will be a major scheduling constraint, because the last survey waves will correspond to intermediate years of HAO data but the survey files will lag behind the HAO files in terms of readiness for analysis. Three-year cumulative HAO files for both sites should be ready for analysis before the end of 1978. Files for waves 1 and 2 of the household survey are already in analysis condition. The schedule for the remaining waves is as follows:

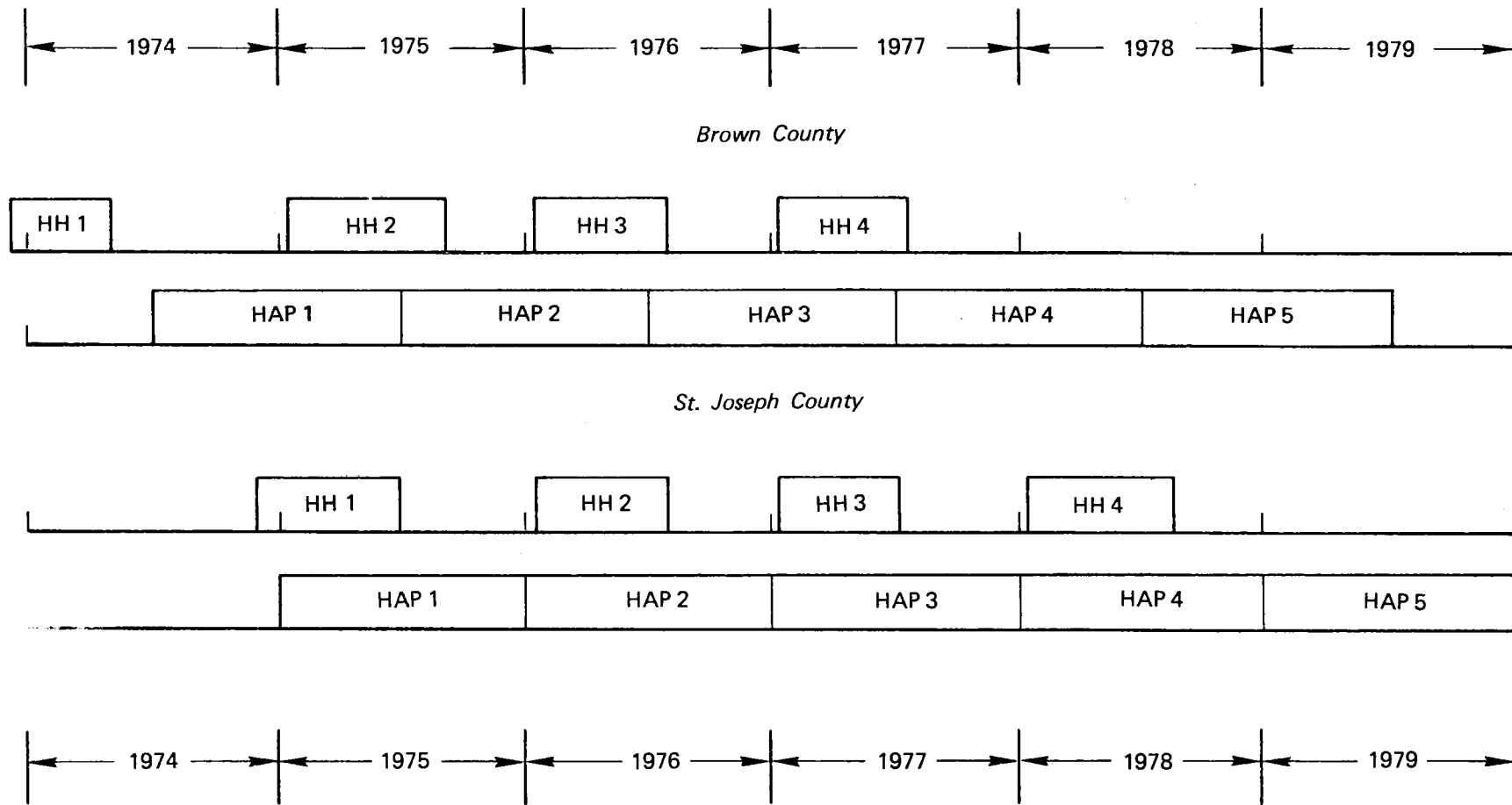
Brown County

Wave 3: October 1978
Wave 4: July 1979

St. Joseph County

Wave 3: March 1979
Wave 4: February 1980

We can build time trends for survey population estimates and project them ahead to keep pace with HAO data to generate preliminary results.



LEGEND :
 HH = Household survey
 HAP = Housing allowance program
 1, 2, 3, 4, 5 = Survey wave or program year

Fig. 2 — Household survey and allowance program data collection :
 Brown and St. Joseph counties, 1974 – 80

Constructing eligibility flags will receive first priority, because they are critical to many other tasks. For example, we must know who is eligible before we can study eligibles' decisions to apply to the allowance program; and we must know which households on the survey files are eligible before we can estimate the population of eligibles in each site.

Describing participation (flows between and durations in states) can begin concurrently with constructing eligibility flags because most of the relevant data are in HAO files (i.e., not dependent on survey file eligibility flags). However, calculation of participation rates and enrollment rates must await estimates of the eligible population. Modeling the steps of participation will begin with the decision to apply (as soon as eligibility flags are set) and probably continue sequentially throughout the program. Linking models to describe the whole system and its path to equilibrium will be the last task.