Housing Allowance Demand Experiment

Minimum Standards Requirements in the Housing Allowance Demand Experiment

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MINIMUM STANDARDS REQUIREMENTS IN THE HOUSING ALLOWANCE DEMAND EXPERIMENT

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ABSTRACT

This report describes the minimum housing standard used in the Housing Allowance Demand Experiment. Each component of the physical and occupancy requirements is described in detail. The report then indicates how often the various elements of the standards caused households to fail the requirements. Special emphasis is placed on those items that accounted for a large proportion of the failures.

More than two-thirds of the units at enrollment failed the physical standard. One component--the light and ventilation requirement--was responsible for a substantial proportion of the failures. This component may have been overly stringent. The failure rate in Phoenix, for example, would have been somewhat lower if local code requirements had been used (as is sometimes done in the Section 8 Existing Housing program). Other alternative light and ventilation requirements would have reduced the failure rate by about a fifth.

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SUMMARY

This is one of a series of technical reports on the results of housing programs tested in the Housing Allowance Demand Experiment. The Demand Experiment, authorized by Congress in the Housing Act of 1970, was designed to test the concept of direct cash assistance to low-income households enabling them to rent suitable housing. The experiment focused on the ways low-income renter households use housing allowances. It tested a variety of allowance plans involving approximately 1,200 Experimental households and 500 Control households at two sites: Allegheny County, Pennsylvania (Pittsburgh) and Maricopa County, Arizona (Phoenix), during 1973-1977. Each household enrolled in the experiment was offered allowance payments for three years. Analysis is based on data from the first two years.

The subject of this report is the minimum housing standards used in the Demand Experiment. These Minimum Standards were used in the experiment operationally, to tie receipt of the allowance to housing for some groups of households, and analytically, as one method for measuring the housing obtained by households during their two years in the experiment. Thus, knowledge of the standard helps to provide an understanding of what it meant for Minimum Standards households to participate in the program[1] and a context for interpretation of the results of analyses using it.

This report considers two topics. The first is a straightforward description indicating which requirements caused units to fail the standard. This is intended to provide some idea of how important the various elements of the requirements actually were in causing households to pass or fail.

The second topic assesses the stringency of the standard and the extent to which the requirements resulted in basically adequate units failing the standard. An operational housing standard must clearly define a dwelling as either acceptable or unacceptable. This necessarily results in

[1] Households in the Minimum Standards plans could receive payments only if they occupied dwellings that met the physical and occupancy standards described in this report. Households in the Minimum Rent plans had to pay at least a specified amount of rent to be eligible to participate. Those in the remaining plans did not have to meet any housing requirements to participate.

potentially arbitrary dividing lines for acceptable units. It is of some interest, therefore, to examine the extent to which reasonable variations of the standards would have resulted in very different rates of passing without accepting materially less adequate units.

The program standards were based primarily on a model national housing code --The American Public Health Association - Public Health Service Recommended Housing Maintenance and Occupancy Ordinance--and covered both physical and occupancy requirements. The physical requirements were grouped into 15 components covering basic housing services, safety features, structure and surface condition, and other indicators of housing condition. The occupancy standard included both space and quality criteria--no more than two persons per adequate bedroom. The data used to determine whether standards were met were primarily collected through housing evaluations. Every dwelling unit was evaluated by a trained housing evaluator when the household enrolled in the program and, thereafter, at least annually and whenever the household moved. The evaluation averaged one hour and covered a broad range of data. The results reported here are based on data from housing evaluations completed for the enrollment units of eligible households in Pittsburgh and Phoenix. The findings of the analysis are summarized below.

1. A substantial proportion of the enrollment units did not pass the Minimum Standards physical requirements. This suggests that the standard is relatively stringent; much of the low- and moderate-income rental housing in Pittsburgh and Phoenix contained a large number of units that did not meet this modified version of a model national code.

   Over two-thirds (70 percent) of the units did not pass the physical requirements. More than one-third of the units that failed the physical requirements lacked or had in disrepair one or more basic housing services (plumbing, kitchen facilities, lighting fixtures, and electrical equipment). Major structural and surface defects in walls, ceilings, floors, and roofs were found in one-third of the units. Just over one-fifth of the units had one or more safety hazards present (inadequate fire exits and unsafe heating equipment). A residual category of

other indicators of housing condition, comprised of ceiling height and light and ventilation requirements, had a failure rate more than twice as high as any of the other requirements (91 percent of the units that failed the standard).

2. Almost half of the units that failed the physical requirements failed only one of the 15 Minimum Standards components. The vast majority of these single component failures were for light and ventilation.

   Forty-five percent of the failing units had only one component that did not meet requirements. Over 80 percent of these units failed light and ventilation, thus accounting for almost 40 percent of those failing the Minimum Standards requirements.

3. One of the 15 components of Minimum Standards--light and ventilation--alone accounted for a substantial proportion of the failures. This requirement had the greatest overall impact on the stringency of the Minimum Standards physical requirements.

   The light and ventilation requirement contained criteria for window presence, size, and opening. More than four-fifths of the units that failed the physical standard did not meet this requirement. Twenty-five percent of enrolled households failed only because of the light and ventilation requirement.

4. The program physical requirements do to a large extent reflect those found in model national codes. Examination of the failure rates for light and ventilation, however, suggests that there should be some local discretion on the specific requirements applied.

   The physical standard was an adaptation of the American Public Health Association - Public Health Service Recommended Housing Maintenance and Occupancy Ordinance, a code that has been the basis for numerous local housing codes. This model ordinance was appropriate for direct use in an experimental setting, in which identical standards had to be used at all sites. An ongoing program might want to set minimum acceptability criteria and leave the setting of specific requirements to local administering bodies,

as has been done in the Section 8 Existing Housing program. An example of the possible benefit of such an approach can be illustrated from the Demand Experiment data. In Phoenix, 14 percent of the failures on the physical requirements were caused by bathroom windows with a window-to-floor-area ratio of less than 10 percent. There was a local code requirement concerning window area that specified that bathroom window area be at least 10 percent of floor area or 3 square feet, whichever was smaller. Had this requirement been substituted for the program standard there would have been a five-point reduction in the overall failure rate in Phoenix.

5. Apart from local discretion, there is general evidence that the light and ventilation requirement was too stringent, and that reasonable variation could have reduced the overall failure rates for both sites.

   Many units that failed to meet Minimum Standards were nevertheless rated by the housing evaluator as in good condition or needing only minor repairs. Units that failed Minimum Standards were also compared with an alternative classification of housing that explicitly recognizes ambiguous areas which may not clearly define a unit as seriously deficient. While few units that failed Minimum Standards were found to be adequate, many were not clearly inadequate. Both in terms of the evaluator rating and the alternative classification, the units in question almost always failed only the light and ventilation requirement.

   Complete elimination of the requirement would have reduced the proportion of households failing to meet standards from 70 percent to 45 percent. Some requirement for a minimum level of light and ventilation seems reasonable, however. Less stringent alternatives, tested using the Demand Experiment data, would have resulted in overall failure rates of from 2 to 10 percentage points less than rates found when the Minimum Standards were used.

6. Although nearly half of the enrolled households failed the Minimum Standards occupancy requirement, this requirement alone accounted for few of the Minimum Standards failures.

Fifty-four percent of the households failed the program occupancy standard. However, only 11 percent of the Minimum Standards failures were due to this requirement alone; the remainder also had physical housing deficiencies.

The occupancy standard of no more than two persons per adequate bedroom involved both space and quality criteria. If the crowding standard of more than one person per room set in the 1974 Housing and Community Development Act had been used as the program occupancy standard, the proportion of households passing Minimum Standards would have increased by only less than 1 percent.

SOURCES OF STATEMENTS

The sources of summary statements are indicated below.

1. Table 2-6 presents information on the overall failure rate and on the incidence of failure for each of the four general categories.

2. Table 2-6 presents the percentage of single component failures; Table 2-7 indicates the number of these that were for light and ventilation.

3. Tables 2-7 and 2-16 indicate the proportion of units that failed the light and ventilation requirement and that failed only that requirement.

4. Information on failure rates and alternative standards for bathroom window area in Phoenix was taken from Tables 2-18 and 2-20.

5. See Tables 2-8, 2-10, and 2-20.

6. Tables 3-2, 3-3, and 3-4 present the information on the occupancy standard.

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 maintained at each site.

The purpose of this report is to document the minimum housing standards used in the Demand experiment. These Minimum Standards play an important role both in the operation and the analysis of the experiment. Operationally, households assigned to the Housing Gap Minimum Standards allowance plans[1] received allowance payments only if they occupied dwellings that met the Minimum Standards requirements for physical condition and occupancy. Those whose units did not meet these standards either had to move or to upgrade their current units to meet the standards to be eligible for payments. Since these standards largely determined the ability of Minimum Standards households to participate in the program, it is important to be clear on what it meant to fail or pass them. Analytically, the Minimum Standards have been used to describe program participation, to indicate the level and condition of housing consumed by all program participants (in conjunction with other measures of consumption, such as housing expenditures, hedonic indices of housing services, and rent-to-income ratios), and to compare the housing conditions of households in the Demand Experiment to those of participants in other housing programs. Knowledge of the

[1] See Appendix I for a description of the allowance plans tested and other information on the experimental design of the Demand Experiment.

measure used in these analyses helps to provide a context for interpretation of the results.

The content of the Minimum Standards is discussed in terms of two basic issues. First, the report simply describes the standards themselves and indicates how often the various elements of the standards caused households to fail to meet the requirements. This is intended to provide some understanding of how the standards operated and of what it actually meant to fail Minimum Standards.

Second, the report discusses whether housing that failed the Minimum Standards requirement was in fact generally inadequate or whether the standard was essentially arbitrary. As has been pointed out in Budding (1978), there is no scientific basis nor public consensus as to what constitutes adequate or inadequate housing. In recognition of this, the principal measure that Budding developed for his analysis of housing deprivation among enrollees in the Demand Experiment contained a third category in addition to "clearly inadequate" and "at least minimally adequate" housing--the "ambiguous" category for which there was not sufficient information to conclude that units were either clearly adequate or inadequate. An operational standard, however, must necessarily clearly classify housing as acceptable or not. Some estimate of the extent to which failure of Minimum Standards can be equated with clearly inadequate housing (and passing of the program requirements equated with at least minimally adequate housing) is possible by comparing the pass/fail Minimum Standards ratings with Budding's analytic measure of housing deprivation. This also enables the analysis to focus on those specific requirements that may not be clearly related to seriously deficient housing, and therefore might be considered arbitrary.

A third issue that is related to both the stringency of the standard and the specific requirements that actually caused units to fail is the extent to which Minimum Standards failures are due solely to items which, while they may represent serious housing deficiencies, involve only trivial,

noncostly repairs. This issue is of particular interest in light of the finding from the Housing Assistance Supply Experiment that the units that initially failed that program's housing requirements and were subsequently brought into compliance were repaired at an average cost of $11.[1] The cost of upgrading units to meet requirements is of some interest as an indicator of the monetary level of effort required by those who initially failed the Minimum Standards requirements to come into compliance and receive payments.[2] However, the data from the Demand Experiment are sufficient only to allow a fairly general, nonquantitative assessment of the costs of bringing units into compliance with the standard.

The minimum physical and occupancy standards used in the Demand Experiment were largely derived from the American Public Health Association--Public Health Service (APHA-PHS) Recommended Housing Maintenance and Occupancy Ordinance (revised 1971) code. The information used to determine whether a household met the requirements was collected on the Housing Evaluation Form.[3,4] Every household's dwelling unit was evaluated by trained housing evaluators when the household enrolled and, thereafter, at least annually and whenever the household moved. Evaluators were subject to continuing quality control and review to assure comparability across evaluators and over time. The evaluation averaged one hour and covered a broad range of data. In a one-bedroom unit with a living room, bath, and kitchen, for example, the evaluation required 137 different

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[1] See Rand (1977). Note that this figure does not include any imputed cost of voluntary owner or renter labor. It should also be noted that the housing requirements used in the Supply Experiment were somewhat different than the Demand Experiment requirements described in this report; see Valenza (1976) for a discussion of the differences.

[2] The housing and housing changes of households that met the Minimum Standards requirement in the Demand Experiment by upgrading their units are discussed in Joseph and Merrill (1979).

[3] See Appendix III for a copy of the Housing Evaluation Form.

[4] Household size information from the Initial and monthly Household Report Forms was also used to determine whether occupancy requirements were met.

items of information, including an overall assessment of the condition of the dwelling unit and indicators of the unit's physical condition, level of basic housing services provided, health and safety hazards, and other housing services. The data presented in this report are primarily from 3,367 housing evaluations completed for the enrollment units of eligible households in Pittsburgh and Phoenix.

The rest of this report examines first the physical and then the occupancy standards used in the Demand Experiment Minimum Standards requirement. Chapter 2 contains a detailed description of the physical standards and explores the incidence of failure overall and for each component. Results are compared to Budding's housing deprivation results. Chapter 3 describes the program occupancy standards and reports how enrolled households fared on this requirement. The results of the analysis are briefly summarized in Chapter 4.[1]

[1]In addition, Appendix IV discusses the accuracy of the housing evaluations in applying the program standards.

REFERENCES

Budding, David W., Housing Deprivation Among Enrollees in the Housing Allowance Demand Experiment, Cambridge, Mass., Abt Associates Inc., November 1978 (revised June 1980).

Merrill, Sally R. and Catherine A. Joseph, Housing Improvements and Upgrading in the Housing Allowance Demand Experiment, Cambridge, Mass., Abt Associates Inc., March 1979 (revised June 1980).

Rand, Third Annual Report of the Housing Assistance Supply Experiment, Santa Monica, Calif., February 1977.

Valenza, Joseph, Comparison of Housing Standards, Washington, D.C., The Urban Institute, September 1976.

CHAPTER 2

THE MINIMUM STANDARDS PHYSICAL HOUSING REQUIREMENTS

The Minimum Standards physical requirements were designed to serve two purposes: first, to be used operationally to tie receipt of the housing allowance to consumption of some minimum level of housing services, and second, to be used analytically, in conjunction with other measures, to describe the impact of the housing allowance program on the housing conditions of participants. It was the first of these two purposes, however, that was the critical consideration in the development of the requirements.

An operational standard for evaluating housing units must have at least the following qualities:

> There must be a clear and objective statement of conditions that cause a unit to fail--too much evaluator discretion or ambiguity creates both problems of equity and areas for dispute.
>
> There can be no "middle ground"--a unit either passes or fails the requirements.
>
> The requirements must be both feasible and not excessively costly to administer.
>
> The standards must be compatible with any prevailing community sentiments regarding adequate levels of housing.

Each of these criteria influenced the definition of the physical standards used in the Demand Experiment. The standards did not, for example, include the evaluator's overall subjective rating of the unit. With one exception, all standards involved objectively defined requirements that could be directly measured by the evaluator. The one exception was the acceptability of a single fire exit in a multiunit dwelling if it was adequately fireproofed. The judgment of adequate fireproofing in existing buildings necessarily required reliance on expert opinion.

The standards classified each unit as either acceptable for the program or not. In developing the standards, this required sometimes arbitrary definitions about the dividing line between, for example, adequate and inadequate window area. Indeed, one of the reasons for this paper is to examine the

extent to which these sharp dividing lines led to overly strict requirements.

Administrative feasibility played a major role in limiting the standards. Thus, for example, the adequacy of electrical service could only be judged in terms of external features--the presence of working outlets and fixtures--with no attempt to ascertain whether wiring was sound. Likewise, since the two sites were both developed urban areas, certain basic urban services such as clean water were assumed (if adequate plumbing was available, the city water supply was assumed to be safe). No attempt was made to impose standards for police and fire protection.

The need to reflect prevailing community standards was reflected both in the decision to base the Minimum Standards on an existing model housing code (the APHA/PHS Recommended Maintenance and Occupancy Ordinance), and the decision not to require local code compliance. In effect, the local codes were taken as actually enforced. No effort was made to require additional enforcement beyond that already made by the community.

Despite these limitations, over two-thirds of the units inhabited by households when they first enrolled in the Demand Experiment failed to meet the physical requirements (see Table 2-1).[1] This high failure rate suggests that the standard was relatively stringent; a substantial amount of the low- and moderate-rent housing at both sites does not meet the requirements. The rest of this chapter examines the physical requirements to see whether this high failure rate accurately reflects the housing conditions of enrollees.

Section 2.1 describes the physical standards in some detail. Section 2.2 then presents some overall indicators of the housing condition of units that failed the Minimum Standards physical requirements in order to examine the extent to which these units do in fact seem to be seriously deficient. Finally, Section 2.3 details the reasons why households failed to meet requirements in terms of the individual elements described in Section 2.1.

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[1] Note that the sample used in this report is all enrollees, not just those households in treatment groups that were required to meet Minimum Standards to qualify for payments.

Table 2-1

STATUS OF ENROLLEE UNITS
ON PHYSICAL HOUSING REQUIREMENTS

	PITTSBURGH	PHOENIX	COMBINED SITES
Pass requirements	30%	30%	30%
Fail requirements	70	70	70
SAMPLE SIZE	(1,625)	(1,742)	(3,367)

SAMPLE: All enrolled households, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

2.1 THE PHYSICAL HOUSING REQUIREMENTS

This section lists the various elements of the Minimum Standards physical requirements. In addition to directly describing the requirements, footnotes indicate the way in which they differ from Budding's measure of physical housing deprivation. The Minimum Standards physical requirements consisted of 15 components made up of related items, as summarized in Table 2-2. These components fall into four general categories: Basic Housing Services (core room presence, complete plumbing, complete kitchen facilities, light fixtures, electrical services); Safety Features (adequate exits, presence and safety of heating equipment); Structure and Surface Condition (room structure, room surface, floor structure, floor surface, roof structure, exterior walls); and Other Indicators of Housing Condition (light-ventilation, ceiling height).[1]

Table 2-2 also indicates how each of the components was classified in Budding's measure of physical housing deprivation. Excluded items were not used at all in Budding's measure. Included items are items that would classify a unit as clearly inadequate under Budding's measure. Questionable or ambiguous items were sufficient to exclude a unit from being considered at least minimally adequate in Budding's measure, but did not by themselves classify a unit as clearly inadequate.[2] Thus, the term ambiguous does not mean that a particular item was ambiguously worded or inconsistently applied; rather, it indicates that although a unit that failed such an item could not be called standard or adequate, it was not clearly dangerous or substandard.

The discussion that follows presents detailed descriptions of each of the 15 components.[3]

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[1] Consistent with the APHA model housing code, the minimum physical standards do not include an evaluation of neighborhood condition. However, the Housing Evaluation Form (HEF), which is the source of the data used to derive them, did include additional items such as ratings of street litter and counts of abandoned buildings on the block face.

[2] Units that failed ambiguous items were classified as clearly inadequate only if the evaluator rated the overall unit as unsound or in need of major repairs. For greater detail, see Budding (1978), Table III-1.

[3] Much of this discussion has been taken from Budding (1978), Appendix III.

Table 2-2

COMPONENTS OF PHYSICAL HOUSING REQUIREMENTS

COMPONENT DESCRIPTION	PRESENCE IN BUDDING'S DEPRIVATION MEASURE
BASIC HOUSING SERVICES	
1. Core room presence. A living room, bathroom, and kitchen will be present. (This set of rooms corresponds to an efficiency unit.)	1. Excluded--redundant with other requirements and not used directly.
2. 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. Included—presence of nonshared toilet, shower or tub, and washbasin with hot water. Ambiguous or questionable--working condition and privacy.
3. Complete kitchen facilities. A cooking stove or range, refrigerator, and a kitchen sink with hot and cold running water will be present and in working condition.	3. Included—presence of facilities and hot water. Ambiguous--working condition
4. Light fixtures. A ceiling or wall-type fixture will be present and working in the bathroom and kitchen	4. Included.
5. Electrical services.[a] At least one electric outlet will be present and operable in the living room and kitchen. A working wall switch, pull-chain light switch or additional electrical outlet will be present in the living room	5. Included--kitchen outlets. Questionable--living room outlets.
SAFETY FEATURES	
6 Adequate fire exits.[b] In multifamily buildings, there will be at least two exits from the dwelling unit leading to safe and open space at ground level.	6 Included
7. Heating equipment [c] 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 Included--presence of some heating equipment and unacceptability of unvented room heaters. Questionable--unacceptability of portable electric heaters.
STRUCTURE AND SURFACE CONDITION	
8 Room structure. Ceiling structure or wall structure for all rooms must not be in condition requiring replacement, such as with severe bulging or leaning.	8 Included—living room, kitchen, bathroom, and first bedroom wall and ceiling structure. Ambiguous--wall and ceiling structure in other than four core rooms.
9 Room surface. Ceiling surface or wall surface for all rooms must not be in condition requiring replacement, as with surface material loose, containing large holes, or severely damaged	9 Included--living room, kitchen, bathroom, and first bedroom wall and ceiling surface. Ambiguous--wall and ceiling surface in other than four core rooms.
10. Floor structure. Floor structure for all rooms must not be in condition requiring replacement.	10 Included--living room, kitchen, bathroom, and first bedroom floor structure. Ambiguous—floor structure in other than four core rooms.
11 Floor surface. Floor surface for all rooms must not be in condition requiring replacement	11. Included—living room, kitchen, bathroom, and first bedroom floor surface. Ambiguous--floor surface in other than four core rooms.
12. Roof structure The roof structure must be firm (applies only if roof is visible)	12. Included.
13 Exterior walls The exterior wall structure or exterior wall surface must not need replacement	13. Included
OTHER INDICATORS OF HOUSING CONDITION	
14 Ceiling height [a] For living room, bathroom, and kitchen, the ceiling must be 7 feet (or higher) in at least one-half the room area	14 Ambiguous.
15 Light and ventilation.[a] The unit must have a 10 percent ratio of window area to floor area and at least one openable window in the living room, bathroom, and kitchen. If kitchen or bathroom has an adequate mechanical ventilation system in working condition, the requirement is met for that room.	15. Ambiguous, questionable, or excluded.

a The requirement is applied to bedrooms in determining the number of adequate bedrooms for the program occupancy standard (see Chapter 3).

b. This component was modified to permit an override if the unit clearly met fire safety requirements even though it lacked a second exit (when the single exit was of adequately fireproof construction). Note also that first-floor units could only fail adequate exits if all their windows were barred or permanently shut.

c In Budding's deprivation measure, heating equipment is divided between Basic Housing Services and Safety Features to reflect the different nature of the criteria being applied to the unit under that component It has been left under Safety Features in this discussion.

Category: Basic Housing Services

The level of services provided by a dwelling unit has typically played a role in defining standard housing. In the census, basic facilities have been defined exclusively in terms of a unit's plumbing facilities. Housing codes and federal housing program standards usually go beyond basic plumbing facilities to specify minimum levels of services for heat, kitchen facilities, and electricity. The Demand Experiment standard includes some consideration of each of these commonly considered services, as well as a requirement that defines a dwelling unit in terms of the presence of core rooms.

Component: Core Room Presence. To meet the core room requirement, a unit had to have a living room, a kitchen, and a bathroom. By definition, the living room requirement was met by every household. To avoid disqualifying efficiency apartments, one room in every unit was coded as a living room even if it was used as a bedroom. A unit was recorded as having a bathroom if it had a bathroom or private toilet, and as having a kitchen if it had a stove, refrigerator, and a kitchen sink.[1]

Component: Complete Plumbing. This component is comprised of 14 separate items. The first five required the presence of:

Toilet facilities
A shower or tub
Hot water in the shower or tub
A wash basin
Hot water in the wash basin.

The next five items required that these five facilities be in proper working condition. In addition, toilet facilities and the shower or tub were required to be "private" in the sense that they could be closed off from the rest of the unit (2 items). Finally, the requirements prohibited shared toilet and bathroom facilities (2 items).[2]

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[1] Budding's deprivation measure excluded this component since it was redundant with other items.

[2] The deprivation measure included presence of the facilities and the prohibition regarding shared facilities. Working condition of the five facilities was considered ambiguous because of some uncertainty in the interpretation of a failure. Because the presence of hot water is assessed separately from the facilities, a failure on working condition for either the shower or tub or wash basin refers to drainage problems or damaged
(footnote continued on next page)

Component: Complete Kitchen Facilities. Kitchen requirements ensure that the minimum facilities necessary for preparing food are present in a dwelling unit. The following four items were required:

A cooking stove or range
A refrigerator
A kitchen sink
Hot water in the kitchen sink.

A second set of items required that the four facilities be in proper working condition.[1]

Component: Light Fixtures. There were four items relating to light fixtures: the presence of a permanent light fixture in the bathroom and in the kitchen, and the requirement that each be in proper working condition.[2]

Component: Electrical Services. This component included two items: at least one working outlet in the kitchen and two working outlets in the living room (or one working outlet and one working wall switch or pull-chain light fixture). These requirements include concerns both with the level of service (number of outlets and working conditions) and with electrical hazards (proper installation of outlets and switches); only working outlets in proper condition were counted.[3]

Component: Adequate Heat. This is discussed under Safety Features, below.

(footnote continued)
pipes. Written instructions to the evaluators did not cover how to evaluate working condition. Verbal instructions during training sessions suggested that a temporarily stopped-up drain should be distinguished from more serious problems and that the evaluator should avoid recording temporary or minor problems. The privacy items were not considered in classifying a unit as clearly inadequate since they were considered not to be within the common definition of housing that was sufficiently poor to be of policy interest.

[1]The presence of the facilities was included in Budding's deprivation measure. As with the complete plumbing requirement, working condition was considered ambiguous (i.e., not sufficient in and of itself to classify the unit as inadequate).

[2]This requirement was included in the deprivation measure.

[3]Budding's deprivation measure included the kitchen outlet requirement. The living room requirement was classified questionable because it did not distinguish between more permanent, expensive to repair problems and potentially minor and temporary ones, such as a missing face plate from an outlet.

Category: Safety Features

Nearly all housing standards specifically prohibit a wide variety of potential safety hazards. These hazards vary widely, ranging from loose stair treads and missing porch railings to unsafe electrical wiring or clear fire hazards. Relatively little information on potential safety hazards was routinely collected in the Demand Experiment. The Minimum Standards physical requirements prohibited only two types of potential safety hazards: the lack of adequate means of escape in case of fire and the presence of unsafe heating equipment.

Component: Adequate Exits. Only multiunit structures with three or more units could fail the Minimum Standards requirement for adequate exits. Such structures were required to have two separate exits to open ground from each dwelling unit. Ground floor units could fail this item only if all windows were permanently barred or nailed shut. The Minimum Standards requirement also provided for case-by-case exceptions so that units with only one exit were considered adequate if the unit met fire safety standards as a fireproof structure.[1]

Component: Heating Equipment. This component included three items concerned with both the level of basic services and with safety features:

Presence of heating equipment

No unvented space heater burning gas, oil, or kerosene

No portable electric heaters as the dwelling's primary source of heat.[2]

Category: Structure and Surface Condition

This category encompasses 31 separate items on the Housing Evaluation Form, assessing the basic physical condition of the unit. Sixteen of the items refer to the structural soundness of the unit, providing separate assessments of the roof, exterior walls and interior walls, ceiling, and floor

[1] This requirement was included in the deprivation measure.

[2] The deprivation measure included the requirement that there be some form of heating equipment and the prohibition for unvented space heaters. The portable electric heater prohibition was classified as questionable because if carefully used, these heaters could be safe.

structure for each room. Collectively these items can be used to approximate the familiar "dilapidated" census category used to describe physically unsound units. The remaining 15 items assess dimensions of the physical condition of the unit other than structural soundness. Fourteen of the items relate to interior surface condition, and failure on these items indicates such problems as falling plaster and large holes in walls or ceilings or severe damage to floor coverings. In all cases, such items indicate the presence of sufficiently serious problems that a wall, ceiling, or floor surface requires replacement. The exterior wall surface item basically measures the extent to which exterior wall surfaces are weathertight.

Each component was rated on a four-point scale, ranging from 0 to 3. The component was failed only if one or more of the items had a rating of 3, which indicated a sufficiently serious physical deficiency to warrant replacement.

Component: Room Structure. The room structure component required that both wall and ceiling structure be sound in every habitable room in the unit. Table 2-3 displays the instructions that evaluators used to assess wall and ceiling structure. Although both the 2 and 3 ratings indicate serious structural problems, a unit failed the requirement only if the wall or ceiling structure in one or more rooms required replacement because of severe buckling, bulging or leaning, damaged, loose or unstable structural members, or evidence of persistent moisture, serious dry rot, or termite damage. A unit that failed one or more of these requirements had at least one wall, ceiling, or floor that was structurally unsound and potentially dangerous.[1]

Component: Room Surface. This component specifies that no part of a wall or ceiling surface in any habitable room be in need of replacement. Table 2-4 displays the rating scales used to assess surface conditions. Although both 2 and 3 ratings describe serious defects rather than cosmetic problems, a unit failed the requirement only if the wall or ceiling surface in

[1]Wall and ceiling structure in the living room, kitchen, bathroom, and first bedroom were included in Budding's deprivation measure. Failures in rooms other than these four core rooms were treated as ambiguous since their seriousness was dependent upon actual occupancy of the unit (i.e., number of household members).

Table 2-3

RATING SCALES FOR INTERIOR STRUCTURE ITEMS

Structure of Walls. Enter a rating from 0 to 3 of the conditions of the structural portion of the walls in each room indicated.

0 = Straight, plumb, firm, and secure walls, partitions and vertical support members.

1 = Minor unevenness of wall, otherwise tight and secure.

2 = Visibly noticeable leaning or buckling of walls or vertical supports.

3 = Requires replacement, severe buckling or leaning, damaged or loose structure members, evidence of persistent moisture, serious dry rot, or termite damage

Structure of Ceilings. Enter a rating of 0 to 3 of the condition of the structural portion of the ceilings in each room indicated

0 = Firm, secure, straight ceilings.

1 = Structural members have minor or barely noticeable sag or slope.

2 = Visibly observable sag or slope of structural members or other structural damage indicating need for repairs.

3 = Requires replacement, severe bulging, noticeable unstable structural members, or evidence of persistent moisture, dry rot, or termite damage.

Rate the ceiling structure in every habitable room. Do not confuse structural problems with deliberately designed sloping ceilings.

Floor Structure Enter a rating from 0 to 3 of the structural elements of the floor for each room indicated (Conditions of finish or floor covering not included.)

0 = Firm, secure, level floors.

1 = Minor unevenness or occasional squeaking of otherwise tight, secure floor.

2 = Visibly noticeable slope or sag, frequent squeaking, minor floor movement under walking stress.

3 = Requires replacement, severe buckling, noticeable movement under walking stress, evidence of persistent moisture, dry rot, or termite damage.

Rate only the floor structure Look at the underlayment and basic floor. Do not be concerned at this time with the finish or floor coverings like carpeting. Those will be rated later.

SOURCE Abt Associates Inc , Housing Evaluator Training Manual, Cambridge, Mass., October, 1974.

Table 2-4

RATING SCALES USED TO ASSESS INTERIOR SURFACE CONDITION

Surfaces of walls. Enter a rating from 0 to 3 of the wall plaster, gypsum board, or other surface for each room indicated

0 = Few (hairline or shrinkage) cracks, tight surface only cleaning or painting may be needed.

1 = Minor evidence of wear, number of minor cracks, slightly loose surfaces, and minor peeling of paper or paint.

2 = Various small, shallow holes, large cracks, loose or missing parts, heavily peeling paint or paper, needs repair.

3 = Requires replacement, surface material loose, contains large holes, or is crumbling and severely damaged.

Surfaces of Ceilings. Enter a rating from 0 to 3 of the ceiling plaster, gypsum board, lathe work, suspended ceiling tile, or other surface for each room indicated.

0 = Few (hairline or shrinkage) cracks, tight surface, only cleaning or painting may be needed.

1 = Minor evidence of wear, numerous minor cracks, slightly loose surfaces, and minor peeling or paper or paint.

2 = Various small, shallow holes, large cracks, loose or missing parts, heavily peeling paint or paper; needs repair.

3 = Requires replacement, surface material loose, contains large holes, or is crumbling and severely damaged

Rate the ceiling surface in every habitable room. Rate any ceiling surface that is composed of structural members (joists, rafters, roof boarding or subflooring), 2 if unpainted, and no higher than 1 if painted.

Floor Surface Enter a rating from 0 to 3 of the condition of the floor finish surface in each room indicated; including linoleum, tile, wood, and inlaid carpeted floors. Floor coverings lying loose on top of the floor surface are considered furnishings and are not included in the rating; rate the floor surface underneath instead.

0 = Newly refinished wood, or equivalent to other new floor surface installation.

1 = Minor noticeable wear or damage to surface or finish, some soil embedded in surface.

2 = Heavily worn or damaged surface, numerous nicks, dents, scratches, cracks and defects.

3 = Needs replacement or extensive repairs large holes, missing parts.

Rate the floor surface Floor surfaces include things like wall-to-wall carpeting, vinyl tile, linoleum, and wood. Floor surfaces DO NOT include floor coverings lying loose.

SOURCE: Abt Associates Inc., Housing Evaluator Training Manual, Cambridge, Mass., October, 1974.

one or more rooms needed to be replaced because of loose surface material, large holes, or crumbling and severely damaged conditions. Interior surface defects are inherently less dangerous than structural problems; they reflect decent living conditions rather than basic structural soundness.[1]

Component: Floor Structure. In order to pass the floor structure requirement, the floor in each habitable room had to be in sound condition. As indicated in Table 2-3, any floor that showed signs of severe buckling, noticeable movement under walking stress, or other serious structural problems led to a failure of this component.[2]

Component: Floor Surface. The floor surface component required that no part of the floor surface in the unit be in need of replacement or extensive repairs or have large holes or missing parts. (See Table 2-4 for the rating scale.)[3]

Component: Roof Structure. The roof structure component was a pass/fail item; the unit failed only if it had a sagging or buckling roof (see Table 2-5). In some cases, evaluators were unable to assess roof condition because unreasonable or dangerous efforts would have been required to observe the roof; this was the case in 38 percent of the units in Pittsburgh and 18 percent in Phoenix.[4]

Component: Exterior Walls. This component specified that neither the structure nor the surface of any exterior wall should be in need of replacement. The rating scales used to assess exterior walls are similar to those used for interior structure and surface items, as indicated in Table 2-5.[5]

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[1]Wall and ceiling surface in the living room, kitchen, bathroom, and first bedroom were included in the deprivation measure; failures in other rooms were considered ambiguous for the same reason as the interior structure items.

[2]Floor structure in only the living room, kitchen, bathroom, and first bedroom was included in the deprivation measure.

[3]The deprivation measure includes floor surface in only the living room, kitchen, bathroom, and first bedroom.

[4]This requirement was included in the deprivation measure.

[5]This requirement was included in the deprivation measure.

Table 2-5

RATING SCALES USED FOR EXTERIOR CONDITION

Roof Structure. Enter a rating of the roof surface not including roof covering. Enter rating of 0 or 3.

0 = Apparently firm structure.

3 = Sagging, buckling roof.

If the roof is not observable, indicate that on the rating form. Do not make unreasonable or dangerous efforts to get onto the roof.

Exterior Wall Structure. Enter a rating from 0 to 3 of the structural condition of the exterior walls of the building as a whole.

0 = Apparently plumb, firm solid structure.

1 = Minor unevenness of wall surface; otherwise tight and secure.

2 = Visible leaning, buckling, or sagging of walls; columns or vertical support members needing repair

3 = Needs replacement, severe leaning, buckling, or sagging; apparent damaged or loose structural members, holes or missing sections.

Rate the structural condition of the exterior walls. The main items to look for are flat surfaces, 90° angles, and strong supporting columns. Be certain to look at all sides of the structure, i.e., the front, back, and sides of the building.

Exterior Wall Surface. Enter a rating from 0 to 3 of the condition of all the exterior walls --covering and trim.

0 = Surface material tight and intact, few or no cracks.

1 = Some loose surface material, parts or minor cracks, otherwise adequate weather protection.

2 = Minor holes or missing parts, numerous loose areas needing repair.

3 = Needs replacement; badly weathered, worn and unprotected surface, various missing sections, excessive cracks or holes.

Rate only the wall surface. Be certain to look at all sides of the structure, i.e., the front, back, and sides of the building.

SOURCE. Abt Associates Inc , Housing Evaluator Training Manual, Cambridge, Mass., October, 1974.

Category: Other Indicators of Housing Condition

This residual category encompasses two components: ceiling height and light and ventilation. Each component commonly occurs in housing codes and program standards for housing. Each component includes serious problems that help define the popular conception of inadequate or substandard housing. With ceiling height, it is basement apartments in which one has to stoop to avoid obstacles, attic bedrooms tucked under the eaves, toilet facilities crammed under stairways, and kitchens in which one cannot stand up. With light and ventilation, it is dark apartments with little or no access to natural light and those with little or no circulation of air.

Component: Ceiling Height. To meet the ceiling height requirement, the ceiling in the living room, kitchen, and bathroom had to be at least seven feet high over at least one-half the floor area. The requirement was taken directly from a model code, the American Public Health Association - Public Health Service Model Housing Ordinance; the local housing codes in Pittsburgh and Phoenix had similar provisions.[1]

Component: Light and Ventilation. The light and ventilation requirements applied to the living room, kitchen, and bathroom. Each room had to meet three separate criteria--window adequacy (size), window opening (the physical ability to open the window), and window presence. These requirements were adopted directly from the APHA/PHS Model Housing Ordinance. The light requirements address concerns about the occupants' ability to carry on normal indoor activity, as well as the overall health and safety of the occupants. The ventilation requirement is based on health and safety concerns. Each requirement is a precise objective or technical standard rather than one that requires the evaluator to exercise judgment on adequacy. The precise requirements are summarized below:

> Living room. The requirement is satisfied if the total window area in the room is greater than or equal to 10 percent of the floor area and at least one window in the room opens (a working room or central air conditioner can substitute for ability to open).

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[1] The ceiling height requirement is treated as ambiguous in the deprivation measure because it was not possible to distinguish with certainty between technical failures and genuinely substandard living conditions (i.e., the requirement did not distinguish between a room that was, say, 6'10" and one in which occupants could not stand up).

Kitchen. The requirement is satisfied if there is a working mechanical ventilation system (such as a range hood), or if there is a window which opens and the total window area in the kitchen equals 10 percent of the kitchen floor area.

Bathroom. The requirement is satisfied if there is a working mechanical ventilation system, or if there is a window which opens and the window area is equal to 10 percent of the floor area.[1]

2.2 OVERALL INDICATORS OF HOUSING CONDITION

As was indicated in Table 2-1, 70 percent of the enrollee units failed the Minimum Standards physical requirements. Table 2-6 presents some indicators of physical housing condition to provide an overview of the condition of the 2,349 units that did not pass the requirements at enrollment. Information about the incidence of failure for each of the four general categories is given first. With the exception of structure and surface condition, the pattern of deficiencies at this level of analysis is very similar at both sites. Thirty-six percent of all units failing the requirements were deficient in the provision of basic housing services. Approximately 22 percent had safety hazards present, and slightly more than 90 percent failed other program requirements (light and ventilation and/or ceiling height). With regard to structure and surface condition, however, only 16 percent of the units that failed in Pittsburgh did not meet one or more of these requirements, as compared to 47 percent of the units in Phoenix. This suggests that the housing in Phoenix was generally more dilapidated.

The second indicator of physical housing condition considered in Table 2-6 is the number of components failed. The distribution of components failed

[1] None of these items were directly included in the deprivation measure. Window or ventilation system presence was classified as ambiguous because the failure could be a temporary breakdown in a ventilation system. The requirement that at least one window in the living room, kitchen, and bathroom be openable was classified as ambiguous because of a concern that these items by themselves did not measure deficiencies of sufficient importance to warrant classifying a unit as inadequate. Kitchen and living room window size were classified as questionable because of the arbitrariness of the 10 percent criterion; bathroom window size was excluded because of the discrepancy between the Demand Experiment requirement and local regulations in Phoenix that allow 3 square feet of window space to be substituted for the 10 percent requirement (this is discussed further in Section 2.3).

Table 2-6

PHYSICAL HOUSING CONDITION OF ENROLLEE UNITS THAT FAILED THE PHYSICAL HOUSING REQUIREMENTS

INDICATORS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentage of all units that failed physical requirements	70%	70%	70%
Number that failed	1,134	1,215	2,349
Categories Failed			
Failed basic housing services	36%	36%	36%
Failed safety features	17	27	22
Failed structure and surface condition	16	47	32
Failed other indicators of housing condition	90	92	91
Number of Components Failed			
1	49	42	45
2	31	17	24
3	10	13	12
4	6	8	7
5	2	7	4
6+	2	13	8
Average number failed	1.84	2.79	2.33
Standard deviation	1.15	2.27	1.73
Evaluator's Overall Rating			
Good (0)	5%	19%	12%
Needs minor repairs (1)	52	36	44
Needs major repairs (2)	41	34	38
Unfit for habitation (3)	1	10	6

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

shows that approximately half (49 percent) of the units that failed the requirements in Pittsburgh failed because of deficiencies in only one component. In Phoenix, a somewhat smaller proportion (42 percent) failed because of a single component. The large proportion of units that failed only one component raises the possibility that these failures may not have been serious. As is shown in Table 2-7, the great majority of units that failed only one component did not meet one or more of the light and ventilation requirements. The nature of single component failures is described further in Section 2.3.

On average, dwelling units in Phoenix failed a larger number of components than those in Pittsburgh. The average number of components failed in Phoenix was 2.79, compared to 1.84 for Pittsburgh. Furthermore, while 20 percent of the units that failed in Phoenix had five or more deficiencies, indicating seriously deficient housing, the comparable figure for Pittsburgh was only 4 percent.

It is clear that failing some requirements represented more serious deficiencies in the unit than failing other requirements. The housing evaluator's overall rating of the unit is taken as another indicator of physical housing condition.[1] This measure conveys information about the overall adequacy of the unit that goes beyond the specific type or number of components failed. Only about 44 percent of all the units that failed the requirements at the initial housing evaluation were rated as being either unfit for habitation or in need of major repairs. Another 44 percent of the units were in need of some minor repairs. Twelve percent were judged to be in good condition, needing only ordinary maintenance. Table 2-8 indicates the components that failed in units that received an overall evaluator rating indicating that they were in good condition. Again, the failures on the

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[1] At the end of an evaluation, the evaluator was required to rate the physical condition of the unit on the following scale:

0 = good condition, only ordinary maintenance needed;
1 = basically sound, but some minor repairs are needed;
2 = basically sound, but major repairs/renovations are needed;
3 = unsound, hazardous, or unfit for human habitation.

See Budding (1978), Appendix III, for further discussion of the evaluator's overall rating.

Table 2-7

CAUSES OF FAILURE FOR UNITS
THAT FAILED ONLY ONE COMPONENT

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Core room presence	-% (0)	-% (0)	-% (0)
Complete plumbing	1 (10)	1 (15)	1 (25)
Complete kitchen	- (1)	- (1)	- (2)
Light fixtures	- (4)	- (3)	- (7)
Electrical services	1 (13)	- (0)	- (13)
Adequate exits	4 (40)	1 (8)	2 (48)
Heating equipment	- (4)	1 (9)	- (13)
Room structure	- (0)	- (1)	- (1)
Room surface	- (4)	1 (16)	1 (20)
Floor structure	- (0)	- (1)	- (1)
Floor surface	- (2)	1 (7)	- (9)
Roof	- (1)	- (1)	- (2)
Exterior walls	- (0)	- (2)	- (2)
Ceiling height	1 (13)	1 (17)	1 (30)
Light and ventilation	41 (468)	35 (427)	38 (895)
Total failing only a single component	49 (560)	42 (508)	45 (1,068)
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

Table 2-8

PHYSICAL HOUSING REQUIREMENTS FAILED
IN UNITS THAT RECEIVED A GOOD OVERALL RATING

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Core room presence	-%	1%	1%
	(0)	(2)	(2)
Complete plumbing	8	3	4
	(5)	(6)	(11)
Complete kitchen	-	3	3
	(0)	(8)	(8)
Light fixtures	2	2	2
	(1)	(4)	(5)
Electrical services	-	1	1
	(0)	(3)	(3)
Adequate exits	27	5	9
	(16)	(11)	(27)
Heating equipment	-	3	2
	(0)	(7)	(7)
Room structure	-	-	-
	(0)	(0)	(0)
Room surface	-	-	1
	(0)	(4)	(4)
Floor structure	-	-	-
	(0)	(0)	(0)
Floor surface	-	3	2
	(0)	(6)	(6)
Roof	-	-	-
	(0)	(0)	(0)
Exterior walls	-	-	-
	(0)	(1)	(1)
Ceiling height	7	7	7
	(4)	(16)	(20)
Light and ventilation	67	86	82
	(40)	(198)	(238)
SAMPLE SIZE	(60)	(229)	(289)

SAMPLE: All enrolled households whose units failed the physical housing requirements and received an overall rating of good, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

light and ventilation component are responsible for the vast majority of units in this category.[1]

The fact that over one-half of the units that failed the requirements were rated as either good or in need of only minor repairs again raises the possibility that many of these units might have been judged by some observers to be at least minimally adequate housing. One final measure of the extent to which a unit's status in meeting the program requirements is an indication of its adequacy is to compare its pass/fail rating with the rating on Budding's three-part measure of housing deprivation. As indicated in Section 2.1, Budding's measure combined both the overall evaluator rating and detailed information on the physical quality of the unit. Thus, a unit could only be classified as clearly inadequate on the basis of the evaluator's overall rating if this was supported by evidence of individual physical deficiencies (including those indicated as ambiguous in Table 2-2). On the other hand, certain deficiencies were regarded as serious enough to classify a unit as clearly inadequate regardless of the evaluator's rating. (Specifically, as indicated in Table 2-2, a unit was classified as clearly inadequate, regardless of the evaluator ratings, if it lacked plumbing or kitchen facilities, had no safe light fixtures in the kitchen or bath, had no electric outlet in the kitchen, lacked adequate fire exits, had no heat or only unvented room heaters, was structurally unsound, or required replacement of the interior or exterior walls, floors, ceilings, or roof.)

As shown in Table 2-9, only 5 percent of all the units (or 8 percent of those units that failed the Minimum Standards physical requirements) both failed the program requirements and were rated as being at least minimally adequate. Over 60 percent of the units that failed the program requirements (or 42 percent of the total sample) were clearly inadequate. The remaining 32 percent of the units that failed the program requirements

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[1]The next most frequent component to fail was adequate exits in Pittsburgh; 27 percent of the units that received an overall rating of good condition failed this item. It is clear that this item could be overlooked in providing an overall rating; it is also clear that lack of a second exit in a multiunit structure is a potential safety hazard.

Table 2-9

COMPARISON OF THE MINIMUM STANDARDS PHYSICAL REQUIREMENTS WITH THE DEPRIVATION MEASURE (COMBINED SITES)

DEPRIVATION MEASURE	MINIMUM STANDARDS REQUIREMENTS		SAMPLE SIZE
	Pass	Fail	
In clearly minimally adequate housing	26% (865)	5% (182)	(1,047)
In clearly inadequate housing	1 (30)	42 (1,426)	(1,456)
Ambiguous	4 (123)	22 (741)	(864)
TOTAL SAMPLE	30% (1,018)	70% (2,349)	(3,367)

SAMPLE: All enrolled households, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

were classified as ambiguous. The components that failed units that were classified on the deprivation measure as ambiguous or as minimally adequate[1] may give an indication of which program requirements were excessively stringent. As is shown in Table 2-10, about 90 percent of these units failed light and ventilation. None of the other requirements had a failure rate close to this.

The figures presented in this section indicate that at least one-half of those units that failed the Minimum Standards physical requirements were clearly seriously defective: 53 percent failed more than one component, 44 percent received an overall evaluator rating that indicated that either major repairs were needed or the unit was unfit for habitation, and 60 percent were classified as clearly inadequate using Budding's physical deprivation measure. However, there are also indications that the requirements may have been overly stringent and that some units that failed may not have had serious housing deficiencies: 47 percent failed only one component, 12 percent were rated by the evaluators as being in good condition, and 32 percent were classified on the deprivation measure as ambiguous. The light and ventilation component stands out clearly as the requirement warranting more detailed examination.

The next section examines the nature and frequency of the failures in each component. Emphasis is placed on those items that do not clearly represent serious housing deficiencies.

2.3 REASONS FOR FAILING THE PHYSICAL REQUIREMENTS

In this section, data on the units that failed the requirements are analyzed to examine the kinds and seriousness of the deficiencies found during the housing evaluations. Table 2-11 ranks the components according to frequency of failure. Approximately three times as many units failed the light and ventilation requirement as the next most frequently failed component; about 86 percent of the households at both sites had deficiencies in this area.

[1] Since bathroom window size was the only item that was excluded from Budding's deprivation measure, the only units that could have failed program requirements and been classified as adequate were those that failed only the bathroom window size item.

Table 2-10

PHYSICAL HOUSING REQUIREMENTS FAILED IN UNITS
THAT WERE CLASSIFIED AMBIGUOUS ON THE DEPRIVATION MEASURE

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Core room presence	-%	-%	-%
	(0)	(1)	(1)
Complete plumbing	4	7	6
	(19)	(22)	(41)
Complete kitchen	2	1	1
	(7)	(4)	(11)
Light fixtures[a]	-	-	-
	(0)	(0)	(0)
Electrical services	6	1	4
	(26)	(3)	(29)
Adequate exits[a]	-	-	-
	(0)	(0)	(0)
Heating equipment	-	2	1
	(0)	(6)	(6)
Room structure	-	1	-
	(0)	(2)	(2)
Room surface	2	3	2
	(8)	(9)	(17)
Floor structure	-	-	-
	(0)	(0)	(0)
Floor surface	-	1	1
	(0)	(4)	(4)
Roof[a]	-	-	-
	(0)	(0)	(0)
Exterior walls[a]	-	-	-
	(0)	(0)	(0)
Ceiling height	10	9	10
	(43)	(30)	(73)
Light and ventilation	93	91	92
	(390)	(293)	(683)
SAMPLE SIZE	(420)	(321)	(741)

SAMPLE: All enrolled households whose units failed the physical housing requirements and were classified ambiguous on Budding's deprivation measure, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

a. Since these components were included in their entirety as being sufficient to classify a unit as inadequate, failure on the program requirements meant a rating of inadequate, by definition.

Table 2-11

RANKING OF COMPONENTS FOR UNITS THAT FAILED THE PHYSICAL HOUSING REQUIREMENT BY FREQUENCY OF FAILURE

PITTSBURGH				PHOENIX			
RANK	COMPONENT	FREQUENCY	PERCENTAGE	RANK	COMPONENT	FREQUENCY	PERCENTAGE
1	Light-ventilation	(958)	85%	1	Light-ventilation	(1,057)	87%
2	Adequate exits[a]	(142)	38	2	Room surface	(407)	33
3	Complete plumbing	(277)	24	3	Floor surface	(354)	29
4	Ceiling height	(148)	13	4	Heating equipment	(311)	26
5	Room surface	(132)	12	5	Complete plumbing	(287)	24
6	Electrical services	(124)	11	6	Room structure	(182)	15
7	Core room presence	(111)	10	7	Ceiling height	(163)	13
8	Light fixtures	(74)	6	8	Exterior walls	(134)	11
9	Complete kitchen facilities	(54)	5	9	Floor structure	(127)	10
10	Heating equipment	(52)	5	10	Light fixtures	(113)	9
11	Floor surface	(49)	4	11	Electrical services	(105)	9
12	Floor structure	(32)	3	12	Adequate exits[a]	(16)	6
13	Room structure	(20)	2	13	Complete kitchen facilities	(78)	6
14	Roof structure[b]	(14)	2	14	Roof structure[b]	(61)	6
15	Exterior walls	(9)	1	15	Core room presence	(42)	3

SAMPLE. All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits

DATA SOURCE Housing Evaluation Form.

a. Applies only to multiunit structures (372 in Pittsburgh, 249 in Phoenix)

b. Applies only to units where roof is visible (687 in Pittsburgh, 1,036 in Phoenix).

Room surface (12 percent failure rate in Pittsburgh and 33 percent in Phoenix) and complete plumbing (24 percent in both Pittsburgh and Phoenix) are present at both sites among the next four high-ranking components failed. Adequate exits ranked second in Pittsburgh, but was a relatively minor problem in Phoenix. On the other hand, floor surface was found deficient in 29 percent of the failed units in Phoenix and only 4 percent in Pittsburgh. The emphasis in the remainder of this section is on the reasons for failing specific components.

Category: Basic Housing Services

As is indicated in Table 2-12, 36 percent of the units that failed the program physical requirements had deficiencies in one or more of the basic housing services. The most frequently failed component was complete plumbing; 24 percent of the failed units at both sites failed one or more of the items under this component.[1] About 13 percent of the units at both sites were missing one or more of these facilities (14 percent in Pittsburgh and 11 percent in Phoenix), and 11 percent had facilities in disrepair. The disrepair rate was almost twice as high in Phoenix as in Pittsburgh (15 percent compared with 8 percent). The items indicating that facilities should be private and not shared were each failed by about 5 percent of the failed units in Pittsburgh; problems in these areas were virtually nonexistent in Phoenix. More than half the failures (15 percent out of 24 percent) were in items sufficient to classify a unit as inadequate in Budding's deprivation measure.

The next most frequently failed component under basic housing services was electrical services, failed by 10 percent of the units that did not meet requirements. Seven of the 10 percent had inadequate electricity in the living room, an item that did not cause a unit to be classified as inadequate under the deprivation measure;[2] 4 percent lacked operable kitchen

[1] One percent of the units at each site failed only the complete plumbing component, the majority because facilities were not present. It should be noted that this would not have been trivial to remedy.

[2] However, less than 1 percent of the units (30) would have gone from the ambiguous to the clearly inadequate category if living room electrical services had been a sufficient item; the remaining 6 percent had other deficiencies that resulted in a rating of clearly inadequate.

Table 2-12

REASONS FOR FAILING BASIC HOUSING SERVICES

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentages failing basic housing services	36%	36%	36%
Failed complete plumbing	24	24	24
Not present	14	11	13
Not working	8	15	11
Not private	5	--	2
Shared	4	--	2
Failed complete kitchen facilities	5	6	6
Not present	2	4	3
Not working	3	3	3
Failed light fixtures	6	9	8
Not present	3	4	3
Not working	4	5	5
Failed electrical services	11	9	10
No kitchen outlets	4	5	4
Inadequate living room outlets	8	6	7
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

outlets (sufficient to fail a unit using the deprivation measure). Approximately 8 percent of the units that failed program requirements either lacked a light fixture in the bathroom or kitchen or both (3 percent) or had at least one light fixture that was not in working condition (5 percent). Six percent of the units failed kitchen facilities; and 3 percent lacked one or more of these facilities, and 3 percent had at least one facility in disrepair.

Category: Safety Features

Of the units that failed the Minimum Standards physical requirements, 22 percent had at least one safety hazard present (see Table 2-13). One hundred forty-two of the 372 multifamily structures in Pittsburgh that failed requirements (38 percent) did not have adequate fire exits; this constituted 13 percent of the overall sample of failed units. Only 6 percent of the failed units in multifamily structures in Phoenix (16 out of 249 units) failed this component. This difference in frequency of failure partially reflects differences in the nature of multifamily structures at the two sites. About 96 percent of the multifamily structures that enrollees lived in in Pittsburgh had two or more stories, as compared to only 38 percent in Phoenix.[1]

Twenty-six percent of the units that failed the requirements in Phoenix had unacceptable heating equipment, as opposed to only 5 percent of the units in Pittsburgh. The majority of failures at both sites were due to the presence of unvented space heaters. Only a few households in Pittsburgh had no means of heating their units; in Phoenix, the number was 8 percent. Few households at either site actually relied on portable electric heaters as their major source of heat. The site differences observed with problems related to heating equipment are a function of the relatively mild climate in Phoenix. Households that have heating equipment at that site tend to rely on less permanent (and often more hazardous) sources of heat.

[1] Four percent of the units in Pittsburgh and 1 percent in Phoenix failed only the adequate exits component; this requirement was neither trivial to remedy nor trivial as a safety hazard.

Table 2-13

REASONS FOR FAILING SAFETY FEATURES

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentage failing safety features	17%	27%	22%
Failed adequate exits[a]	38	6	25
Failed adequate exits[b]	13	1	7
Failed heating equipment	5	26	16
Presence	1	8	5
Unvented space heaters	3	16	10
Reliance on portable electric heaters	-	2	1
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

a. Applied only to multiunit structures (372 in Pittsburgh; 249 in Phoenix).

b. As a percentage of all units.

Category: Structure and Surface Condition

The most striking site differences are found in the failure rates for structure and surface condition (see Table 2-14). Of the units that failed the program requirements, almost one-half had structure or surface deficiencies in Phoenix, compared to fewer than one-fifth in Pittsburgh. The units in Phoenix not only had a higher incidence of deficiencies in this category, but also failed a greater number of structure and surface items: only 2 percent of the Pittsburgh units that had any structure or surface deficiencies failed more than five items, compared to 21 percent in Phoenix.

The highest failure rates at both sites in this category were for room and floor surface.[1] Twelve percent and 33 percent of the units in Pittsburgh and Phoenix, respectively, had at least one wall and/or ceiling surface that required replacement. The comparable figures for floor surfaces were 4 percent and 29 percent.

Interior structural deficiencies were also a greater problem in Phoenix than in Pittsburgh, affecting 21 percent of the failed units in the former site and 4 percent in the latter. Failures in exterior conditions were also a more frequent occurrence in Phoenix (13 percent in Phoenix compared to 2 percent in Pittsburgh).

Category: Other Indicators of Housing Condition

As is indicated in Tables 2-15 and 2-16, this residual category had by far the highest percentage of failures: 90 percent in Pittsburgh and 92 percent in Phoenix. Thirteen percent of the failed units at each site did not pass the ceiling height component.[2] Bathroom ceiling height was the most common reason for failure at both sites (see Table 2-15). The distribution

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[1] One percent of the Phoenix units failed only room surface, which was not a trivial defect to repair.

[2] The ceiling height component was the single cause for failure for 1 percent of the failed units at both sites. This would not be inexpensive to remedy; however, in constructing the deprivation measure it was not considered sufficient to fail a unit since the information available from the HEF did not allow a distinction between technical failures and genuinely substandard conditions (e.g., no distinction was made between "near misses" with ceiling heights of, say, 6'10" and rooms where one could not stand up).

Table 2-14

REASONS FOR FAILING STRUCTURE AND SURFACE CONDITION

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentage failing structure and surface condition	16%	47%	32%
Failed interior structure	4	21	13
Room structure	2	15	8
Floor structure	3	10	7
Failed interior surface	14	43	29
Room surface	12	33	23
Floor surface	4	29	17
Failed exterior condition	2	13	8
Exterior walls	1	11	6
Roof[a]	2	6	4
Roof[b]	1	5	3
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

a. Applied only if roof was visible (687 in Pittsburgh; 1,036 in Phoenix).

b. As a percentage of all units.

DISTRIBUTION OF NUMBER OF SURFACE AND STRUCTURE ITEMS FAILED

NUMBER OF ITEMS FAILED	PITTSBURGH	PHOENIX	COMBINED SITES
1	69%	30%	40%
2-5	28	47	43
6-9	2	12	10
10-13	-	6	5
14-17	-	2	2
18+	-	1	1
SAMPLE SIZE	(186)	(573)	(759)

SAMPLE: All enrolled households whose units failed one or more of the structure and surface items at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

Table 2-15

REASONS FOR FAILING OTHER INDICATORS OF HOUSING CONDITION: CEILING HEIGHT

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentage failing other indicators	90%	92%	91%
Failed ceiling height	13	13	13
In living room	1	4	2
In bathroom	11	11	11
In kitchen	2	6	4
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.
DATA SOURCE: Housing Evaluation Form.

DISTRIBUTION OF NUMBER OF ROOMS FAILING CEILING HEIGHT

NUMBER OF ROOMS	PITTSBURGH	PHOENIX	COMBINED SITES
1	94%	57%	74%
2	5	22	14
3	1	21	12
SAMPLE SIZE	(148)	(163)	(311)

SAMPLE: All enrolled households whose units failed the ceiling height requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.
DATA SOURCE: Housing Evaluation Form.

Table 2-16

REASONS FOR FAILING OTHER INDICATORS OF HOUSING CONDITION: LIGHT AND VENTILATION

COMPONENTS	PITTSBURGH	PHOENIX	COMBINED SITES
Percentage failing other indicators	90%	92%	91%
Failed light and ventilation	85	87	86
No window or ventilation system[a]	12	12	12
Inadequate window area[b]	42	63	53
Inadequate window opening[c]	52	37	44
SAMPLE SIZE	(1,134)	(1,215)	(2,349)

SAMPLE: All enrolled households whose units failed the physical housing requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

a. Note that a working ventilation system can substitute for a window in bathrooms and kitchens but not living rooms.

b. For bathroom and kitchen, this also means that there is no working ventilation system that can substitute for this requirement.

c. For bathroom, kitchen or living room, this also means that there is no working ventilation system.

DISTRIBUTION OF NUMBER OF ROOMS FAILING LIGHT AND VENTILATION

NUMBER OF ROOMS	PITTSBURGH	PHOENIX	COMBINED SITES
1	51%	52%	52%
2	32	31	31
3	17	17	17
SAMPLE SIZE	(958)	(1,057)	(2,015)

SAMPLE: All enrolled households whose units failed the light and ventilation requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form.

of number of rooms falling short of the ceiling height requirement indicates that the extent of the problem was greater in Phoenix than in Pittsburgh; in Phoenix, 43 percent of these units had ceiling heights of less than seven feet in more than one room, as compared to only 6 percent in Pittsburgh.

The component that failed the largest number of units was the light and ventilation requirement: 86 percent of the failed units at both sites did not meet this requirement (see Table 2-16). Twelve percent of the failed units at both sites did not pass window presence in one or more rooms; for bathrooms and kitchens, failure of this item means that neither a window nor an operating ventilation system was present. Fifty-three percent had at least one of the three core rooms with window area less than 10 percent of floor area (42 percent in Pittsburgh and 63 percent in Phoenix),[1] and 44 percent failed on window opening (52 percent in Pittsburgh and 37 percent in Phoenix).[2] The distribution of number of rooms with inadequate light and ventilation indicates that about half of the units that failed this component had deficiencies in only one room, about a third had problems in two rooms, and 17 percent failed one or more of the requirements in all three rooms.

Table 2-17 provides more detailed information about the nature and extent of the deficiencies which caused the light and ventilation component to be failed so frequently at both sites. The cells outlined in the upper left-hand corner of the matrix represent failure of the component due to a single deficiency. Combined, the single deficiency cells account for approximately 45 percent of all light and ventilation failures in Pittsburgh. Examining the marginals of the matrix, it is clear that no single room and no single type of deficiency can be identified as the primary reason for light and ventilation failures in Pittsburgh. In general, these data suggest that the failure rate for this component in Pittsburgh would be relatively insensitive to change in parts of the requirement. For example, if any one element were deemed unnecessary, say the window opening requirement were waived for the living room (the largest single deficiency cell), the number of units failing would be changed by only 9 percentage points. In order to dramatically change the fail rate, the requirements would have to be substantially changed,

[1] By definition this also means that bathrooms and kitchens that failed had no working ventilation systems.

[2] By definition this also means that there was no working ventilation system present.

Table 2-17

REASONS FOR FAILING LIGHT AND VENTILATION BY SITE

REASONS FOR FAILING	LIVING ROOM ONLY	BATHROOM ONLY	KITCHEN ONLY	ANY TWO ROOMS	ALL THREE ROOMS	TOTAL
PITTSBURGH						
No window or ventilation system in one or more core rooms[a]	--% (5)	4% (44)	--% (6)	5%[d] (51)	4%[d] (36)	15% (142)
Each core room has one or more windows.						
Fails area only[b]	8 (76)	5 (48)	6 (61)	3 (31)	-- (5)	23 (221)
Fails opening only[c]	9 (83)	7 (67)	6 (56)	11 (103)	3 (31)	35 (340)
Fails both	1 (12)	3 (25)	1 (7)	12 (120)	9 (91)	27 (255)
Total	18% (176)	19% (184)	14% (130)	32% (305)	17% (163)	100% (958)
PHOENIX						
[illegible]	[illegible] (1)	[illegible] (40)	[illegible] (3)	[illegible] (50)	[illegible] (45)	[illegible] (139)
[illegible]	[illegible] (55)	[illegible] (229)	[illegible] (64)	[illegible] (99)	[illegible] (22)	[illegible] (469)
[illegible]	[illegible] (62)	[illegible] (126)	[illegible] (12)	[illegible] (233)	[illegible] (10)	[illegible] (453)
Fails both	-- (6)	3 (29)	1 (13)	14 (134)	10 (109)	30 (291)
Total	12% (124)	30% (317)	10% (104)	31% (332)	17% (180)	100% (1,057)

SAMPLE. All enrolled households whose units failed the light and ventilation requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

NOTE: Cells in upper left corner represent failures due to single deficiency.

a. Note that a working ventilation system can substitute for a window in bathrooms and kitchens but not living rooms.

b. Some bathroom and kitchen cells also mean that there is no working ventilation system.

c. This also means that there is no working ventilation system.

d. Includes cases in which at least one room fails for missing windows and other rooms fail [illegible]

resulting in a version of this requirement significantly weaker than those found in the APHA and local codes.

The data for Phoenix tell a somewhat different story. The single deficiency cells account for approximately 47 percent of light and ventilation failures, about the same proportion as that observed in Pittsburgh. However, note that the failure of window area in the bathroom alone contributes 21 percentage points of all the light and ventilation failures in Phoenix. This deficiency is far more prominent than those represented by any of the other single deficiency cells at either site. The importance of this cell is also reflected in the marginals of the matrix. The causes of failure are more concentrated in a single room (bathroom only) and a single type of deficiency (window area only) than was true in Pittsburgh.[1] Consequently, the light and ventilation failure in Phoenix would be more sensitive to changes in requirements. By eliminating the window adequacy requirement in the bathroom alone, the failure rate for this component would be lowered by 21 percentage points.

The actual measurements of window and floor area by room were coded for a subsample of the households enrolled in the Demand Experiment. Table 2-18 displays the ratios of window area to floor area for the units in the sample that failed the window adequacy requirement. At both sites, in the cases where window adequacy was failed, the ratio of window area to floor area is usually a good deal below the 10 percent level. Over three-fourths of the observations have ratios below 8 percent. Therefore, in order to dramatically affect the fail rate for the units in this sample, the 10 percent requirement would have to be changed substantially.

Table 2-19 presents additional sample data comparing characteristics of the rooms that failed window adequacy with rooms that passed. In general, the rooms that failed the requirement had only slightly greater floor area but substantially less window area than those that passed. Thus, the mean ratios for units failing the window adequacy requirement was considerably lower than ratios for units that passed. In Phoenix, the average ratios of window area to floor area for bathrooms that passed the requirement barely exceeded the 10 percent requirement. Part of the explanation for

[1]This finding is consistent with the fact that the Phoenix housing code considered bathroom windows that did not meet the 10 percent requirement, but which were at least three square feet to be adequate. The Pittsburgh code had no such exception to the 10 percent requirement.

Table 2-18

DISTRIBUTION OF RATIOS OF WINDOW-TO-FLOOR AREA IN ROOMS WITH WINDOWS OF INADEQUATE SIZE

ROOM	PERCENTAGE OF CASES WITH RATIO OF: 0 - 0.049	0.050- 0.079	0.080- 0.099	Above 0.10[a]	SAMPLE SIZE
		PITTSBURGH			
Living room	10%	66%	22%	2%	(59)
Bathroom	33	53	10	4	(46)
Kitchen	10	63	26	1	(66)
		PHOENIX			
Living room	19%	52%	27%	2%	(37)
Bathroom	21	64	11	4	(95)
Kitchen	39	45	16	0	(51)

SAMPLE: Subsample of enrolled households for which window area measurements were coded that had windows present but of inadequate size, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form.

a. Includes cases where window-to-floor area ratio is less than 0.10 but there is adequate natural light from an adjacent room (for example, through a large archway between the rooms or through large interior windows facing an enclosed porch).

Table 2-19

AVERAGE FLOOR AREA, WINDOW AREA, AND RATIO OF THE TWO BY STATUS ON WINDOW ADEQUACY

ROOM	STATUS	FLOOR AREA	WINDOW AREA	RATIO	SAMPLE SIZE
		PITTSBURGH			
Living room	Pass	183.5	25.5**	0.139**	(358)
	Fail	193.5	13.8	0.071	(59)
Bathroom	Pass	39.8	7.4**	0.176**	(371)
	Fail	44.3	2.6	0.065	(46)
Kitchen	Pass	124.4*	18.3**	0.147**	(351)
	Fail	143.0	9.9	0.069	(66)
		PHOENIX			
Living room	Pass	189.0	28.4**	0.154**	(332)
	Fail	183.0	12.9	0.069	(37)
Bathroom	Pass	38.8**	4.4**	0.118**	(274)
	Fail	46.2	3.0	0.067	(95)
Kitchen	Pass	104.4	14.5**	0.137**	(318)
	Fail	109.9	6.2	0.058	(51)

SAMPLE: Subsample of enrolled households for which window area measurements were coded, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

* Difference between the means of rooms that passed and those that failed significant at the 0.05 level.

** Difference between the means of rooms that passed and those that failed significant at the 0.01 level.

the relatively small bathroom window area in Phoenix can be traced to the specifications of the housing code for that city. The average window area of three square feet for bathrooms that failed in Phoenix (see Table 2-19), therefore, suggests that some of these cases actually met the local code requirements and that the program requirement may have been overly stringent, given the local code requirements.

The light and ventilation requirement was also the largest source of single component failures. Forty-one percent of all failed units in Pittsburgh and 35 percent in Phoenix failed solely on the basis of this component. Detailed information about the deficiencies present in units failing only light and ventilation is contained in Table 2-20. The distribution of cases basically parallels the light and ventilation data presented for all households that failed the requirement (see Table 2-17). In Pittsburgh, single deficiencies accounted for 57 percent of the units in the matrix. This represents 23 percent of all households failing the requirements at that site. Again, no specific room or type of deficiency can be singled out as the primary reason for the failures. Single deficiencies accounted for 68 percent of the units in Phoenix. Failure of window area in only the bathroom accounts for 39 percent of all the single-component failures in Phoenix and for 14 percent of all the units that failed at that site; thus, the overall failure rate on physical housing requirements in Phoenix would have been 10 points lower if there had been no window area requirement in the bathroom. However, extrapolating from the sample data in Table 2-18 if this requirement had merely been lowered to 8 percent, the overall failure rate would have been only about 2 points lower. If it had been 3 square feet, the reduction would have been about 5 points.

Another means of assessing the impact and seriousness of the light and ventilation failures is to compare the evaluators' overall ratings for those units that failed only light and ventilation and those that failed one or more other components; this is done in Table 2-21. Relatively few units that passed the Minimum Standards physical requirements were rated poorly. In Pittsburgh, 23 percent of the units that failed only the light and ventilation component were classified as requiring major repairs, and none was judged to be unfit for habitation. In contrast, 54 percent of the units that failed other components were rated as needing major repair and 2 percent were considered unfit.

Table 2-20

REASONS FOR SINGLE COMPONENT LIGHT AND VENTILATION FAILURES

REASONS FOR FAILING	LIVING ROOM ONLY	BATHROOM ONLY	KITCHEN ONLY	ANY TWO ROOMS	ALL THREE ROOMS	TOTAL
			PITTSBURGH			
No window or ventilation system in one or more core rooms[a]	1% (4)	4% (17)	1% (4)	3%[d] (16)	2%[d] (10)	11% (51)
Each core room has one or more windows.						
Fails area only[b]	10 (46)	6 (30)	8 (38)	3 (13)	1 (4)	28 (131)
Fails opening only[c]	12 (55)	8 (39)	7 (31)	10 (46)	2 (12)	39 (183)
Fails both	1 (5)	2 (8)	-- (2)	11 (53)	7 (35)	22 (103)
Total	24% (110)	20% (94)	16% (75)	27% (128)	13% (61)	100% (468)
			PHOENIX			
No window or ventilation system in one or more core rooms[a]	--% (0)	3% (14)	1% (3)	3%[d] (13)	1%[d] (3)	8% (33)
Each core room has one or more windows						
Fails area only[b]	8 (36)	39 (166)	7 (31)	11 (99)	1 (6)	67 (288)
Fails opening only[c]	7 (31)	2 (9)	1 (3)	1 (4)	-- (2)	11 (49)
Fails both	-- (1)	2 (9)	1 (4)	6 (26)	4 (17)	13 (57)
Total	16% (68)	46% (198)	10% (41)	22% (92)	6% (28)	100% (427)

SAMPLE: All enrolled households whose units failed only the light and ventilation requirements at enrollment, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

NOTE. Cells in upper left corner represent failures due to single deficiency.

a. Note that a working ventilation system can substitute for a window in bathrooms and kitchens but not living rooms.

b. For bathroom and kitchen this also means that there is no working ventilation system.

c. This also means that there is no working ventilation system.

d. Includes cases in which at least one room fails for missing windows and other rooms fail window adequacy and/or opening.

Table 2-21

OVERALL EVALUATOR RATINGS ON UNITS THAT PASSED THE REQUIREMENTS, FAILED ONLY LIGHT AND VENTILATION, AND FAILED OTHER COMPONENTS

STATUS OF UNIT	EVALUATOR OVERALL RATING				
	GOOD	MINOR REPAIR	MAJOR REPAIR	UNFIT	TOTAL
		PITTSBURGH			
Pass physical requirements	25% (123)	66% (322)	9% (46)	--	30% (491)
Fail light and ventilation only	8 (35)	69 (324)	23 (109)	--	29 (468)
Fail other components	4 (25)	40 (269)	54 (358)	2 (14)	41 (666)
TOTAL	11% (183)	56% (915)	32% (513)	1% (14)	100% (1,625)
		PHOENIX			
Pass physical requirements	64% (340)	32% (169)	3% (17)	--	30% (526)
Fail light and ventilation only	42 (178)	50 (212)	9 (37)	--	24 (427)
Fail other components	6 (51)	29 (226)	48 (382)	16 (128)	45 (787)
TOTAL	33% (569)	35% (607)	25% (436)	7% (128)	100% (1,740)
		COMBINED SITES			
Pass physical requirements	46% (463)	48% (491)	6% (63)	--	30% (1,017)
Fail light and ventilation only	34 (213)	60 (536)	16 (146)	--	26 (895)
Fail other components	5 (76)	34 (495)	51 (740)	4 (142)	43 (1,453)
TOTAL	22% (752)	45% (1,522)	28% (949)	4% (142)	100% (3,365)

SAMPLE: All enrolled households, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

The difference in ratings between those failing only light and ventilation and those failing other components is even more dramatic in Phoenix. Only 9 percent of the single-component failures were rated as needing major repair, and none was judged to be unfit. On the other hand, 48 percent of the units failing other components were rated as needing major repairs, and 16 percent were rated as unfit.

Thus, detailed examination of the individual components confirms the conjecture of Section 2.2 that the light and ventilation requirement may have been somewhat stringent.[1] Particularly in Phoenix, the local code provision for a window of three square feet in the bathroom, instead of the 10 percent standard, should probably have been allowed.

[1] It should be noted, however, that a standard with a less stringent light and ventilation requirement would not necessarily result in a higher pass rate. In the simulation of the Section 8 Existing Housing criteria presented in Appendix II, the failure rate is similar to that obtained using the Demand Experiment standards, even though the Section 8 light and ventilation criteria are less stringent.

CHAPTER 3

THE MINIMUM STANDARDS OCCUPANCY REQUIREMENTS

During the 19th and early 20th century the practice of cramming several families and unrelated individuals into crowded tenement houses was quite common. While this situation is no longer an important contributor to the housing problem, crowding continues to be an issue of major concern to policymakers. The Housing and Community Development Act of 1974 defines dwelling units with more than 1.0 persons per room as crowded. Although this standard is still used, results of a number of studies suggest that it may be preferable to relate household size to the number of available bedrooms or sleeping rooms rather than to the total number of rooms. According to the current census definition, a unit is considered to be crowded if there are more than two persons per available bedroom in the dwelling unit. Likewise, Section 8 Acceptability Criteria specify a maximum of two persons per sleeping room. The occupancy requirement used in the Demand Experiment was based on persons per bedroom. That requirement is described below in Section 3.1; Section 3.2 reports the incidence of failure of the occupancy requirement for households at enrollment.

3.1 THE OCCUPANCY REQUIREMENT

In order to satisfy the Demand Experiment program occupancy requirement, there had to be no more than two persons per "adequate" bedroom.[1]

Thus, meeting the occupancy requirements depended not only on the number of people per bedroom but, through the concept of adequate bedrooms, involved

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[1] The actual requirement for various household sizes were:

1 or 2 persons:	efficiency or 1 bedroom
3 or 4 persons:	2 bedrooms
5 or 6 persons:	3 bedrooms
7+ persons:	4 bedrooms

Program rules were altered as of November 1974 to limit the standard to a maximum requirement of four bedrooms, consistent with the Housing Gap payment schedule, which does not increase for family size over eight. Roomers and boarders are added to household size when determining whether a household meets occupancy standards, because all of the rooms in the dwelling unit are taken into account.

several quality criteria as well. A bedroom was considered adequate if it could be completely closed off from other rooms and if it met each of the following physical requirements:

> The structure and surface of walls, ceilings, and floor must not be in need of replacement
>
> There had to be adequate natural light and ventilation (window area equal to at least 10 percent of floor area and either at least one openable window or a working air conditioning unit)
>
> The ceiling had to be at least seven feet in height across at least one half the bedroom area
>
> There had to be adequate electrical service (two or more working outlets or one such outlet and a working wall or pull-chain switch for overhead light).

As part of the physical housing standards, the structure and surface requirements were applied directly to all rooms in the dwelling unit, including bedrooms. There is thus complete overlap between this part of the physical and occupancy requirements. However, requirements concerning electrical service, ceiling height, and light and ventilation were applied only to core rooms (living room, bathroom, and kitchen) for the physical requirements. Thus, failure of one or more of these components only affected the adequacy of a bedroom for the occupancy requirement.

3.2 RESULTS ON MEETING OCCUPANCY REQUIREMENTS

Table 3-1 indicates how households fared on the program occupancy standards at enrollment. Just over half the households (52 percent in Pittsburgh and 57 percent in Phoenix) failed the occupancy requirement. Of those units that failed the Demand Experiment occupancy standard, 58 percent would have passed a standard that was limited to only requiring two persons per bedroom, with no quality criteria. Thus only about one-quarter of the enrollees would have failed a requirement that concerned only sufficient space.

Table 3-2 indicates the impact of the occupancy standards on the overall Minimum Standards failure rate. About one-fifth of the enrollees satisfied both sets of requirements. Of those that did not meet the Minimum Standards requirements, 70 percent failed the occupancy requirement. However, only about 11 percent of the Minimum Standards failures were due solely to a

Table 3-1

OUTCOMES ON OCCUPANCY REQUIREMENTS AT ENROLLMENT

STATUS	PITTSBURGH	PHOENIX	COMBINED SITES
Passed occupancy requirements	48%	43%	45%
Failed occupancy requirements	52	57	54
SAMPLE SIZE	(1,625)	(1,742)	(3,367)

SAMPLE: All enrolled households excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form and Initial Household Report Form.

Table 3-2

JOINT STATUS OF ENROLLEE UNITS ON THE PHYSICAL HOUSING AND OCCUPANCY REQUIREMENT

STATUS	PITTSBURGH	PHOENIX	COMBINED SITES
Passed physical; passed occupancy	20%	22%	21%
Failed physical; passed occupancy	28	21	24
Passed physical; failed occupancy	10	9	9
Failed physical; failed occupancy	42	48	46
SAMPLE SIZE	(1,625)	(1,742)	(3,367)

SAMPLE: All enrolled households excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form and Initial Housing Report Form.

failure to meet the program occupancy requirement. As is indicated in Table 3-3, 56 percent of those that failed only the occupancy requirement met the two persons per bedroom portion of the requirement but one or more of those bedrooms did not meet the physical adequacy requirements. Thus, approximately 6 percent of the enrolled households did not meet the Minimum Standards requirements solely because of bedroom adequacy.

In summary, most of the households (89 percent) that did not meet the occupancy requirement also had physical housing deficiencies that caused their units to fail the physical requirements. The program occupancy requirement alone accounted for only 11 percent of the Minimum Standards failure rate for all enrollees. Six percent failed solely because of the adequacy requirements; the other 5 percent did not have a sufficient number of bedrooms.

Furthermore, Table 3-4 indicates that about 91 percent of this group fell within the 1974 Housing and Community Development Act definition of crowded (more than 1.0 person per room). Only 9 percent of this 5 percent (or 13 households) would have passed rather than failed if the definition from the 1974 Act had been substituted for the Minimum Standards occupancy requirement.

Table 3-3

STATUS ON TWO PERSONS PER BEDROOM MEASURE FOR HOUSEHOLDS THAT FAILED ONLY THE PROGRAM OCCUPANCY REQUIREMENT

STATUS	PITTSBURGH	PHOENIX	COMBINED SITES
Passed occupancy requirements	60%	53%	56%
Failed occupancy requirements	40	47	44
SAMPLE SIZE	(161)	(156)	(317)

SAMPLE: All enrolled households that failed only the program occupancy requirement, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form and Initial Household Report Form.

Table 3-4

INCIDENCE OF CROWDING FOR HOUSEHOLDS THAT HAD MORE THAN TWO PERSONS PER BEDROOM AND FAILED MINIMUM STANDARDS SOLELY BECAUSE OF THE OCCUPANCY REQUIREMENT

PERSONS PER ROOM	PITTSBURGH	PHOENIX	COMBINED SITES
Less than 1	19%	1%	9%
1 - 1.5 (crowded)	75	89	83
More than 1.5 (severely overcrowded)	6	10	8
SAMPLE SIZE	(65)	(73)	(138)

SAMPLE: All enrolled households that failed Minimum Standards solely because of the occupancy requirement and had more than two persons per bedroom, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCES: Housing Evaluation Form and Initial Household Report Form.

CHAPTER 4

SUMMARY

Housing evaluations were performed on all housing units at the time households agreed to enroll in the Demand Experiment. The analysis in this report has focused on the physical and occupancy standards that those units were measured against and on the nature of the deficiencies that caused a substantial number of units to fail the requirements. The pass/fail status on these program requirements is a basic variable used in a number of the Demand Experiment reports; the material presented in Chapters 2 and 3 of this report provides descriptive documentation on the standards and what it meant to pass (or fail) them.

The program standards were based primarily on a national model code--the American Public Health Association - Public Health Service Recommended Housing Maintenance and Occupancy Ordinance. The physical requirements were grouped into 15 components covering basic housing services, safety features, structure and surface condition, and other indicators of housing condition. The majority of these requirements were included in the physical housing deprivation measure used in Demand Experiment analyses. The fact that over two-thirds of the enrollment units did not pass the requirements suggests that the standard is relatively stringent; low- and moderate-income rental housing in Pittsburgh and Phoenix contained a large number of units that did not meet this modified version of a model national code. It may also raise the possibility that many adequate, standard units did not meet the requirements because of trivial or inconsequential items.

More than one-third of the units that failed the physical requirements lacked one or more basic housing services. The services that were required --plumbing, kitchen facilities, lighting fixtures, and electrical equipment-- are commonly found in housing codes and housing program standards. Structural and surface defects in walls, ceilings, floors, and roofs were found in one-third of the units; these kinds of deficiencies were three times as prevalent in Phoenix as in Pittsburgh. These items as a group indicate the extent of dilapidation, whether the unit is weathertight, and if surfaces are so severely damaged as to require replacement. Just over one-fifth

of the units had one or more safety hazards present. The requirements contained only two safety feature components: adequate fire exits and safe heating equipment. These represent a small set of the potential safety hazards that are often present in low- and moderate-rent units and that are included in other housing standards.

The residual category of other indicators of housing condition had a failure rate more than twice as high as any of the others. The light and ventilation requirement, which covered window presence, size, and opening, was not met by more than four-fifths of the units that failed the physical requirements. Of those households that failed only one of the 15 components (nearly half of the combined site sample), nearly all failed the light and ventilation requirement. Over 80 percent of the units that failed the program physical standard but received an overall rating that indicated the unit was in good condition failed light and ventilation.

In Phoenix, one item in one room alone accounted for 14 percent of all the units that failed the physical standard at that site (bathroom window area). This requirement had the greatest overall impact on the stringency of the Minimum Standards physical requirements; it was also an item that was not financially trivial to remedy. If another housing program were to base its standards on those used in the Demand Experiment, the items in this component should be examined most closely to assess their contribution to the overall standard of adequacy being sought.

If the light and ventilation component were eliminated entirely, the failure rate for the two sites would have been 25 points lower (or 45 percent rather than 70 percent). However, few would deny the need for a requirement for some minimum level of light and ventilation in an adequate unit; the problem is one of setting a defensible standard that can be equitably and inexpensively administered. If the standard were reduced to an 8 percent ratio of window-to-floor area, the rate would be reduced by about one-fifth. If the ratio had been 5 percent, there would have been about a four-fifths reduction. Thus, while it is clear that the stringency of this component could be relaxed, the impact of a change would depend upon the alternative standard that was selected and upon the housing stock being evaluated.

The Demand Experiment housing standard also contained an occupancy requirement of no more than two persons per adequate bedroom. Just over half the enrolled households failed this requirement. However, only 11 percent of the Minimum Standards failures were due to the occupancy requirement alone; the remaining households that did not meet that requirement also had physical housing deficiencies. If the crowding standard used in the Housing and Community Development Act of 1974 (one person or less per room) had been used as the program standard, only 13 more households (or less than 1 percent of the overall sample) would have passed Minimum Standards.

Returning to the issues raised in Chapter 1, the items that caused households to fail the program requirements were generally not trivial to repair or remedy. Focusing on the largest cause of failure, light and ventilation, the majority of units did not pass the requirement because of inadequate window size, which is not cheap to remedy. However, two-fifths of those that failed had windows which would not open properly. This might involve only the replacement of window cords or sashes; unfortunately, the data do not indicate the precise nature of the deficiency, making it impossible to determine the nature of necessary repairs. Other items that accounted for a large proportion of failures--such as wall and ceiling surfaces that needed replacement, incomplete plumbing facilities, and inadequate ceiling height--all represent deficiencies that are generally not trivial to remedy. There were other items that may have had a relatively low cost-to-repair --plumbing and kitchen facilities in disrepair (which did not pass in 11 and 3 percent of the failed units, respectively), and electrical service in the living room (7 percent). However, the data do not present sufficient detail on the nature of the deficiencies to allow accurate estimates of the cost to repair. It is clear that most of the units that failed the standards could not have been cheaply repaired.

The remaining question, then, is whether failure of the program standard did in fact reflect the adequacy of the unit as a decent, safe, and sanitary dwelling. Reasonable people might differ on whether the criteria for several of the components should have been more or less stringent, should have left more or less interpretation to the judgment of the professional evaluators, or even whether the component should have been included in the requirements at all. Since there exists no public or professional consensus as to what constitutes adequate housing, there are no recognized

arbiters for such disagreements. One issue that does surface in examining the results from the Demand Experiment is whether a program standard adopted for use across a number of jurisdictions should be framed to allow some flexibility for local adaptation. The case in point in this report is the bathroom window size requirement in Phoenix. If the program standard had allowed for the substitution of local code requirements (three square feet of window area rather than the 10 percent ratio of window-to-floor area), which had the same objectives as the program requirements, the physical standard failed rate at that site would have been reduced by about 5 points. Although varying requirements by locality would not have been appropriate in the experimental setting of the Demand Experiment, the approach used in the Section 8 Existing Housing program, whereby local requirements are set that operationalize national acceptability criteria, appears to be desirable for ongoing programs.

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 PIT = 45 PHX = 36			
b = 0.25	$1.2C^*$	Plan 1 PIT = 33 PHX = 30	Plan 4 PIT = 34 PHX = 24	Plan 7 PIT = 30 PHX = 30	
	C^*	Plan 2 PIT = 42 PHX = 35	Plan 5 PIT = 50 PHX = 39	Plan 8 PIT = 44 PHX = 44	Plan 12 PIT = 63 PHX = 40
	$0.8C^*$	Plan 3 PIT = 43 PHX = 39	Plan 6 PIT = 44 PHX = 35	Plan 9 PIT = 43 PHX = 35	
b = 0.35	C^*	Plan 11 PIT = 41 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 PIT = 28 PHX = 21	Plans 14 - 16 PIT = 109 PHX = 81	Plans 17 - 19 PIT = 113 PHX = 86	Plans 20 - 22 PIT = 92 PHX = 84	Plan 23 PIT = 65 PHX = 46

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

CONTROLS.

With Housing Information	Without Housing Information
Plan 24 PIT = 159 PHX = 137	Plan 25 PIT = 162 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

LIMITED COMPARISON OF THE MINIMUM STANDARDS PHYSICAL REQUIREMENTS WITH OTHER MEASURES

In Chapter 2, the program physical standards were compared to the measure of physical housing deprivation developed in Budding (1978). This appendix presents a limited comparison to two other measures of physical housing condition: Minimum Standards Low and the Section 8 acceptability criteria.

II.1 MINIMUM STANDARDS LOW

Minimum Standards Low is another descriptive measure of physical housing condition used in some Demand Experiment analyses.[1] The most basic Minimum Standards components were included in Minimum Standards Low:

Complete plumbing
Complete kitchen facilities
Heating equipment
Roof structure
Exterior wall structure and surface.[2]

If a unit failed one or more of these components it failed Minimum Standards Low. It was a less stringent measure than Minimum Standards, using fewer of the requirements, and substantially fewer households failed to meet those requirements. As shown in Table II-1, 25 percent of the units (21 percent in Pittsburgh and 29 percent in Phoenix) did not pass that standard. In Table II-2 the components are ranked according to the frequency with which they were failed. In Pittsburgh, complete plumbing was failed far more frequently than any other component, with 82 percent of the units having plumbing deficiencies. Approximately 15 percent of the units failed complete kitchen facilities and heating equipment. Relatively few units had deficiencies on the roof structure (4 percent) or exterior walls (3 percent) components. In Phoenix, more than half the units that failed Minimum Standards Low did not pass the heating equipment and complete plumbing components

[1] Minimum Standards Low was never used in the program operations of the Demand Experiment.

[2] Refer to Chapter 2 for a detailed description of the requirements specified by each of these components.

Table II-1

STATUS OF ENROLLEE UNITS ON MINIMUM STANDARDS LOW

	PITTSBURGH	PHOENIX	COMBINED SITES
Passed Minimum Standards Low	79%	71%	75%
Failed Minimum Standards Low	21	29	25
SAMPLE SIZE	(1,625)	(1,742)	(3,367)

SAMPLE: All enrolled households, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

Table II-2

RANKING OF COMPONENTS BY FREQUENCY OF
FAILURE FOR UNITS THAT FAILED MINIMUM STANDARDS LOW

RANK	COMPONENT	FREQUENCY	PERCENTAGE
	PITTSBURGH		
1	Complete plumbing	(277)	82%
2	Complete kitchen facilities	(54)	16
3	Heating equipment	(52)	15
4	Roof structure[a]	(14)	4
5	Exterior wall condition	(9)	3
SAMPLE SIZE		(339)	
	PHOENIX		
1	Heating equipment	(311)	61%
2	Complete plumbing	(287)	57
3	Exterior wall condition	(134)	26
4	Complete kitchen facilities	(78)	15
5	Roof structure[a]	(61)	8
SAMPLE SIZE		(507)	

SAMPLE: All enrolled households whose units failed Minimum Standards Low at the initial housing evaluation, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

a. Applied only to units where the roof was visible.

(61 percent and 57 percent, respectively). Exterior walls was failed by 26 percent. Complete kitchen facilities ranked fourth with a failure rate of 15 percent, and 8 percent had difficulties with roof structure.

Table II-3 shows the number of Minimum Standards Low components failed at the initial evaluation. The proportion of units that did not pass the standard because they failed more than one component was a good deal higher in Phoenix than in Pittsburgh. Eighty-two percent of the units in Pittsburgh and 53 percent of those in Phoenix failed only one of the five components. Plumbing deficiencies were responsible for the most (65 percent) single-component failures in Pittsburgh, while inadequate heating equipment was the largest contributor (24 percent) to single-component failures in Phoenix. Sixteen percent of the units in Pittsburgh and 29 percent of those in Phoenix failed two components. Only 2 percent of the units in Pittsburgh failed three or more components, as compared to 17 percent of the units in Phoenix.

II.2 APPROXIMATION OF THE SECTION 8 ACCEPTABILITY CRITERIA

The current Section 8 Existing Housing program includes a set of physical housing requirements that define housing which is acceptable for rental by its participants. Table II-4 indicates the items contained in the Section 8 acceptability criteria and how they compare to the program Minimum Standards. Using data from the Housing Evaluation Forms, variables were derived to approximate the Section 8 criteria.

A comparison of just the number of items suggests that the Section 8 acceptability criteria are more comprehensive than the program Minimum Standards. The Section 8 proxy, therefore, might be expected to have a failure rate at least as high as, and maybe higher than, that observed for the program requirements. It should also be noted, however, that some of the specific program requirements were actually more stringent than those included in the Section 8 standard. For example, while Section 8 acceptability criteria did require that the unit have adequate natural light, there was no provision concerning adequate window area comparable to that included in the Demand Experiment. As shown in Table II-5, the two standards produce comparable

Table II-3

DISTRIBUTION OF NUMBER OF
MINIMUM STANDARDS LOW COMPONENTS FAILED

	PITTSBURGH	PHOENIX	COMBINED SITES
Failed 1	82%	53%	65%
Complete plumbing	65	20	38
Complete kitchen facilities	5	2	3
Heating Equipment	8	24	18
Roof structure	2	1	1
Exterior wall condition	2	5	4
Failed 2	16	29	24
Failed 3 or more	2	17	11
SAMPLE SIZE	(339)	(507)	(846)

SAMPLE: All enrolled households whose units failed Minimum Standards Low at the initial housing evaluation, excluding those with enrollment incomes over the eligibility limits.

DATA SOURCE: Housing Evaluation Form.

Table II-4

COMPARISON OF ITEMS INCLUDED IN MINIMUM STANDARDS PHYSICAL REQUIREMENTS AND IN SECTION 8

ITEMS COVERED IN MSP AND SECTION 8	ITEMS COVERED IN MSP ONLY	ITEMS COVERED IN SECTION 8 ONLY
• Completely equipped bathroom (with approved drainage)[b]	• Ceiling height	• Adequate space for food storage and preparation[d]
• Completely equipped kitchen[a]		• Adequate facilities for disposal of food wastes[d]
• All core rooms present[a]		• Exterior door lockable[c]
• Adequate heating facilities[b]		• Adequate cooling[c]
• Adequate natural light[b]		• Unit free of vermin and rodents[b]
• Adequate ventilation[b]		• Condition of exterior stairways, halls, and porches[a]
• Adequate light fixtures[b]		• Free of lead based paint[e]
• Adequate electrical outlets[a]		• Unit has its own access[a]
• Interior of unit sound and with good surface conditions[a]		• Site and neighborhood conditions adequate[d]
• Exterior of unit sound and with good surface conditions[a]		• Sanitary water supply[e]
• Adequate exits[a]		
• One bedroom for every two persons[a]		

a. Able to do a good approximation of this Section 8 criterion.
b. Able to do a good to fair approximation of this Section 8 criterion.
c. Able to do a fair approximation of this Section 8 criterion.
d. Able to do only a fair to poor approximation of this Section 8 criterion.
e. Unable to approximate this criterion.

Table II-5

JOINT RATING ON THE MINIMUM STANDARDS REQUIREMENTS AND APPROXIMATED SECTION 8 ACCEPTABILITY CRITERIA

	PASS SECTION 8	FAIL SECTION 8	TOTAL
	PITTSBURGH		
Pass Minimum Standards	11%	10%	21%
Fail Minimum Standards	11	68	79
TOTAL	21%	79%	100%
	PHOENIX		
Pass Minimum Standards	17%	5%	22%
Fail Minimum Standards	18	60	78
TOTAL	34%	65%	100%
	COMBINED SITES		
Pass Minimum Standards	14%	8%	22%
Fail Minimum Standards	14	64	78
TOTAL	28%	72%	100%

SAMPLE: All enrolled households.

DATA SOURCES: Housing Evaluation Form and Initial Household Report Form.

failure rates.[1] In Pittsburgh, 79 percent of the enrolled units would have failed the approximated Section 8 standard at the time of the initial housing evaluation. This is exactly the same percentage of units that actually failed Minimum Standards. In Phoenix, 65 percent failed the Section 8 proxy as compared to 78 percent failing Minimum Standards. The gap between the two standards in Phoenix is at least partly attributable to the fact that many units failed Minimum Standards solely on the basis of bathroom window area at that site (see Table 2-20). As previously mentioned, the Section 8 acceptability criteria (and the approximated version used here) contain no specific requirements concerning window area.

The comparison between the Demand Experiment housing requirements and the Section 8 acceptability criteria included in this appendix is crude at best. Some items are covered in both standards, but given more explicit definition in Minimum Standards. On the other hand, the Section 8 standard includes items not covered by Minimum Standards. These caveats notwithstanding, the comparison shows the overlap in classification to be about 80 percent, considering both physical housing condition and occupancy.

[1] This comparison is based on a slightly different sample from the analysis in the text in that households with incomes over the income eligibility limits have not been excluded.

APPENDIX III

HOUSING EVALUATION FORM

Information on the physical characteristics of dwelling units was collected on the Housing Evaluation Form; a copy of that form is reproduced on the pages that follow.

Approval of OMB not Required SERIAL NO 12431

Housing Evaluation Form

1. HH# ☐-☐☐☐☐-☐☐-☐

2. Name _____

3. Address _____ (No / Street / Apt.#)

_____ (City / State / Zip)

Phone # _____

COMMENTS AND DIRECTIONS

_____

_____

_____

4 Quality Control
1 ( ) Yes
2 ( ) No

5. Date Evaluation Requested
☐☐ (month) ☐☐ (day) 197☐ (year)

6. Type of Evaluation
1 ( ) Initial
2 ( ) Pre-Move
3 ( ) Post-Move
4 ( ) Upgrading
5 ( ) Annual
6 ( ) Post-Move M S
7 ( ) Pre-Enrollment
8 ( ) Special

7. Census Codes
Tract ☐☐☐☐ ☐☐
Block Group ☐☐☐

8. Access
1 ( ) Direct
2 ( ) Through another unit

9. Type of Building
1 ( ) One single family house detached from any other
2 ( ) One single family house but attached to other houses
3 ( ) Semi detached or duplex
4 ( ) 2 unit structure
5 ( ) 3 unit structure (multi)
6 ( ) 4 unit structure (multi)
7 ( ) 5 or more unit structure (multi)
8 ( ) Unit is mobile home or trailer

10. Travel Time
☐☐☐ Minutes

11. Time Started
☐☐ ☐☐ AM PM

12. M S Physical
1 ( ) Yes
2 ( ) No

13. Number of Adequate Bedrooms ☐

14. Date Evaluation Completed
☐☐ (month) ☐☐ (day) 197☐ (year)

15. Completed by
Evaluator ID# ☐☐☐

LOG OF PHONE CALLS TO MAKE APPOINTMENT

Date of Call	Time of Call	Name of Caller	Result of Attempt: No Ans	Busy	Call Later	Appt Made (Date/Time)	Other

LOG OF VISITS TO UNIT

Date	Time	Evaluator's Name	ID#	ATTEMPT: No one home	RESULT: HH Refused	Let in by

H-1-3A
HUD Approval Date 16 Apr 1973

OTHER ROOMS: Number of Other Rooms ☐

PART A DWELLING UNIT INTERIOR

1 Room Information	LR	BTH	KCN	BDR	Location ____ Type ☐	Location ____ Type ☐	Location ____ Type ☐	Location ____ Type ☐
• Presence	( )	( )	( )	( )				
• Length	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
• Width	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐	☐☐
• Area	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐	☐☐☐
• Regular	( )	( )	( )	( )	( )	( )	( )	( )
2 Window Adequacy	( )	( )	( )	( )	( )	( )	( )	( )
• Window Opening	( )	( )	( )	( )	( )	( )	( )	( )
• Ventilation System		( )	( )					
3 Ceiling Height	( )	( )	( )	( )	( )	( )	( )	( )
4. Number of Outlets	☐		☐	☐	☐	☐	☐	☐
5 Switches								
• Presence	( )			( )	( )	( )	( )	( )
• Working	( )			( )	( )	( )	( )	( )
6 Fixtures								
• Presence		( )	( )					
• Working		( )	( )					
	LR	BTH	KCN	BDR				

OTHER ROOMS

Location _____ Location _____ Location _____ Location _____

Type _____ Type _____ Type _____ Type _____

	LR	BTH	KCN	BDR				
7. Ceiling Structure								
8 Ceiling Surface								
9. Wall Structure								
10 Wall Surface								
11. Floor Structure								
12 Floor Surface								
13 Window Condition								

For Pre-Move Evaluation Only

Tenant Supplied
- Cooking Stove or Range ( ) Omit 14A
- Refrigerator ( ) Omit 14B

14 Kitchen Accessories	Presence	Working
A Cooking Stove or Range	( )	( )
B Refrigerator	( )	( )
C Kitchen Sink	( )	( )
D Hot Running Water	( )	( )
E Counter Space	( )	
F Shelving	( )	
G Dishwasher	( )	( )
H Garbage Disposal	( )	( )

15 Kitchen Sink ☐

"X" No Sink ( )

16a. Water Facilities	Presence	Working
A Private Toilet Facilities	( )	( )
B Shower or Tub	( )	( )
C Hot and Cold Running Water in Shower or Tub	( )	( )
D Wash Basin	( )	( )
E Hot and Cold Running Water in Wash Basin	( )	( )

16b Shower-Tub ☐

16c Condition ☐

16d Waterproof ☐

17 Room Arrangement ( )

18 Heating Equipment ☐

19 Heat Control ( )

COOLING EQUIPMENT

20 *Presence* ( )

21 *Type(s) & Numbers*

	Presence	Number
B Evaporation Cooler	( )	
C Central Air Conditioning	( )	
D Individual Air Conditioning Unit	( )	☐
E Window Fans	( )	☐
F Attic Fans	( )	☐

PART B· DWELLING UNIT EXTERIOR

PORCH(ES)

22a. Presence ( )

22b Number

- Covered ☐
- Uncovered ☐
- Enclosed ☐

22c Balcony Presence ( )

23 Adequate Exits ( )

24. Passageways ☐

25 Number of Stories ☐

26a Elevator Presence ( )

26b Elevator Working ( )

27. Floor Location ☐

QUESTIONS 23-27 APPLY TO MULTI UNITS ONLY

28. Evidence of Rats ( )

29 Exterior Wall Structure ☐

30 Exterior Wall Surface ☐

31. Roof Structure ☐
Not Observable ( )

32 Roof Surface ☐
Not Observable ( )

33 Roof Gutters ☐
Not Observable ( )
Not Needed ( )

34 Chimneys/Flues ☐
Not Observable ( )
Not Applicable ( )

35 Exterior Stairs ☐
No Stairs ( )

36 Overall Cleanliness ☐

37. When Built ☐

PART C NEIGHBORHOOD

38 Street Maintenance ☐
39 Street Lighting ( )
40 Pedestrian Walkways ( )
41 Landscaping ☐

42 Type of Street ☐
43 Street Litter ☐
44 Type of Building ☐

47 Abandoned Buildings ( )
48 Abandoned Cars ( )

45 Detrimental Features

- Noise _____
- Odor _____
- Physical Hazards _____
- Flooding _____
- Other _____

46 Beneficial Features

- Parklands _____
- Water _____
- Woodlands _____
- View _____
- Other _____

49 Overall Rating ☐

- Structural _____
- Safety or Fire _____
- Plumbing _____
- Other _____

Time Ended ☐☐:☐☐ AM PM

APPENDIX IV

THE ACCURACY OF HOUSING EVALUATIONS IN MEASURING MINIMUM STANDARDS

Apart from the criteria used in the Minimum Standards, there may also be some question about the accuracy of the measurements. The U.S. Census, for example, dropped interviewer ratings of units from the 1970 Census after determining that these ratings were extremely unreliable. A similar finding for the housing evaluations conducted in the Demand Experiment would raise serious issues for the interpretation of housing quality data and the effect of the Minimum Standards requirement.

The housing evaluations conducted in the Demand Experiment were based on well-documented standards and rigorous quality control. The standards themselves were carefully explained in the Housing Evaluator's Manual, which was itself updated from time to time to reflect situations that arose in the field. Evaluators were not allowed to perform independent evaluations until they had successfully evaluated test units in agreement with the Housing Supervisor's evaluation. In addition, approximately five to seven percent of the units evaluated in any month were re-evaluated by the Housing Evaluation Supervisor in each site throughout the experiment to assure continuing agreement in evaluation standards.[1] Finally, weekly conferences in each site were used to review each section of the Housing Evaluator's Manual on a regular basis and to discuss and document problems found in the field.

Despite these safeguards, it is reasonable to suppose that the housing evaluations did contain errors, so that units are not classified perfectly. One way

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[1] These units were selected at random based on comparison of Housing Evaluation Form numbers and a list of random numbers. Evaluators did not know which units had been selected until after they completed their evaluations, nor could the Housing Evaluation Supervisors examine the evaluator's results until after they had completed their quality control evaluation. Any discrepancy in ratings was reviewed with the evaluators so that evaluators were continually retrained to keep their ratings consistent with those of the Supervisor.

This procedure could still be subject to some drift in ratings over time. Attempts were made to guard against this by periodic reviews of site office evaluation ratings by Cambridge staff. In addition, of course, the presence of a Control group meant that drifts in ratings (or actual housing conditions) would be taken account of in analysis.

to estimate the extent of such errors is based on latent trait/errors in variables analysis. The specific latent trait model employed in this appendix assumes that each evaluator made mistakes in rating units that resulted in errors of classification. The key assumption is that the errors made by different evaluators are independent of one another and depend only on the true state of the unit. Because of this, repeated evaluations of the same unit can be used to estimate the frequency of errors and the underlying true proportions in each category. If, for example, we find that successive evaluators all rate a given set of units in the same way, we would be tempted to accept the evaluations as accurate. On the other hand, if successive evaluations are apparently only consistent to the extent that chance alone would predict, we would be tempted to regard the evaluations as hopelessly unreliable.[1]

Repeated observations on the same unit are available for households that did not move during the experiment. Every household unit was evaluated at enrollment and at least annually thereafter (as well as whenever the household moved). Thus the units of households that did not move were evaluated three times during the experiment--at enrollment and at the end of the first and second years after enrollment.[2] The only drawback is the length of time between successive evaluations. While the units may be the same, it is quite possible that they have been improved or have deteriorated enough to change their true classification. One approach to this would be to ignore this problem and allow changes in units actual condition to be included in measurement error. Neil Henry (1973) has shown that this is not necessary; allowance can be made for changes in unit condition.[3]

The rest of the appendix develops Henry's model and applies it to the Minimum Standards classification. The basic model is as follows: Let v_i^t be the probability that a unit actually falls into category i, (i equals 1 if the unit fails Minimum Standards and equals 2 otherwise) at time, t. Further assume that the probability that a unit is classified i at time t, p_i^t, is

---

[1] Consistency is no guard against systematic error, of course. For this we must accept the documentation, training, and review to assure that the instructions given evaluators were those documented.

[2] Interestingly, three repetitions are necessary to estimate reliability.

[3] Use of Henry's model was suggested by David Napior.

related to v_i^t by

(1) $$p^t = v^t Q^t$$

where

$v^t = (v_1^t, v_2^t)$ = the vector of true state probabilities

$p^t = (p_1^t, p_2^t)$ = the vector of classification probabilities

$Q^t = \begin{pmatrix} q_{11}^t & q_{12}^t \\ q_{21}^t & q_{22}^t \end{pmatrix}$ = the matrix of conditional classification probabilities where q_{ij}^t = the probability that a unit in state i is classified j.

Note that this model places no restrictions on v, q, or p, beyond the inherent ones.

(2) $$\begin{cases} v_1^t + v_2^t = 1 \\ p_1^t + p_2^t = 1 \\ q_{11}^t + q_{12}^t = 1, \; i = 1, 2. \end{cases}$$

The Q^t (and hence p^t) may assume any values from one time period to the next. The v^t are assumed to be linked by a Markov process.

(3) $$v^{t+1} = v^t M^t$$

where

$M^t = \left\{M_{ij}^t\right\}$ = the probability that a unit in state i at time t is in state j at time t+1.

The Markov assumption is critical to the manipulations that follow. Under this assumption,

$$\begin{aligned} v^{t+1} &= v^t M^t \\ &= v^{t-1} M^{t-1} M^t \\ &= v^{t-N} M^{t-N} \ldots M^t, \end{aligned}$$

That is, the transition probabilities at time t do not depend on states prior to t. Thus, if v^t_{rmn} is the probability that a unit occupies a sequence of true states (r, m, n) at times (t, t+1, t+2), we have

$$(4) \qquad v^t_{rmn} = v^t_r \, M^t_{rm} \, M^{t+1}_{mn} \, .$$

It must be admitted that the Markov assumption does not seem very reasonable. As long as some sorts of repairs are less likely to be undertaken than others, units that have failed Minimum Standards for several periods would be expected to be more likely to continue to fail in the future than units that have just failed Minimum Standards for the first time. Unfortunately, the Markov assumption is critical to the model. Furthermore, it is not clear that it can be tested in terms of available observables, though alternative models could probably be estimated.

The basis for Henry's estimates is the expression for the three-period classification probabilities

$$(5) \qquad p_{ikj} = \sum_{\alpha=1}^{2} \sum_{\beta=1}^{2} \sum_{\gamma=1}^{2} q^1_{\alpha i} \, q^2_{\beta k} \, q^3_{\gamma j} \, v_{\alpha\beta\gamma}$$

where

p_{ikj} = the probability that a unit is classified in the sequence (i, k, j) at times (1, 2, 3)

$v_{\alpha\beta\gamma}$ = the probability that a unit actually falls into the sequence (α, β, γ)

q^t_{ij} = the classification probabilities defined in Equation (1).

Some straight-forward algebra, shown below, can be used to rewrite this matrix to allow identification of Q^2. Equation (2) can be rewritten,

$$(6) \qquad p_{ikj} = (q^1_{1i}, \, q^1_{2i}) \begin{bmatrix} \sum_\beta q^2_{\beta k} \, v_{1\beta 1} \, , & \sum_\beta q^2_{\beta k} \, v_{1\beta 2} \\ \sum_\beta q^2_{\beta r} \, v_{2\beta 1} \, , & \sum_\beta q^2_{\beta r} \, v_{2\beta 2} \end{bmatrix} \begin{pmatrix} q^3_{1j} \\ q^3_{2j} \end{pmatrix} .$$

Under the Markov assumption, v_{rmn} is given by Equation (4). Thus the $(rn)^{th}$ element of the term in brackets is

$$(7) \qquad \sum_{\beta} q^2_{\beta k}\, v_{r\beta N} = q^2_{1k}\, v_{r1n} + q^2_{2k}\, v_{r2n}$$

$$= q^2_{1k}\, v^1_r\, M^1_{r1}\, M^2_{1n} + q^2_{2k}\, v^1_r\, M^1_{r2}\, M^2_{2n} .$$

Thus, the term in brackets in Equation (6) may be written

$$(8) \qquad \begin{bmatrix} & \\ & \end{bmatrix} = \begin{pmatrix} v^1_1 & 0 \\ 0 & v^1_2 \end{pmatrix} \begin{pmatrix} M^1_{11} & M^1_{12} \\ M^1_{21} & M^1_{22} \end{pmatrix} \begin{pmatrix} q^2_{1k} & 0 \\ 0 & q^2_{2k} \end{pmatrix} \begin{pmatrix} M^2_{11} & M^2_{12} \\ M^2_{21} & M^2_{22} \end{pmatrix},$$

and the matrix of the p_{ikj}, given k, is written

$$(9) \qquad \left\{ p_{ikj} \mid k \right\} = Q^{1'} \begin{pmatrix} v^1_1 & 0 \\ 0 & v^1_2 \end{pmatrix} M^1\, D_k M^2\, Q^3$$

where

$$D_k = \begin{pmatrix} q^2_{1k} & 0 \\ 0 & q^2_{2k} \end{pmatrix} .$$

As noted in Equation (2),

$$(10) \qquad D_1 + D_2 = I.$$

Thus if P(1, 3) represents the two-way classification probabilities between periods 1 and 3,

$$P(1, 3) = \left\{ p_{ikj} \mid k = 1 \right\} + \left\{ p_{ikj} \mid k = 2 \right\}$$

$$(11) \qquad = Q^{1'} \begin{pmatrix} v^1_1 & 0 \\ 0 & v^1_2 \end{pmatrix} M^1\, M^2\, Q^3 .$$

In addition, by symmetry

$$(12)\qquad \begin{cases} P(1,\ 2) = Q^{1'} \begin{pmatrix} v_1^1 & 0 \\ 0 & v_2^1 \end{pmatrix} M^1 Q^2 \\ \\ P(2,\ 3) = Q^{2'} \begin{pmatrix} v_1^2 & 0 \\ 0 & v_2^2 \end{pmatrix} M^2 Q^3 \end{cases}$$

Accordingly,

$$(13)\qquad \left\{p_{ikj} \mid k\right\} [P(1,\ 3)]^{-1} = Q^{1'} \begin{pmatrix} v_1^1 & 0 \\ 0 & v_2^1 \end{pmatrix} M^1 D_k \left[Q^{1'} \begin{pmatrix} v_1^1 & 0 \\ 0 & v_2^1 \end{pmatrix} M^1 \right]^{-1}$$

a matrix similar to D_k. Thus the roots of $\left\{p_{ikj} \mid k\right\} [P(1,\ 3)]^{-1}$ identify D_k, and hence Q^2 (see Equation (2)).[1] This also identifies v^2 since

$$(14)\qquad (v^2,\ 1 - v^2) = (p^2,\ 1 - p^2)\ (Q^2)^{-1}\ .$$

---

[1] A given matrix, A, is similar to another matrix, B, if there exists some non-singular matrix, Q, such that

$$A = QBQ^{-1}.$$

Similar matrices have the same characteristic roots (γ) defined by

$$\text{Det}\ (A - \gamma I) = 0$$

since

$$\text{Det}\ (B - \gamma I) = \text{Det}\ Q[B - \gamma I]\ Q^{-1}$$
$$= \text{Det}\ (A - \gamma I).$$

By Equation (13), $\left\{p_{ikj} \mid k\right\} [P(1,\ 3)]^{-1}$ is similar to D_k. But D_k is a diagonal matrix with roots equal to its diagonal elements, since

$$\text{Det}\ (D_k - \gamma I) = (q_{1k}^2 - \gamma)(q_{2k}^2 - \gamma),$$

which is zero for γ equal to q_{1k}^2 or q_{2k}^2.

Because of this, the sequence of three repeated observations provides seven observations of frequencies (the p_{ikj}). The model has eleven parameters--two for each of M^1, M^2, Q^1, Q^2, Q^3 plus v_1^1. It should be noted that which root corresponds to q_{11} is not dictated by the model. The presumption, used here, is that q_{11} is greater than q_{21}.

The remaining parameters (Q^1, Q^3, M^1, M^3, v^1, v^3) are not identified. If, however, we assume that Q^t is invariant over time, the remaining parameters are identified by (using Equations (12) and (14)),

$$(15)\qquad \begin{cases} (v^t,\ 1 - v^t) = p^t,\ 1 - p^t)\ Q^{-1} \\ \begin{pmatrix} v_1^1 & 0 \\ 0 & v_2^1 \end{pmatrix}^{-1} Q^{-1} P(1,\ 2)\ Q^{-1} = M_1 \\ \begin{pmatrix} v_1^2 & 0 \\ 0 & v_2^2 \end{pmatrix}^{-1} Q^{-1} P(2,\ 3)\ Q^{-1} = M_2 \end{cases}.$$

The (p_{ikj}) matrices are shown in Table IV-1 for two groups--Control households that did not move during the two years after enrollment and all enrolled households (excepting those subject to Minimum Standards requirements) that did not move during the two years after enrollment. Minimum Standards households are excluded because they had special incentives to repair certain deficiencies.[1] Casual examination of Table IV-1 suggests reasonably reliable measurements. For the larger sample, for example, given the proportions of units classified as clearly inadequate in each period (75, 75, and 77 percent, respectively), 45 percent of units would be expected to be classified the same way in all three periods if the successive classifications were completely independent of one another.[2] In fact, 79 percent of units were classified the same way in all three periods. (Corresponding figures for the Control sample are 49 percent and 79 percent.)

Calculation of Henry's model, presented above, confirms this impression as shown in Tables IV-2 and IV-3. Based on Henry's model using the full sample (Table IV-2) an estimated 95 percent of units were correctly classified in

---

[1] It may be noted that it is possible that the same evaluator evaluated a given unit more than once. Assignment was approximately random, however, and many evaluators were not employed for the full two years of the experiment, so that it seems doubtful that this happened very often.

[2] Ie, $p_1p_2p_3 + (1 - p_1)(1 - p_2)(1 - p_3)$ where p_i is the proportion classified as clearly inadequate at time, i.

Table IV-1

CROSS-TABULATION OF REPEATED MINIMUM STANDARDS RATINGS
AT ENROLLMENT AND ONE AND TWO YEARS AFTER ENROLLMENT

For All Households That Did Not Move During the First Two Years After Enrollment, Excluding Minimum Standards Households[a]

For t_2=1

t_1 \ t_3	1	2
1	65% (630)	2% (22)
2	6% (62)	2% (16)

For t_2=2

t_1 \ t_3	1	2
1	3% (30)	5% (52)
2	3% (26)	14% (135)

N=973

Control Households That Did Not Move During the First Two Years After Enrollment[a]

For t_2=1

t_1 \ t_3	1	2
1	67% (224)	3% (10)
2	6% (19)	2% (8)

For t_2=2

t_1 \ t_3	1	2
1	3% (9)	5% (17)
2	2% (8)	11% (38)

N=333

SAMPLE: All enrolled households active at two years after enrollment that did not move during the first two years after enrollment, excluding households with enrollment incomes over eligibility limits, those in their own homes or subsidized housing.

DATA SOURCES: Housing Evaluation Form, Household Report Forms.

a. 1 = classified as failing Minimum Standards
   2 = not classified as failing Minimum Standards

Table IV-2

ESTIMATED PARAMETERS FOR FULL SAMPLE

	PERIOD		
	1	2	3
Percent Classified as Failing Minimum Standards	75%	75%	77%
Estimated Percent Actually Failing Minimum Standards	75	75	77
M[a]	$\begin{pmatrix} .93 & .07 \\ .19 & .81 \end{pmatrix}$	$\begin{pmatrix} 1.01 & -.01 \\ .06 & .94 \end{pmatrix}$	NA
Q[b]		$\begin{pmatrix} .97 & .03 \\ .10 & .90 \end{pmatrix}$	
Estimated Probability that a Unit is Actually Inadequate			
If Classified Inadequate[c]	.97	.97	.97
If Classified Adequate[d]	.10	.10	.11
Estimated Proportion of Units Classified Accurately[e]	.95	.95	.95

Sample Size: 973

SAMPLE: All enrolled households active at two years after enrollment that did not move during the first two years after enrollment, excluding households with enrollment incomes over eligibility limits, those in their own homes or subsidized housing.

DATA SOURCES: Housing Evaluation Form, Household Report Forms.

a. $M^t = \left\{ m_{ij}^t \right\}$ where m_{ij}^t = the estimated probability that a unit in state, i, at time, t, is in state j at time $t + 1$.

b. $Q = \left\{ q_{ij} \right\}$ where q_{ij} = the estimated probability that a unit in state i is classified j.

c. Calculated as $\frac{v^t q_{11}}{p^t}$ where v^t, p^t are the proportions estimated to be actually failing and classified failing, respectively.

d. Calculated as $\frac{v^t q_{12}}{1 - p^t}$.

e. Calculated as $v^t q_{11}{}^t + (1 - v^t)\, q_{22}^t$.

Table IV-3

ESTIMATED PARAMETERS FOR CONTROL SAMPLE

	PERIOD		
	1	2	3
Percent Classified as Failing Minimum Standards	78%	78%	78%
Estimated Percent Actually Failing Minimum Standards	76	76	76
M[a]	$\begin{pmatrix} .95 & .05 \\ .19 & .81 \end{pmatrix}$	$\begin{pmatrix} .99 & .01 \\ .00+ & 1.00- \end{pmatrix}$	NA
Q[b]		$\begin{pmatrix} .98 & .02 \\ .16 & .84 \end{pmatrix}$	
Estimated Probability that a Unit is Actually Inadequate			
If Classified Inadequate[c]	.95	.95	.95
If Classified Adequate[d]	.09	.09	.09
Estimated Proportion of Units Classified Accurately[e]	.94	.94	.94

Sample Size: 333

SAMPLE: All enrolled households active at two years after enrollment that did not move during the first two years after enrollment, excluding households with enrollment incomes over eligibility limits, those in their own homes or subsidized housing.

DATA SOURCES: Housing Evaluation Form, Household Report Forms.

a. $M^t = \left\{ m_{ij}^t \right\}$ where m_{ij}^t = the estimated probability that a unit in state, i, at time, t, is in state j at time $t + 1$.

b. $Q = \left\{ q_{ij} \right\}$ where q_{ij} = the estimated probability that a unit in state i is classified j.

c. Calculated as $\frac{v^t q_{11}}{p^t}$ where v^t, p^t are the proportions estimated to be actually failing and classified failing, respectively.

d. Calculated as $\frac{v^t q_{12}}{1 - p^t}$.

e. Calculated as $v^t q_{11}^t + (1 - v^t)\, q_{22}^t$.

each time period.[1] The estimated percent of units that were actually inadequate was accordingly within one percentage point of the percent classified as inadequate. Similar figures are found for the Control sample (Table IV-3).

These results are reasonably reassuring. The only obvious reservation, mentioned earlier, is the Markov assumption. This assumption is difficult to test within Henry's model. Indeed, it is not clear that the assumption is testable without severe restriction on M^t and Q^t. Absent such a test, it would probably be desirable to estimate alternative models to examine the sensitivity of results to the use of the Markov assumption. This has not been done here.[2]

Estimates for the full sample in each site are presented in Tables IV-4 and IV-5. Both sites show similar high levels of estimated accuracy.[3]

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[1] Henry's model is, of course, exact, whereas the observed classification frequencies and in the calculations are random variables. No attempt has been made to work out the distribution of the estimated parameters.

[2] Preliminary investigation suggests that it may be the case that any admissible $\{p_{ikj}\}$ matrix can be represented by the right hand side of Equation (9), but this is not proven. It is easy to verify that the Markov restriction that $|\{v_{ikj} \mid k\}| = 0$ does not carry over to $\{p_{ikj} \mid k\}$, for example.

[3] The Minimum Standards requirement includes both physical and occupancy requirements. Estimation of Henry's model for the physical requirements only yielded similar estimates of classification accuracy to those found for the total requirements. The estimated probability that a failing unit is classified as failing (q_{11}) and a passing unit classified as passing (q_{22}) are shown below for the physical requirements.

	Combined Sites	Pittsburgh	Phoenix
q_{11}	.96	.97	.95
q_{22}	.90	.88	.94

Table IV-4

ESTIMATED PARAMETERS FOR PITTSBURGH
(FULL SAMPLE)

	PERIOD		
	1	2	3
Percent Classified as Failing Minimum Standards	.75	.78	.81
Estimated Percent Actually Failing Minimum Standards	.75	.78	.82
M^a	$\begin{pmatrix} .95 & .05 \\ .25 & .75 \end{pmatrix}\begin{pmatrix} 1.03 & -.03 \\ 0.08 & 0.92 \end{pmatrix}$		
Q^b		$\begin{pmatrix} .97 & .03 \\ .11 & .89 \end{pmatrix}$	
Estimated Probability that a Unit is Actually Inadequate			
If Classified Inadequate[c]	.96	.97	.98
If Classified Adequate[d]	.11	.12	.15
Estimated Proportion of Units Classified Accurately[e]	.95	.95	.95

Sample Size: 973

SAMPLE: All enrolled households active at two years after enrollment that did not move during the first two years after enrollment, excluding households with enrollment incomes over eligibility limits, those in their own homes or subsidized housing.

DATA SOURCES: Housing Evaluation Form, Household Report Forms.

a. $M^t = \left\{ m_{ij}^t \right\}$ where m_{ij}^t = the estimated probability that a unit in state, i, at time, t, is in state j at time t + 1.

b. $Q = \left\{ q_{ij} \right\}$ where q_{ij} = the estimated probability that a unit in state i is classified j.

c. Calculated as $\frac{v^t q_{11}}{p^t}$ where v^t, p^t are the proportions estimated to be actually failing and classified failing, respectively.

d. Calculated as $\frac{v^t q_{12}}{1 - p^t}$.

e. Calculated as $v^t q_{11}^t + (1 - v^t)\, q_{22}^t$.

Table IV-5

ESTIMATED PARAMETERS FOR PHOENIX
(FULL SAMPLE)

	PERIOD		
	1	2	3
Percent Classified as Failing Minimum Standards	.76	.70	.69
Estimated Percent Actually Failing Minimum Standards	.76	.70	.68
M[a]	$\begin{pmatrix} .90 & .10 \\ .07 & .93 \end{pmatrix}$	$\begin{pmatrix} .97 & .03 \\ .02 & .98 \end{pmatrix}$	
Q[b]		$\begin{pmatrix} .97 & .03 \\ .09 & .91 \end{pmatrix}$	
Estimated Probability that a Unit is Actually Inadequate			
If Classified Inadequate[c]	.97	.96	.96
If Classified Adequate[d]	.09	.07	.06
Estimated Proportion of Units Classified Accurately[e]	.96	.95	.95

Sample Size: 973

SAMPLE: All enrolled households active at two years after enrollment that did not move during the first two years after enrollment, excluding households with enrollment incomes over eligibility limits, those in their own homes or subsidized housing.

DATA SOURCES: Housing Evaluation Form, Household Report Forms.

a. $M^t = \left\{ m_{ij}^t \right\}$ where m_{ij}^t = the estimated probability that a unit in state, i, at time, t, is in state j at time $t + 1$.

b. $Q = \left\{ q_{ij} \right\}$ where q_{ij} = the estimated probability that a unit in state i is classified j.

c. Calculated as $\frac{v^t q_{11}}{p^t}$ where v^t, p^t are the proportions estimated to be actually failing and classified failing, respectively.

d. Calculated as $\frac{v^t q_{12}}{1 - p^t}$.

e. Calculated as $v^t q_{11}{}^t + (1 - v^t)\, q_{22}^t$.

REFERENCES

Henry, Neil W., "Measurement Models for Continuous and Discrete Variables," in Goldberger, Arthur S. and Otis Dudley Duncan, eds., Structural Equation Models in the Social Sciences, New York, N.Y., Seminar Press, 1973.