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Factors Influencing Crime and Instability in Urban Housing Developments

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Factors Influencing Crime and Instability in Urban Housing Developments

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ABSTRACT

The purpose of this study was to determine which social, physical and managerial characteristics of federally-assisted urban housing developments are most important in causing crime, fear of crime, and instability. The causal model for this study is largely based on earlier defensible space theory and research.

The 63 sites in the study are federally-assisted, moderate-income developments in Newark, St. Louis, and San Francisco and public housing projects in San Francisco. These developments consist of row house, walk-up, and high-rise buildings with a varied composition of rent-subsidized residents. Path analysis is used to estimate the model and to calculate total, direct, and total indirect effects.

The results indicate that, of the causal factors examined, the following four have the largest and most consistent effects: building size; the accessibility of apartments and buildings to unauthorized intrusion by outsiders; the percent of one-parent, welfare families combined with the mean income of households; and the ratio of teenagers to adults in the resident population. While burglary rate is primarily determined by accessibility, personal crime rate (robberies and assaults) is largely determined by low-income/AFDC and teen-adult ratio. Both fear of crime and community instability are primarily determined by building size and low-income/AFDC. Fear of crime is also affected by the ratio of teenagers to adults. These effects are all in the expected direction. Burglary increases with accessibility and personal crime increases with the level of low-income/AFDC and the ratio of teenagers to adults. Both fear of crime and community instability increase with building size and low-income/AFDC, and fear increases with the ratio of teenagers to adults.

The indirect effects of building size indicate that residents' control over the space outside their apartments is an important intervening variable in transmitting the effects of building size to burglary, personal crime, and fear of crime. Residents' use of space outside their apartments is an important intervening variable in transmitting the effects of building size to personal crime and to fear of crime. These findings concerning the role played by use and control of space in mediating the effects of building size confirm important tenets of defensible space theory.

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CONTENTS

INTRODUCTION

In answering their legislative mandate federally-assisted housing projects are built with certain identifiable characteristics: they house a comparatively high percentage of low-income residents; they are constructed at comparatively high densities with little investment in site development; and, because their rental incomes and subsidies are low, the funds available for maintenance and security are minimal. All three factors -- the low socioeconomic status of the residents, the high density buildings and poorly defined sites, and the lack of funds for maintenance and security -- can, in themselves, be seen as precursors of high crime rates, fear, and project instability.

It is the purpose of this study to determine whether these "built-in" characteristics of assisted, moderate- and low-income housing developments are, in fact, contributors to crime, fear and instability and, if so, which of these characteristics are most important. The study will also try to determine how crime, fear, and instability are interrelated.

To the extent that the study is successful in isolating the factors which contribute to crime, fear and residential instability, it will explore the policy implications of these findings for the modification of existing, and the construction and leasing of new, housing developments.

In this study important emphasis is given to examination of the role played by physical factors in determining the levels of crime, fear and instability. This is not because we expect that the physical characteristics of buildings and sites will prove to be the dominant predictors but rather because the study principals have, from their past work, become expert in analyzing the role of housing design factors in predicting crime rate. This study provides a further opportunity to develop and measure these factors.

The theory of how physical form acts to deter crime, fear and instability is grounded in two principles:

Principle 1: The theory postulates that the fewer the number of families required to share a common entry, internal circulation system, and adjacent outside grounds in a multi-family building, the more frequently will residents make use of these communal and outside areas and the more willing they will be to intervene to maintain and control them and to prevent anti-social behavior from occurring within them. As a consequence, there will be less crime in buildings which house fewer families per entry, residents will be less fearful, and, finally, for all these reasons, residents will be more pleased with their buildings and developments and less anxious to move out.

Principle 2: The theory postulates that the physical layout of a building and its grounds can restrict unauthorized access to a building and the apartments within it without the intervention of residents. Building and site design can restrict access through the use of real barriers (fencing which surrounds the grounds of buildings and units, doors and locks, window guards, and intercoms) and through the design of a building and grounds entry and exit system that can be easily controlled by a doorman or guard. As a consequence of this restricted accessibility, both crime and fear of crime will be lower than in buildings where access is not limited. And, as a result of the lower crime and fear of crime, community instability will also be lower.

This study follows on an earlier research project that was the basis for the book DEFENSIBLE SPACE (Newman, 1972). The earlier research project examined the relationship between crime rate and various physical and social characteristics of low-income public housing projects in New York City.

In the New York City study, a step-wise multiple regression was used to examine the relationships between physical and social characteristics of housing projects and various types of crime. Table I-1 below presents the results for one type of crime, robbery. The source of the robbery data was New York City Housing Authority Police reports, and the robbery rate of a project was figured as the total number of robberies in a project per 1,000 residents. The strongest predictor of robbery rate, as indicated by the magnitude of the regression structure coefficients, was the percent of the population receiving welfare (coefficient = .71). The second most important predictors were building height (.55) and the percent of families with a female head of household (.55). Thus, the physical design feature, building height, ranked among the three most important predictors of robbery rate. The importance of building height is further indicated by the percentage of variance in robbery rate that it explained, namely 10%.

Table I.1

Robbery Rate as Predicted by
Social and Physical Variables in 53
New York City Public Housing Projects[1]

Social and Physical Variables[2]	Simple R^3	Regression Structure Coefficient	R^2	Change in R^2
% of population receiving welfare	.47	.71	.22	.22
Building height	.36	.55	.33	.10
Project size	.25	.38	.38	.05
Number of public housing projects in area	.33	.50	.40	.03
% of families with female head	.36	.55	.44	.03

[1]This table is adapted from Table III in Newman (1973), FINAL REPORT: PROJECT FOR THE SECURITY DESIGN OF URBAN RESIDENTIAL AREAS submitted to the National Institute of Law Enforcement and Criminal Justice. The source of the crime data is New York City Housing Authority Police Reports for 1969.

[2]These are the first five variables that were entered into the regression equation.

[3] $r \geq .35$, $p < .01$
$r \geq .27$, $p < .05$

Although the present study draws upon the theory and the findings of the earlier research, it is not intended that this study replicate it but rather that it extend the scope and detail of the earlier work. This study is different from the original defensible space study in the following ways:

a) This is a study of moderate-income housing and public housing rather than of public housing only. Federally-assisted, moderate-income developments serve a slightly higher income group than public housing. They are built with government assistance by non-profit or limited-profit groups who own and manage them. Public housing is built by the federal government and is owned by individual municipalities.

b) The housing developments studied are located in three medium-sized cities rather then in a single, large city like New York. The housing developments studied in the three medium-sized cities were constructed at much lower densities and contain a comparatively small number of units overall. Most of the buildings in this study are two and three stories in height, while most of the buildings in the New York City study were over six stories in height.

c) The primary objective of the present study is to determine how a number of characteristics of housing developments determine not just the level of crime, but also the level of fear and community instability.

d) Additional characteristics of developments are included as possible determinants of crime (and of fear and instability).

These are: the presence of housing guards or doormen, the quality of municipal police service, and residents' participation in ownership of the housing.

e) An important objective of this study is to determine <u>how</u> physical design and social characteristics work to affect residents' fear, the crime they experience, and the instability which results. To better understand the mechanisms by which the independent variables act on the dependent variables, intervening variables were introduced in a causal model linking the independent variables to the dependent variables. These intervening variables are: management's success in collecting rents; residents' use of project areas outside their homes; residents' sense of control over these areas; and residents' social interaction with their neighbors.

This use of intervening variables in a causal model represents the first real examination of the mechanics of the theory. The first defensible space study sought only to demonstrate that there was an important relationship between the physical form of low-income assisted housing and the occurrence of crime.

There is also an important difference in how crime is measured in the two studies. In this study, crime rates are determined from a victimization survey of residents rather than from police reports. The use of a victimization survey also allowed us to measure residents' fear of crime which is a more continuous and persistent variable.

As mentioned above, this is a study primarily of federally-assisted, moderate-income developments, but it also includes some public housing projects. The sites are moderate-income developments in Newark, St. Louis, and San Francisco, and public housing projects in San Francisco. Altogether, 63 sites are analyzed; these sites consist of high-rise, walk-up, and row house buildings. The primary source of data is a survey of the residents living in these sites. The information gathered in the survey is supplemented with information gathered from interviews with housing managers and police personnel and with information from housing agency and housing development records.

Chapter 1 presents the study's causal model. It describes the variables in the model and outlines the most important anticipated effects of the characteristics of housing developments on crime, fear, and instability. Chapter 2 presents the characteristics of the sites and the sampling design. The construction and content of the variables in the causal model are described in Chapter 3 and the use of path analysis in this study is presented in Chapter 4. Chapters 5, 6, 7, and 8 are all results chapters. In Chapter 5 the effects of the physical design characteristics are presented; in Chapter 6 the effects of the social characteristics are presented; and in Chapter 7 the effects of police and guard service are described. Chapter 8 is a summary of the major findings. Chapter 9 is the discussion chapter, and Chapter 10 is an examination of the policy implications.

CHAPTER 1: THE CAUSAL MODEL

The diagrams in Figures 1.1 and 1.2, below, illustrate the study's causal model. Two figures are employed to describe the model rather than one to enable us to examine the effects on, and of, two different types of crime: burglary and personal crime. Aside from this difference, the models in the two figures are identical.

The independent, intervening, and dependent variables are grouped from left to right in these diagrams. The arrows running from the independent variables to the intervening variables and to the dependent variables indicate the causal effects anticipated. Each independent variable is expected to affect each intervening variable and each dependent variable. Each intervening variable is expected to affect each variable that follows it in the causal sequence. (The individual lines from each independent variable to each of the intervening and dependent variables should have been drawn separately; however, for the purpose of graphic clarity all the independent variables have been grouped together and their individual effects are shown as single lines running from the entire group of independent variables).

The independent variables consist of seven characteristics of housing developments. These seven characteristics can be

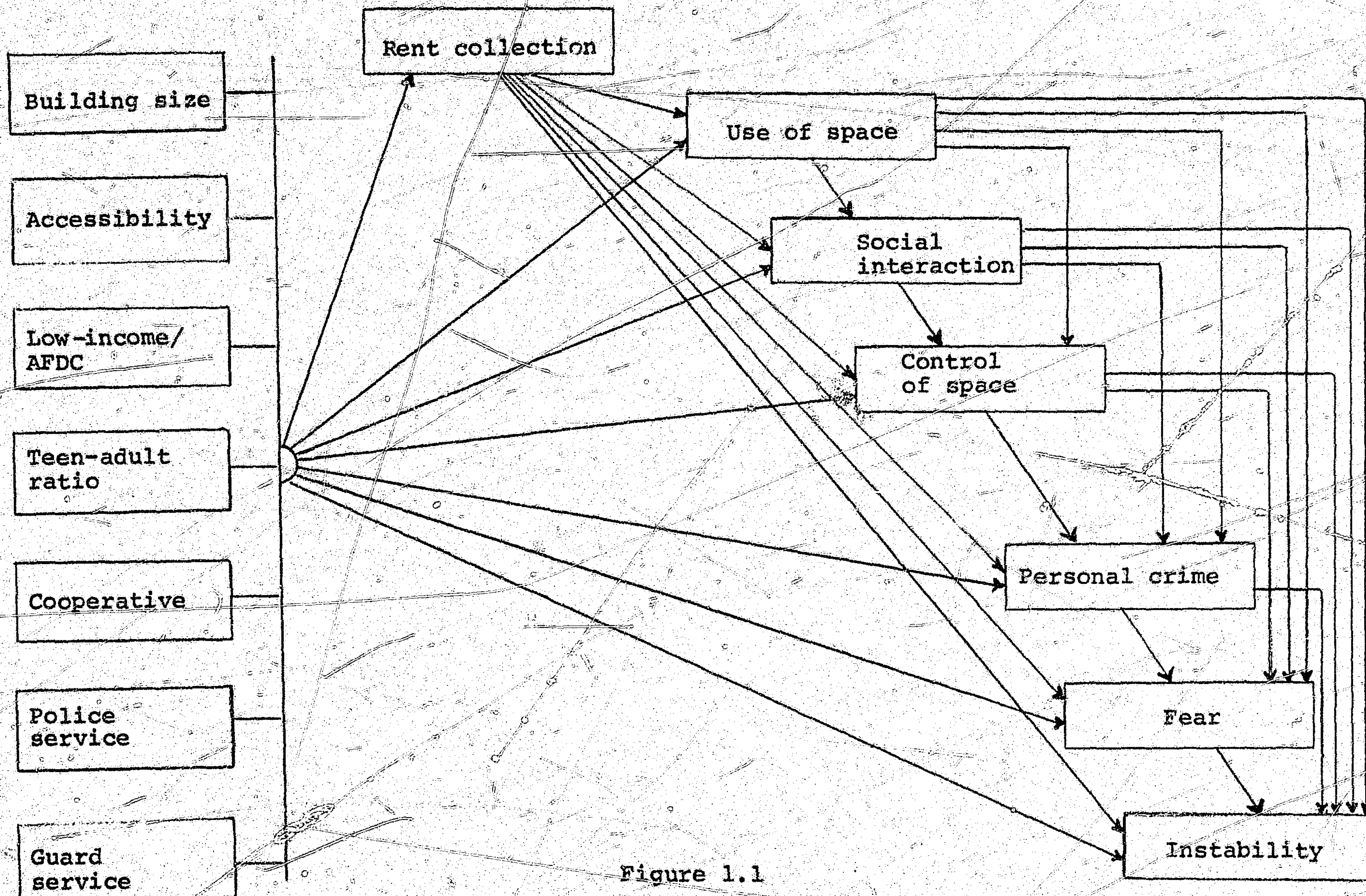

Figure 1.1

Theoretical Model of the Key Factors Affecting
<u>Personal Crime</u>, Fear, and Instability

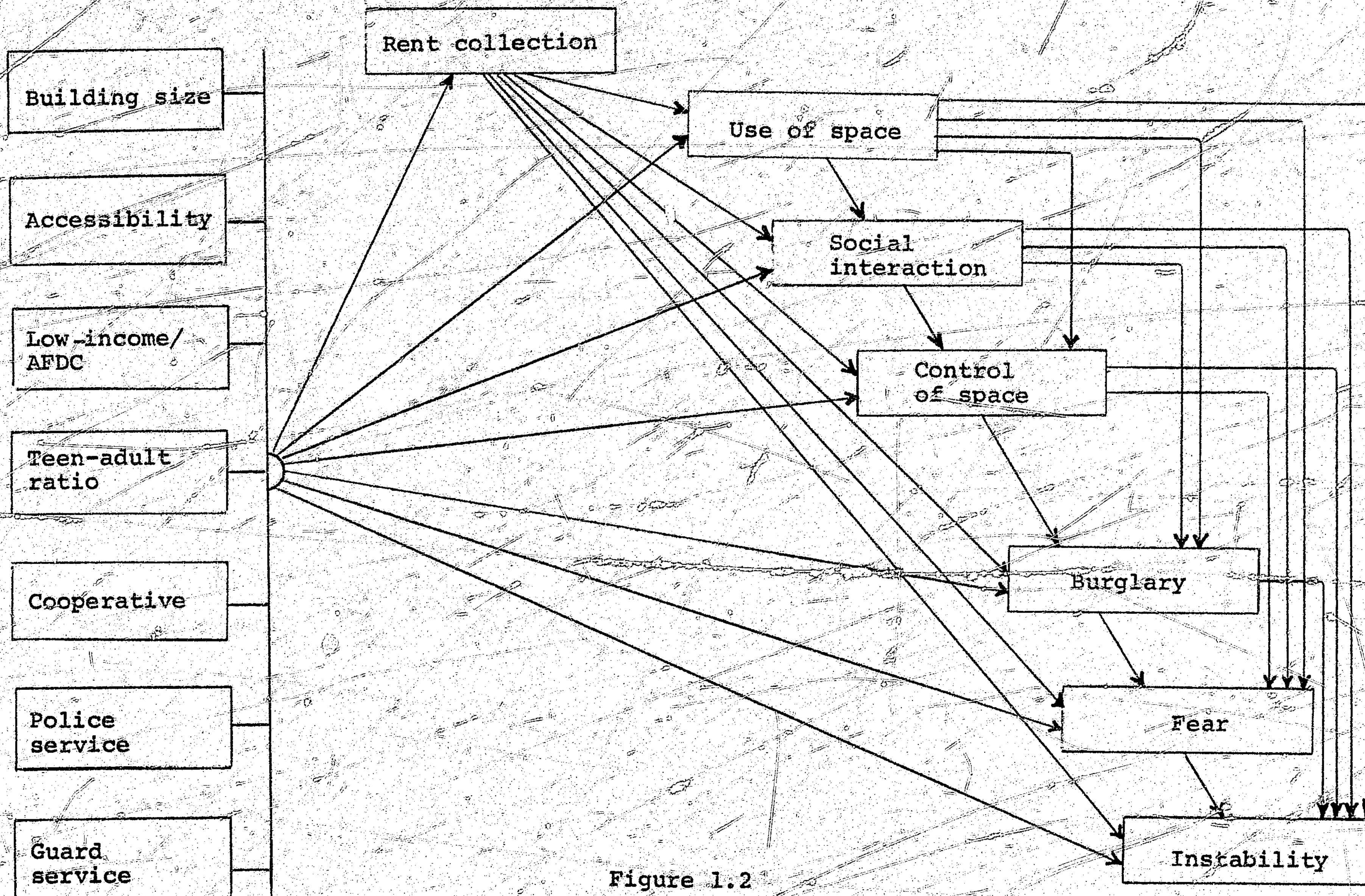

Figure 1.2

Theoretical Model of the Key Factors Affecting
Burglary, Fear, and Instability

grouped into three categories: (1) physical design variables (building size and accessibility); (2) social characteristics of residents (low-income/AFDC, teen-adult ratio, and cooperative ownership); and (3) security service (police service and guard service). In the sections that follow, each of the independent variables is discussed in more detail along with its most important expected effects.

The four intervening variables measure different attitudes and actions on the part of management and residents. Rent collection is a measure of management's success in collecting rent and is based on information from housing managers concerning the total amount of rent owed by residents and similar items. Residents' use of space is a measure of how frequently residents use space outside their apartments and was compiled from the survey of residents. Social interaction reflects the frequency and intensity of social contacts between residents and is also composed of items from the survey of residents. Control of space consists of items from the survey of residents that measure their perception of the likelihood that residents would intervene in suspicious or criminal situations.

The four dependent variables are: personal crime rate; burglary rate; fear of crime; and rate of instability. Personal crime is made up of robberies and assaults; burglary of both burglaries and attempted burglaries. Both crime variables are compiled from residents' experiences of these crimes as they occurred within their developments during the twelve-month period prior to the interview. Each crime variable is figured as a rate per 1,000 residents. Fear of crime is an index composed of several questions from the survey of residents concerning their perceptions of how unsafe different areas are and the likelihood that certain crimes will occur. Instability is also a composite variable that includes the actual rate of turnover of apartments, the rate of vacancy, the rate of abandonment, and residents' desire to move out of the development as expressed in the household survey. The data on turnover, vacancy, and abandonment were collected from the files of housing agencies.

Physical Design Characteristics

The two physical variables, building size and accessibility, together, measure the defensibility of housing environments. That is to say, the larger the building and the greater the accessibility to it, the lower its defensibility. Building size is the physical design characteristic most expected to influence residents' use of space and control over areas outside their homes. Accessibility is a measure of how the physical design of buildings and apartments restricts unauthorized access to a building's interior without any action on the part of the residents. A building's interior areas are defined as the common circulation areas and the interior of apartment units. Common circulation areas consist of the lobby, corridors, elevators, stairs, mail room, washer/dryer facilities, communal rooms, enclosed parking areas, etc.

Building Size

Building size is a composite variable made up of two measures: building type and the number of apartment units that share a common entry and common circulation system. Building type is an ordinal variable consisting of four categories: (1) row houses; (2) regular walk-up buildings; (3) galleria-type walk-up buildings which have an open, single-loaded corridor; and (4) high-rise buildings. Building type and the number of units per entry are highly correlated, but each captures a different facet of the design of residential buildings, as described below.

The theory postulates that the number of units sharing an entry is the key physical factor in determining the extent to which residents use and control the areas immediately outside their apartments. For this reason the number of units sharing an entry is an essential element in the measure of building design. However, the theory goes on to state that there are physical design characteristics other than number which determine the control and use of outside areas by residents: the distance of apartments to the communal areas below and the ease of access to these communal areas (elevators in high-rises versus stairs in walk-ups versus direct access to street in row houses). These additional design characteristics are best measured in the present study by the four categories of building type. The measure <u>building type</u> is a better indicator of the problems of access to ground level communal areas than the measure <u>number of units per entry</u>.

In the initial defensible space study, building height was used as the sole measure of both the number of units sharing a common entry and of the problems of access to communal areas. This was because the buildings constructed by the New York City Housing Authority are of a comparatively uniform type in which the number of units sharing an entry increase in direct proportion with the height of buildings. Similarly the problems of access to, and supervision of, communal areas and grounds increased directly with the height of the building and the distance of the average apartment to the ground.

In the present study, however, building height could not be used as the sole measure of units per entry and of ease of access and supervision for two reasons. First, in the present study, height is not as accurate an indicator of the number of units sharing an entry as it was in the original defensible space study. This is because there are several sites composed of three-story buildings which have long outdoor corridors (called gallerias) and as a consequence have as many families sharing an entry and common circulation system as a high-rise. Second, using building height as the only measure of the ease of access to outdoor communal areas would not have permitted us to make a distinction between the galleria type of walk-up, described above, and the standard type of walk-up, since both types are three stories high but access to communal areas is easier in the standard type of walk-up than in the galleria type.

We reasoned, therefore, that in the present study the single variable, building height alone, would not be sufficient to measure those characteristics of buildings which prevent residents from using and controlling communal areas. We decided that a measure which combined the actual number of units per entry with a classification of building type, which captured not only the height above the ground but also the type of circulation system, would be best.

Accessibility

The accessibility of apartments and buildings is a measure of the ease with which an outsider can gain access to the interior of a building or an apartment, either directly (through a window) or indirectly (via the common interior circulation areas of a multifamily building to the doors or windows of each unit). Accessibility is composed of a series of ratings of physical design characteristics including: the position and design of doors and windows and their locking hardware; the position and surveillability of circulation areas, stairs, corridors, and the doors to individual apartments; the presence of high fencing or other real barriers; and the presence of symbolic devices which demarcate areas as private.

Because of the unique qualities of each of the three building types (row houses, high-rises, and the two types of walk-ups combined), apartments in each type are vulnerable to intrusion in decidedly different ways. That is to say, the characteristics that make row house apartments easily accessible are different from the characteristics that make either walk-up or high-rise apartments accessible, and similarly the design features that make walk-up units accessible are different from those that make high-rise units accessible. For this reason, the criteria used to rate accessibility are somewhat different for each of the three building types. The accessibility ratings reflect the variability in accessibility <u>within</u> each building type.

In the original defensible space study some of the features now being measured within the <u>accessibility</u> rating were measured separately as either the <u>visibility</u> or <u>location</u> of the building entry. These measures alone proved inadequate for capturing the operational qualities of accessibility in that study and have been replaced with new measures that are included in our present rating of accessibility. Also in the original defensible space study, project size (the total number of apartment units in the project) proved to be an important predictor of robbery rate (see Table I.1). In the present sutdy project size is not included as a physical design variable because the sites are consistently small.

The causal paths of primary import to this study involve the effects of the two physical design variables, building size and accessibility. These paths are illustrated in Figures 1.3 and 1.4 on the following pages. Figure 1.3 shows the anticipated effects of building size and accessibility on burglary, fear, and instability, and Figure 1.4 shows the anticipated effects on personal crime, fear, and instability. Paths that have been left out represent no anticipated effect, although in the path analysis itself all recursive paths are estimated and tested for significance.

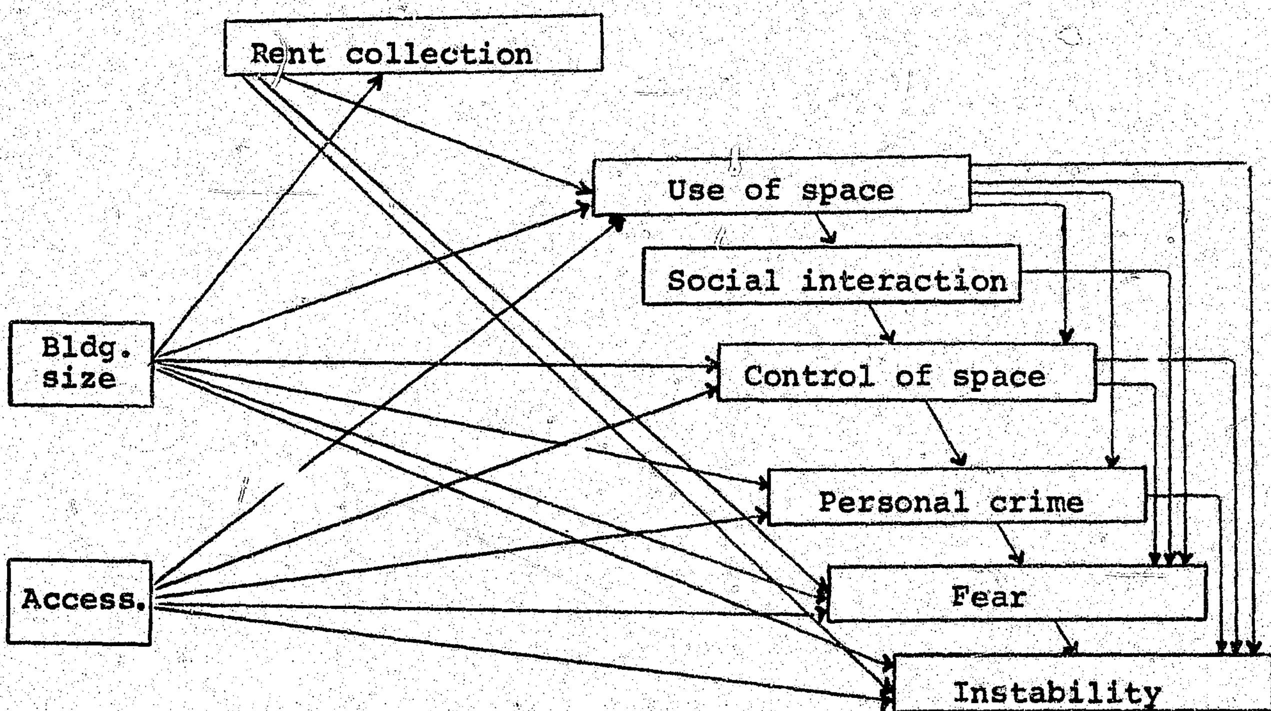

Figure 1.3

Theoretical Model of Anticipated Effects of Physical Variables on Personal Crime, Fear, & Instability

The anticipated effects of physical design are discussed in the next four sections of this chapter in the following sequence: first, the effects of building size in the personal crime version of the model; second, the effects of accessibility in the personal crime version of the model; third, the effects of building size in the burglary version of the model; and fourth, the effects of accessibility in the burglary version of the model.

Effects of Building Size on Personal Crime, Fear, and Instability

Building size is expected to affect each dependent variable (personal crime, fear, and instability) directly and indirectly through the intervening variables. We expect that crime, fear of crime, and instability will increase with building size. The action of the intervening variables explains how the physical variables are expected to influence the dependent variables.

Building size is expected to have a negative effect on rent collection: the larger the building, the lower the expected rent collection. It is necessary at this juncture to digress a moment to discuss the intervening variable: rent collection. Management's success in collecting rent is used in this study as a measure of management effectiveness. It is clear of course that management effectiveness should be measured by other criteria as well. However, a comprehensive analysis of management effectiveness was beyond the scope of this study. In the Urban Institute's studies of management in federally-assisted housing, rent collection ability was found to be a good indicator of management performance and management firmness (Isler, Sadacca, and Drury, 1974). Rent collection ability was also found to correlate with residents' view of management strictness -- and a strict management was viewed by residents as a good and satisfactory management.

Rent collection is not, however, used in the present study as an <u>independent</u> variable measuring the quality of management. This is because management's ability to collect rent is probably determined by factors other than managment competence: residents' financial solvency and the complexity of a building are two other factors that are likely to affect rent collection. Both of these other factors are independent variables in this study. We thought preferable, therefore, to make rent collection a first order intervening variable in the model. This would then allow us to learn the effect of the study's other independent variables on management's ability to collect rent as well as to learn how rent collection, in turn, affected the study's other intervening and dependent variables.

Building size is expected to have a negative effect on rent collection because the larger a building, the more it is dependent on complex service systems for its daily operation. Elevators, garbage disposal chutes, washer-dryer rooms, parking garages, intercoms, doormen, maintenance men are all essential to the successful operation of a large high-rise building. The history of the operation of large subsidized buildings is that when these service systems break down, or are curtailed in any way, residents withhold rent or are late in paying rent. Lack of anticipated operating monies from rent, in turn, further inhibits management from undertaking preventive maintenance and in responding to service system breakdowns. Thus complex buildings are prone to breakdown, leading to problems in rent collection, leading to further breakdowns. Management's inability to maintain services -- resulting from poor rent collection -- is, in turn, likely to affect negatively residents' use of space outside their apartments, and to increase their fear and the instability of the development.

Building size is expected to have a negative effect on residents' use of the areas outside their apartments: the larger the building, the less frequently these areas will be used. Residents in large buildings will be less willing to use the areas outside their apartments because they are required to share these areas with a large number of other residents and because most of these areas are at a greater distance from their own apartments. Residents' infrequent use of areas outside their apartments is expected, in turn, to lead to less frequent interaction with other residents, to a lack of control over these areas, and to feelings of fear.

Building size is also expected to directly affect residents' control over the areas outside their apartments: the larger the building, the lower the control. This is because, according to defensible space theory, the larger the number of families who share these areas (as measured by building size), the less control any one family is able to exert and, overall, the less control residents together will feel they are able to exert. Residents' control over outside areas is, in turn, expected to affect the occurrence of personal crime, residents' fear of crime, and community instability. The less control residents have, the higher the crime, the fear of crime, and the community instability are expected to be.

Building size is further expected to influence instability directly, that is, independent of its effect through the intervening variables. This direct influence is probably due to the feelings of dissatisfaction with large buildings held by families with children. Families with children will be dissatisfied with large-sized buildings because of the difficulties children have in getting down to the grounds safely and because of the difficulties parents have in supervising their children in these areas. So, regardless of whether residents actually use the areas of the building and development, and regardless of whether they control them, residents' dissatisfaction with the development is expected to increase with building size. The level of community instability will reflect this dissatisfaction.

A similar argument explains why we expect to find a direct effect of building size on fear: large-sized buildings have many places that are hidden from the view of anyone (elevators, hidden landings, corridors, fire-stairs). Residents will therefore feel apprehensive about going through these areas alone and feel they are very vulnerable to criminal attack in such buildings. Thus, regardless of whether residents have actually experienced crimes in these areas, they will be fearful of them.

And finally we anticipate that personal crime will affect both residents' fear of crime and community instability: the higher the rate of personal crime, the greater the fear and the greater the community instability. It is expected that fear of crime will also affect community instability.

Effects of Accessibility on Personal Crime, Fear, and Instability

The accessibility of buildings and apartments is expected to affect residents' use of areas: the greater the accessibility, the lower the use. This is because accessibility measures the vulnerability of areas outside the apartments to intrusion by outsiders[1], and the more vulnerable to intrusion these areas are, the less comfortable residents will be about using them. In other words, the less private and more open to everyone's use these areas are, the less willing residents themselves will be to use them. For much the same reason, the accessibility of buildings and apartments should affect residents' control over the areas outside their apartments. The less private and more open these areas are, the less control residents will be able to exert.

Accessibility is also likely to have direct effects on fear and instability because residents are able to perceive that the areas outside their apartments are open to outsiders and, regardless of whether or not this affects their ability to use or control these areas or the amount of personal crime taking place there, residents will feel fearful and will be dissatisfied with the development as a place to live.

<u>Effects of Building Size on Burglary, Fear, and Instability</u>

Figure 1.4, below, presents the theoretical model of the effects of building design and accessibility on <u>burglary</u>, fear, and instability.

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[1] The way the accessibility rating system works, it reflects both the vulnerability of apartments and the vulnerability of areas outside the apartments (See Chapter 3 for a detailed description of the accessibility rating system).

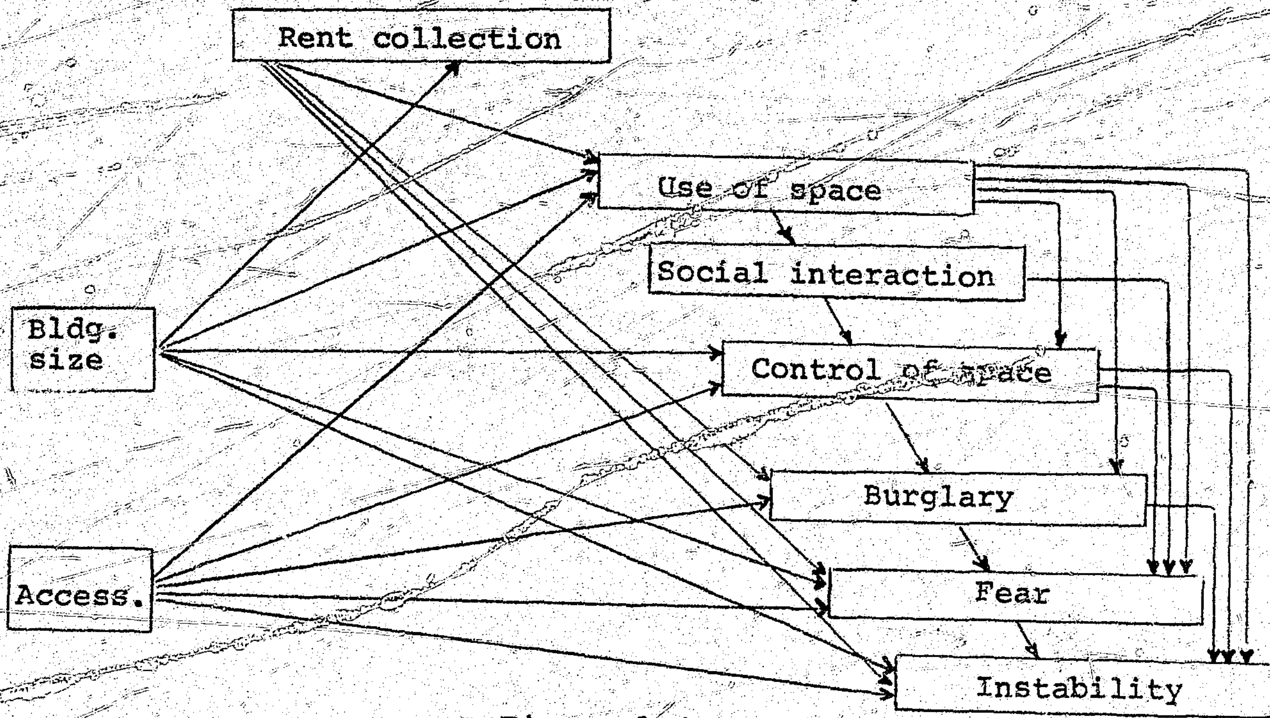

Figure 1.4

Theoretical Model of Anticipated Effects of Physical Variables on Burglary, Fear, & Instability

This section is devoted to a discussion of the anticipated effects on, and of, burglary, as different from personal crime. The anticipated effects of building size and accessibility on the intervening variables (rent collection, use of space, social interaction, and control of space) were discussed earlier and will not be repeated here. Only the effects of the physical variables that are peculiar to burglary are discussed as are any additional effects intervening variables may have on burglary, or the effects of burglary on fear and instability.

Building size, through rent collection, is expected to affect the occurrence of burglaries. If a development's management is short of funds as a consequence of poor rent collection, it will likely have inadequate funds to repair locks on doors and windows and to mend fencing. Building size is also expected to affect burglary rate through control of space. The larger the building, the less control residents will be able to exert over the areas outside their apartments, and, consequently, the easier it will be for burglars to break into the apartments from these areas.

Effects of Accessibility on Burglary, Fear, and Instability

Accessibility is expected to have a strong and important direct effect on burglary because accessibility is primarily a measure of the vulnerability of apartments to intruders. The primary motive intruders have for breaking into apartments is to commit burglaries.

The occurrence of burglaries is anticipated to affect instability because residents will desire to move as a consequence of being burglarized. Burglary is also expected to affect residents' fear, and through fear to affect instability.

Burglaries do not involve encounters between criminals and victims. Therefore it is not expected that they will evoke fear in the victim as much as inconvenience and frustration as a consequence of property loss. Burglary, therefore, is expected to have a stronger effect on residents' desire to move to another location (instability) than on their fear of crime.

Social Characteristics of Residents

Although the causal effects that are of particular interest to this study are those of physical design, other characteristics that are likely to influence the dependent variables are also included in the theoretical model. The inclusion of other causal factors allows us to estimate the comparative effects of different characteristics of housing developments: that is, to determine which of the factors play the strongest roles in causing crime, fear, and instability when all are acting together.

Each of the three social variables is intended to measure a different facet of the social profile of residents in a development. The composite measure low-income/AFDC is an indicator of the socioeconomic class of residents and of the family structure. Teen-adult ratio is an indicator of the dominance of teenagers in the site (a crime-prone group) and of the lack of adults. Cooperative ownership is an indicator of residents' financial involvement in the development. Each of these social variables and their important anticipated effects are described in the following sections of this chapter.

Low-income/AFDC

Low-income/AFDC is a composite measure composed of two variables: the mean adjusted income of households in a site[2] and the proportion of one-parent families receiving welfare. These two variables are combined and included as a composite measure because they are highly correlated and because earlier research has shown them to be important predictors of crime rate.

In the initial defensible space study, the percent of households receiving welfare and the percent of female-headed families proved to be the two most important social characteristics of New York City public housing projects in determining robbery rate (see Table I.1). These two characteristics were highly correlated in that study (r = .72) which suggested that most of the one-parent families in public housing projects in New York were receiving welfare under the program Aid to Families with Dependent Children and that it was primarily the proportion of this type of household that determined the rate of robbery. Unfortunately the percentage of AFDC families was not available as a discrete measure for the Defensible Space study. In this study the percent of AFDC families replaces both the percent of families receiving welfare and the percent of one-parent families.

[2] Mean adjusted income has been reversed so that the direction of this variable is consistent with the direction of AFDC -- the higher the value, the higher the proportion of low income families.

The percentage of female heads of household who are welfare recipients was also singled out by Starr (1971), director of the New York City Housing Administration, as the governing factor predicting instability in public housing. He attributed high crime and vandalism rates, high vacancy rates, and eventual abandonment to the increase in the percentage of AFDC families assigned to public housing. His conclusions were reached as a result of conversations with housing officials and managers, rather than as a result of controlled studies.

A second social characteristic of public housing projects that proved important in determining crime in the New York City study was per capita disposable income (Newman, 1973): the lower the per capita income, the higher the crime rate. It therefore was important to include a measure of the level of income of residents in the present study. The percent of AFDC families does provide some measure of income level, but as some of the moderate-income sites in this study house no AFDC families whatever, percent AFDC alone would not have provided a good measure of the relative economic composition of different sites. Since mean income of households and percent AFDC were highly correlated, the two variables were combined to form a single index.

As shown in Figure 1.5, the variable low-income/AFDC is expected to have direct effects on all the intervening and dependent variables. The percent of low-income and AFDC

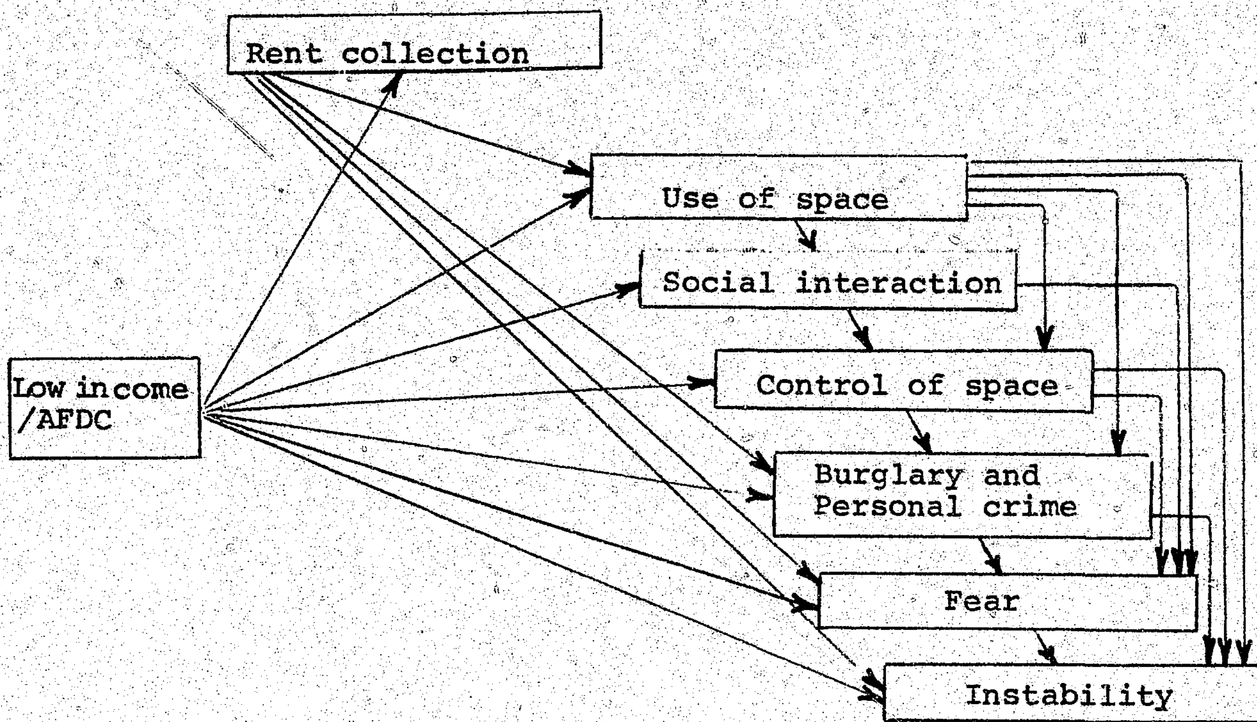

Figure 1.5

Theoretical Model of Anticipated Effects of Low income/AFDC on Crime, Fear, and Instability

families living in a development will probably: produce rent collection problems for management; minimize residents' use of areas outside their apartments; reduce social interaction between residents; minimize residents' control over areas outside their apartments; and influence crime, fear, and instability both directly and indirectly through the four intervening variables.

Ratio of Teenagers to Adults

The ratio of teenagers to adults is the number of teenagers, aged 10 through 20, in a site, divided by the number of persons who are older than 20. Several recent studies have documented teenagers' involvement in crime, particularly in crimes committed within a short distance of their homes. Therefore, it was important to include a measure of the proportion of teenagers.

In our Institute's earlier study of crime in the New York City Housing Authority's projects (Newman, 1972), we found that in 1969, 30.2% of all felony apprehendees were under the age of 15 and that 76.6% were under the age of 21. We also learned that 51% of the apprehendees lived in the projects. Repetto (1974), in his study of residential crime in Boston, found that as the percentage of population under 18 years of age increased, so did the crime rate of the residential areas under study. The results were particularly significant where those under 18 years of age surpassed 40 percent of the population. As an example, an analysis of all arrests for burglary in a large housing project with more than 40 percent teenagers showed that of 78 persons arrested, 30 percent were under 17, and the rest were between 17 and 24 years of age. Eighty-one percent of all persons arrested lived in the project.

In reviewing the literature on crime displacement, Repetto (1976) found that young criminals commit most of their crimes a short distance from home, and that many of these are crimes of opportunity (rather than premeditated crimes) involving small rewards and minimal skills.

The presence of teenagers in a housing environment is therefore likely to affect the crime rate experienced by residents. In examining alternate modes of measuring the concentration of teenagers we choose the ratio of teenagers to adults over the ratio of teenagers to the total population. The latter measure was rejected because it combines the number of young children (under the age of 10) with the number of adults to form the non-teenage part of the measure. Using children and adults to form the base of the ratio causes the ratio to be lower than if adults only are used to form the base. This lower ratio is deceptive since the theory postulates that the presence of adults can control teenagers' criminal activity. Adult residents, in addition to being the victims of most teenage crime, are also the restraining and moralizing force in the community. We therefore reasoned that the ratio of teenagers to adults would be the measure most likely to capture the effects of a teenage presence on crime and of an adult presence on crime prevention.

Because most adults are aware from their own experiences that teenagers commit a high percentage of all crimes, residents' sensibilities and activities should also be affected by the obvious presence of a high ratio of teenagers -- regardless of the adults' actual experiences of crime. Figure 1.6 illustrates the theoretical model showing the anticipated effects of teen-adult ratio on the intervening and dependent variables.

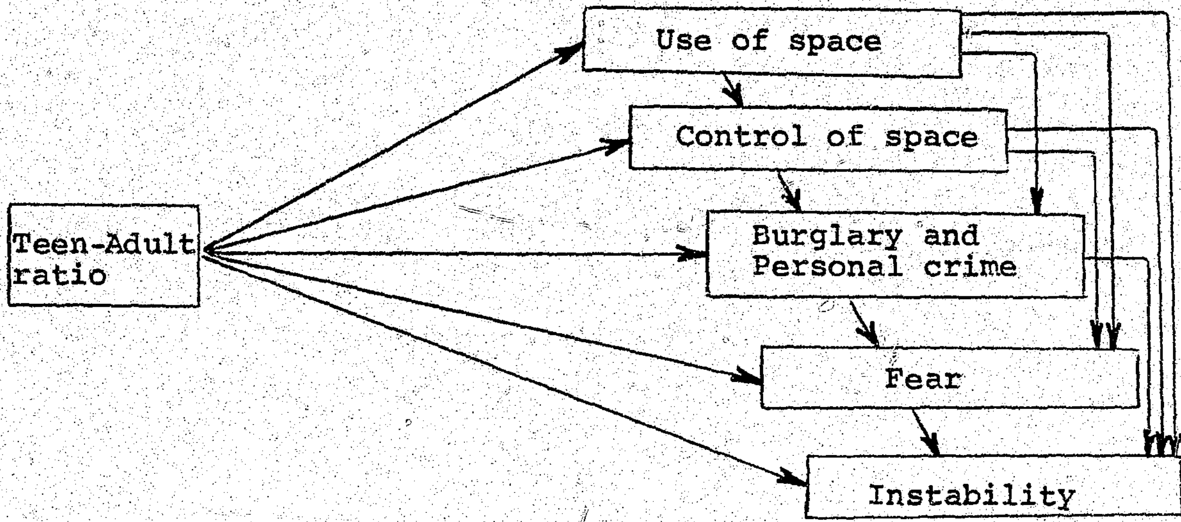

Figure 1.6

Theoretical Model of Anticipated Effects
of Teen-Adult Ratio

Teen-adult ratio is expected to have a direct positive effect on residents' experience of burglary and personal crime, on fear, and on instability. Teen-adult ratio is expected to affect negatively the following intervening variables: residents' use of space and residents' control of space. The effects of teen-adult ratio on these two intervening variables is expected to be reflected in an increase in residents' fear and in the developments' instability.

Cooperative Ownership

The independent social variable cooperative ownership is a simple dichotomous variable which measures whether or not the development was financed within a framework which allowed residents to take title to their apartments through a mortgage arrangement.

Cooperative ownership was introduced for two reasons. First, it is reasonable to assume that, all other social, physical, and managerial conditions being equal, residents' use of and control over areas of their development outside their apartments would be affected by whether or not they had legal title to it. Similarly, residents' desire to move might be affected by whether or not they shared in the ownership of the development. Second, critics of the original defensible space study made the point that residents' identification with an area and their sense of control over it were probably more the consequence of their involvement in the ownership of the development than of building design or the assignment of physical space.

Figure 1.7 shows how cooperative ownership is expected to influence the intervening and dependent variables. Cooperative ownership is expected to directly and favorably influence: residents' use of the areas outside their apartments; their control over these areas; their interaction with their neighbors; their fear of crime; and their desire to move. Cooperative ownership, through the three intervening variables (use of space, social interaction, and control of space), is also expected to have effects on all the dependent variables (crime, fear, and instability).

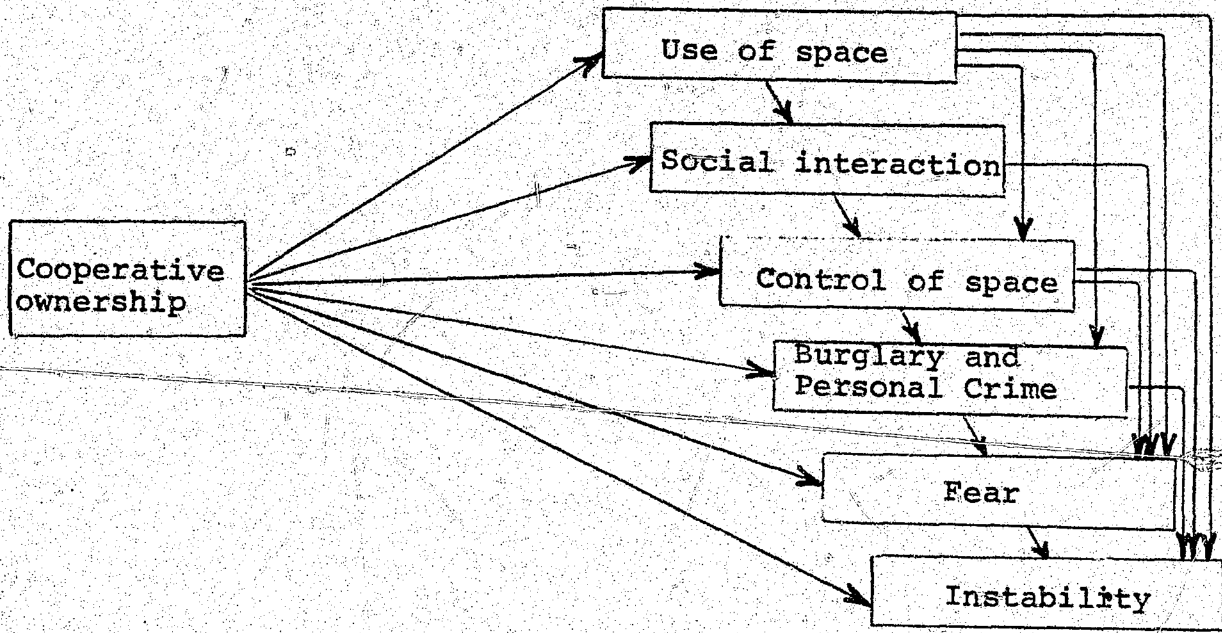

Figure 1.7

Theoretical Model of Anticipated Effects of Cooperative Ownership

Police Service and Guard Service

No consideration of the social and physical factors which affect crime, fear, and instability would be complete without weighing the influence of security forces. There are two types of security forces that must be considered: the municipal police and the development's own security guard service. The reason for including municipal police service and security guard service as independent variables in the causal model is to control for the possible effects they might have on crime, fear, and instability and thereby to estimate the effects of physical design features and social characteristics as accurately as possible. It should be kept in mind that the causal model and research design for this study were developed primarily to estimate the effects of physical design features and social characteristics of residents, not to estimate the effects of municipal police and guard service.

Municipal Police Service

The quality of municipal police service is measured by an index of the number and type of patrols the police make. Given the findings of earlier studies, we do not expect that police service will affect either the rate of personal crime or the rate of burglary. The Police Foundation's study of residential crime in Kansas City showed that neither the doubling of municipal police assigned to the patrolling of residential neighborhoods, nor their total removal, had any demonstrable effect on residential crime. Repetto, in his study of residential crime, found that less than 5% of crimes taking place in residential areas were observed by police while the crimes were being committed. Variation in the patrolling practices that municipal police forces provide to housing developments is not therefore expected to show any effect on the occurrence of personal crime or burglary.

The quality of police service is, however, expected to affect residents' fear, in that the visual presence of patrolling police and a quick police response to residents' requests for assistance can be expected to have an effect in reducing residents' fears (Figure 1.8). Through its effect on fear, the quality of police service is also likely to influence instability.

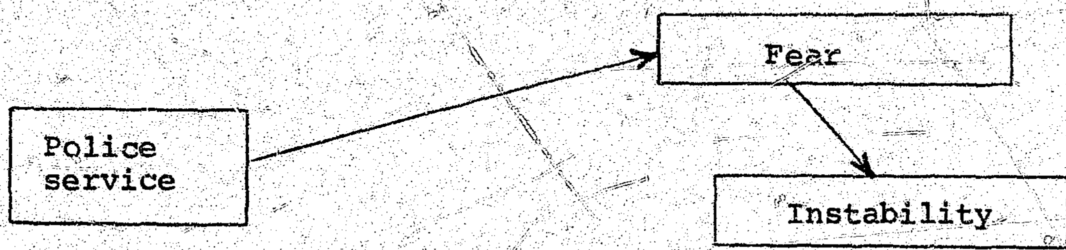

Figure 1.8

Theoretical Model of Anticipated Effects of Police Service

Security Guard Service

Security guard service is a measure of the presence and nature of the security guard services provided at each site. Security guard service is expected to have direct effects on both types of crime and on residents' fear of crime, and indirect effects on instability through crime and fear of crime (see Figure 1.9).

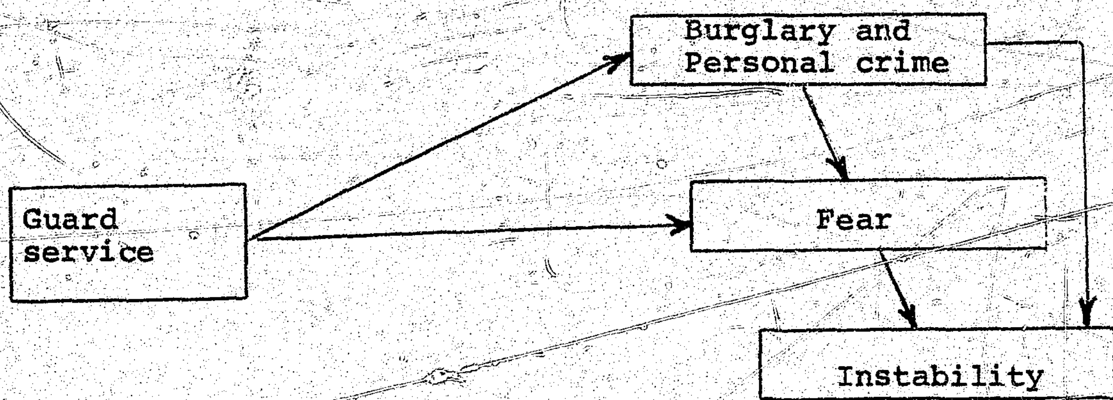

Figure 1.9

Theoretical Model of Anticipated Effects of Guard Service

CHAPTER 2: STUDY SITES AND SAMPLE OF RESIDENTS

The primary source of data for this study is a survey of households conducted in a single stage in late 1976 and early 1977 in which interviews were obtained from residents in federally-assisted housing developments in three cities. Housing managers and city police were also interviewed. Archival data collected from housing management and police files were used to supplement the interviews with residents, management, and police. This chapter presents the selection criteria and characteristics of the study sites and the sampling design for selecting residents to be interviewed. A detailed description of the sources of data is given in Appendix C.

Study Sites

The study sites are moderate-income, federally-assisted housing developments in Newark, St. Louis, and San Francisco, and public housing projects in San Francisco. In this study the terms "moderate-income developments" and "public housing projects" refer to the two major types of federal assistance programs which are used to build and operate these apartment complexes. The moderate-income developments are privately owned either by non-profit or limited dividend corporations, or by the tenants themselves. They were built under Title 221(d)(3) or Section 236 of the National Housing Act which provide a share of the equity and guarantee low-interest mortgage loans. The public housing projects were built with the federal government providing the total project costs and are owned and maintained by the individual municipality. Maintenance costs are supposed to be covered by rental income, although the federal government has recently started providing subsidies to housing authorities who house a high proportion of low-income and welfare residents. For the most part moderate-income developments house a higher-income group than public housing. However, the term "moderate-income" is not always an accurate description of the relative economic composition of these sites since some moderate-income sites in this study house as many low-income families as a public housing project (See Table 2.2).

Several housing developments in this study contain buildings of two different types -- such as walk-ups and row houses -- within the same development. Whenever a development in this study contained more than one building type, the buildings of each type were treated as separate sites. Thus with developments containing only one building type the unit of analysis is the entire development: the housing development coincides with the study site. When the development contains two building types there are two study sites and the unit of analysis is each group of buildings of the same type.

Criteria for Selecting Cities

The initial design for this study proposed that moderate-income developments in eight cities be examined. This, it was reasoned, would provide a large number of sites and a high degree of variation in the physical design and social characteristics of sites. However, a preliminary examination of the costs of visiting each city numerous times, of training local personnel, of administering the interviews, and of gathering archival data indicated that this would be prohibitively costly. It was decided, therefore, to limit the study to moderate-income developments in three diverse cities and to select cities which contained developments of sufficiently diverse physical and social characteristics.

The three cities to be chosen were required to meet five criteria. First, the cities would have to be of medium size, varying from 250,000 to 750,000 in population. This city-size criterion was determined by the funding agency (NILECJ) who desired to test the defensible space hypotheses in smaller cities; the original defensible space research was conducted in New York City. The second criterion was that these moderately-sized cities be located in three different regions of the country: the Northeast, the Midwest, and the Far West.

The third and fourth criteria required variation in two of the study's most important independent variables -- building type and percent AFDC families -- and the need to keep the correlation between these two variables low. Together, the housing developments in the three cities were to provide the full range of multifamily building forms -- row houses, walk-up buildings, and high-rise buildings -- and within each building type there was to be sufficient variation in the percent of single-parent welfare families (AFDC). Cities with concentrations of AFDC families in particular building types were to be avoided.

The fifth and final criterion in selecting the study cities was not generated by the internal needs of the study but was nevertheless an essential ingredient to its success: that the housing agencies and management firms in each of the cities extend their cooperation. Of the cities examined in the three regions of the country, the three which best satisfied the above criteria were Newark, St. Louis, and San Francisco (see Table 2.1).

Table 2.1

Characteristics of the Three Study Cities

			Mean Percent AFDC in Different Building Types		
City	National location	Population	Row House	Walk-up	High-rise
Newark	Northeast	382,000	-[1]	19%	8%
St. Louis	Midwest	622,000	6	21	-[1]
San Francisco	Far West	716,000	10	6	12

[1] (-) indicates no buildings of this type

Criteria for Selecting Study Sites in Each City

In each of the three cities, our research plan called for study sites to consist of all the moderate-income, federally-assisted developments which were more than two years old as of April, 1976, and which had less than 60% elderly residents.[1] Seven developments which met these two criteria were excluded for other reasons: in Newark four developments that consisted of small scatter-site housing units were excluded because they were separated by several blocks of privately owned housing; in St. Louis one owner refused to allow his development to be included in the study; and in San Francisco the tenant boards of two housing developments declined to authorize the inclusion of their developments in the study. This brought the total number of moderate-income developments included in the study to 35. Ten of these thirty-five developments consist of a mix of two building types. Each of the individual building types in the ten mixed developments was considered a separate study site. The total number of moderate-income study sites was therefore 45.

Upon detailed examination of the characteristics of the study sites it was found that only two of the moderate-income

[1]Past studies (Newman, 1972) have shown that developments occupied by 60% or more elderly take on a very different character from developments that are occupied solely by families with children, working couples and singles, or by a mixture of families with children and elderly in which the elderly are the minority. For this reason developments containing more than 60% elderly residents were excluded from the study.

sites fell into the category of high-rise with a high proportion of low-income families. In order to increase the number of high-rise, low-income sites, it was decided that all of San Francisco's public housing projects should be added to the study. This solution was found to be preferable to including additional cities in order to obtain more high-rise, low-income sites. (See Appendix A for a more detailed account of the decision to include San Francisco public housing.)

A total of 19 public housing projects in San Francisco were found to be eligible for the study in that they housed less than 60% elderly residents and were more than two years old as of April, 1976. Adding these 19 projects brought the total number of <u>developments</u> in the study to 54. Eight of these public housing projects contained two building types, thus making 16 study sites. The total number of San Francisco public housing sites was thus 27. The addition of these 27 public housing sites to the 45 moderate-income sites brought the total number of study <u>sites</u> to 72. The number of low-income, high-rise sites increased from two to seven.

Characteristics of the Sites

Nine of the 72 study sites were excluded from the analysis when it was found that: 1) the number of interviews obtained in seven of the smaller sites was fewer than eight; 2) in two of the San Francisco sites the residents were

Chinese and were not fluent enough in English to be interviewed. The final number of study sites used in the analysis was therefore 63.

Table 2.2 presents the major physical and social characteristics of each of the 63 study sites used in the analysis. The high-rise sites are located in Newark and San Francisco; the row house sites in St. Louis and San Francisco; and the walk-up sites in each of the three cities. Altogether there are 11 high-rise sites, 34 walk-up sites, and 18 row house sites. On the whole, the sites are small, ranging from 32 units (Urban Housing high-rise) to 772 units (Sunnydale) with the average size being 169 apartment units.

The proportion of single-parent families on welfare (%AFDC) ranges from 0 in several moderate income sites to 63% in one public housing site (Hunter's View row house site). The average for all sites is 23%. There is a higher proportion of AFDC families located in public housing than in moderate-income housing as was expected (see Appendix A). The ratio of teenagers to adults ranges from .1 in Jefferson row houses and walk-ups to 2.2 in Timstill and Hunter's View; the mean across all sites is .7. Of the 63 sites, 49 housed 70% or more black households. Only two sites had no black families (Jefferson walk-up and Jefferson row houses). The remaining 12 sites ranged from 32% to 59% black.

Table 2. 2

Physical and Social Characteristics of Sites

Name of development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income [illegible]0 and not welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
I. Newark Moderate Income Developments									
Hill Manor	High-rise	425	371	8%	81%	.4	95%	95	26%
Urban Housing	High-rise	32	32	17	50	1.0	100	12	38
Zion	High-rise	268	253	5	72	.4	80	69	27
Mt. Calvary 1	High-rise	116	104	14	64	.5	93	28	27
Mt. Calvary 2	High-rise	116	104	28	52	.6	97	34	33
Carmel	High-rise	216	197	5	89	.4	95	62	31
St. James	High-rise	200	200	5	94	.3	100	61	31
Average for Newark High-rise Developments		196	180	12%	72%	.5	94%	-	30%
Urban Housing	Walk-up	86	83	25	52	.4	100	31	37
Timstill	Walk-up	75	72	50	35	2.2	100	24	33
Amity Village I	Walk-up	96	91	24	59	.9	97	33	36
University Courts	Walk-up	270	268	[illegible]7	80	.4	89	84	31
Average for Newark Walk-up Developments		132	129	27%	57%	1.0	97%	-	34%

(continued)

Table 2.2 (Continued)

Name of development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income ≥ $2000 and not on welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
II. St. Louis Moderate Income Developments									
Jefferson	Walk-up	108	108	0%	76%	.1	0%	27	25%
Alpha Gardens	Walk-up	145	140	6	87	.4	98	49	35
Alpha Village	Walk-up	91	87	4	83	.4	100	25	29
Westside Community Gardens	Walk-up	252	251	44	27	1.5	99	69	27
Kinloch Manor East	Walk-up	101	93	41	50	.9	100	22	24
Aritha Spotts	Walk-up	38	37	0	78	.4	100	9	24
Boaz	Walk-up	104	97	50	19	.8	92	36	37
Hillvale	Walk-up	146	145	0	98	.5	100	46	32
Leawood	Walk-up	84	64	11	69	.3	33	27	42
Average for St. Louis Walk-up Developments		119	114	17%	65%	.6	80%	-	31%
Jefferson	Row house	196	194	2	96	.1	0	51	26
Primm	Row house	210	203	11	65	1.2	99	65	32
Aritha Spotts	Row house	36	36	0	83	1.3	100	13	36
University Terrace	Row house	56	56	0	81	.1	82	17	30
Average for St. Louis Row House Developments		125	122	3%	81%	.7	70%	-	31%

(continued)

Table 2.2 (Continued)

Name of development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income >$2000 and not on welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
III. San Francisco Moderate Income Developments									
Geneva	High-rise	576	452	12%	80%	.6	86%	68	15%
Ridgeview	Walk-up	48	39	0	67	.1	100	13	33
Vista del Monte	Walk-up	104	100	0	96	.7	46	25	25
Glenridge	Walk-up	76	72	0	94	.1	30	19	26
F. D. Haynes	Walk-up	104	101	7	80	.8	77	30	30
Prince Hall	Walk-up	93	80	8	48	.3	96	25	31
Thomas Paine	Walk-up	60	51	4	73	.1	83	24	47
Marcus Garvey	Walk-up	65	61	13	75	.1	88	16	26
Martin Luther King	Walk-up	38	36	20	56	.1	82	11	31
Freedom West	Walk-up	312	310	5	80	.4	52	90	29
Banneker	Walk-up	108	106	23	52	.8	97	34	32
Friendship	Walk-up	158	154	12	61	.5	96	47	31
St. Francis	Walk-up	299	297	0	97	.4	36	71	24
Average for San Francisco Walk-up Developments		122	117	8%	73%	.4	74%	-	30%

(continued)

Table 2.2 (continued)

	Name of development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income > $2000 and not on welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
III.	San Francisco Moderate Income Developments (continued)									
	Ridgeview	Row house	53	51	0%	86%	.8	88%	15	29%
	Loren Miller	Row house	107	103	4	78	.6	92	24	23
	Glenridge	Row house	199	196	4	92	.7	40	51	26
	Thomas Paine	Row house	38	36	17	67	.9	100	14	39
	Marcue Garvey	Row house	36	36	25	55	1.0	100	12	33
	Martin Luther King	Row house	72	66	15	81	1.2	96	28	42
	Freedom West	Row house	70	68	20	72	.5	42	21	31
	Average for San Francisco Moderate-Income Row House Developments		82	79	12%	76%	.8	80%	-	32%
IV.	San Francisco Public Housing Developments									
	Bernal	High-rise	64	54	53	15	.7	31	16	30
	Yerba Buena Plaza	High-rise	468	395	52	16	.5	96	96	24
	Yerba Buena Plaza Annex	High-rise	211	172	36	35	.4	96	50	29
	Average for San Francisco Public Housing High-rise Developments		248	207	47%	22	.5	74%	-	28%

(continued)

Table 2.2 (continued)

	Name of development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income > $2000 and not on welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
IV.	San Francisco Public Housing Developments (continued)									
	Valencia Gardens	Walk-up	246	221	39%	38%	.5	41%	59	27%
	Bernal	Walk-up	144	127	53	15	1.2	59	35	28
	Westside Courts	Walk-up	136	133	35	41	.7	96	49	37
	Potrero Annex	Walk-up	172	131	44	13	1.3	78	39	30
	North Beach	Walk-up	229	227	41	45	1.1	40	30	13
	Alemany	Walk-up	56	49	56	44	.5	70	9	18
	Yerba Buena Plaza	Walk-up	140	136	33	31	1.2	95	45	33
	Alice Griffith	Walk-up	96	79	53	18	.6	100	17	22
	Hayes Valley	Walk-up	310	282	55	26	.6	85	69	24
	Average for San Francisco Public Housing Walk-up Developments		170	154	45%	30%	.9	74%	-	26%

(continued)

Table 2.2 (continued)

	Name of Development	Building type	Total units	Total occupied units[1]	% AFDC households[2]	% households with income > $2000 and not on welfare[3]	Teen to adult ratio[4]	% black households[5]	Number of respondents	Respondents as % of occupied units
IV.	San Francisco Public Housing Developments (continued)									
	Holly Courts	Row house	118	115	30%	19	.3	18%	27	23%
	Potrero Terrace	Row house	469	448	43	27	.6	74	140	31
	Sunnydale	Row house	772	736	37	22	.9	68	150	20
	Harbor Slope	Row house	226	186	36	42	.8	95	41	22
	Alemany	Row house	108	101	38	18	.8	85	34	34
	Hunter's View	Row house	253	222	63	22	2.2	89	56	25
	Alice Griffith	Row house	258	249	48	26	1.3	87	66	27
	Average for San Francisco Public Housing Row-House Developments		315	294	43%	25%	1.0	74%	-	26%

[1] Occupied units at time of sampling.

[2] Calculated from the household survey by taking the number of respondents whose households receive Aid to Families with Dependent Children as a percentage of the total number of respondents who answered question R8. Any one-parent family receiving welfare as the major source of income and with children under the age of 18 was considered to be receiving AFDC.

[3] Calculated from the household survey. Total household income was reduced by the number of household members multiplied by $600 to arrive at an estimated real income.

[4] Calculated from the household survey using the household roster. Teenagers were defined as all persons aged 10-20; adults were defined as all persons aged 21 and older.

[5] Calculated from the household survey using question R11.

Table 2.3 summarizes the information from Table 2.2 and shows, for example, that the mean percent of AFDC families for all 11 high-rise sites is 21%. This table demonstrates that the mean differences in social characteristics between the three building types in the study are not significant. No more than 8 percent of the variation in any of the social characteristics of residents is determined by building type (see the values for eta^2 in Table 2.3).

Table 2.3

Social Characteristics of Sites by Building Type
(N = 63 sites)

	High-rise Sites		Walk-up Sites		Row house Sites		
	Mean	s.d.[1]	Mean	s.d.[1]	Mean	s.d.[1]	Eta^2 *
Percent AFDC families	.21	.18	.22	.20	.22	.19	.0004
Mean adjusted family income	$2400	$1666	$2177	$1843	$2703	$2189	.0144
Ratio of teenagers to adults	.54	.20	.63	.47	.86	.49	.0729
Percent black households	88	20	78	27	75	30	.0256
	N=11		N=34		N=18		

1. Standard deviation

* None of the values of eta^2 is significant ($p < .15$).

The Sample of Residents

At the time the survey sample was designated 9,764 households were living within the 63 study sites. It is these households that constitute the population surveyed.

Sampling Design

The sample of residents interviewed was a stratified probability sample. Six stratification variables were used in the sampling design: 1) city where the site is located; 2) building type; 3) size of development; 4) percent low-income residents; 5) percent one-parent families; and 6) proximity to public housing. The cross-classification matrix formed by these variables contained a total of 216 strata, only 45 of which, however, were actually represented by the study sites. The method used for allocating the number of interviews to be obtained from each stratum was proportional allocation: the number of interviews to be obtained was proportional to that stratum's share of the total number of occupied units across all the developments. The number of interviews to be obtained within each stratum was inflated in order to allow for ineligible and non-responding households. Within each stratum, systematic sub-samples were drawn with random starts. (Please refer to Appendix B for a more detailed presentation of this sampling design.)

In each designated household, either of the two adult heads, if there were two, could be interviewed. Therefore, as part of the selection of the sample, the sex of the family head <u>to be</u> interviewed in each household was determined randomly. Interviewers were instructed to ignore the <u>designated</u> sex of the person to be interviewed in households where there was only one head of household.

<u>Eligibility Requirements</u>

In order to be interviewed, households had to meet two eligibility requirements. First, the respondents had to speak and understand English or Spanish well enough to be interviewed in one of those languages. Second, the respondent had to have lived in his or her current apartment for at least twelve months. In cases where the designated respondent was ineligible under either of these two criteria, or if he or she was seriously ill, or was away for an extended period of time, the spouse, if eligible, was interviewed instead. If there was no spouse, or the spouse was also ineligible, the household was declared ineligible.

During the interviewing phase of the study, two problems were encountered: (1) a high rate of ineligibility among designated respondents because of their short length of residence or their lack of knowledge of either English or Spanish; and (2) a large number of recently vacated apartments among the designated households. These two problems, while reducing the total number of interviews obtained, did not entail either actual refusal to participate by residents or failure to reach residents. Therefore, these lost respondents were not included in the computation of non-response rates.

The number of designated respondents who were ineligible under the twelve-month residency requirement was found to be so large that after two and one-half months of interviewing it was decided to reduce the criterion for length of residency from 12 to 9 months. Interviewers therefore returned to all households where the occupant was declared ineligible because of the 12 month residency requirement and obtained an interview if the respondent was eligible under the new requirements. Even with this new criterion, ineligibility due to length of residency remained a problem in high-turnover developments. (The total number of additional interviews obtained, from residents who met the new, lower length-of-residency requirement, was 68.)

Rates of Response

Table 2.4 shows, by city and building type: the sample as initially designated -- that is, the number of household heads or spouses who were originally slated to be interviewed; the designated sample after subtracting out vacant apartments and ineligible households; and percentages of respondents and non-respondents, respectively.

Table 2.4

Rate of Response by City and Building Type

	Newark		St. Louis		San Francisco Moderate Income			San Francisco Public			Total
	Walk-up	High-rise	Row house	Walk-up	Row house	Walk-up	High-rise	Row house	Walk-up	High-rise	
Designated sample:[1] Number of household heads or spouses designated for interview	232	570	216	464	247	638	205	956	619	474	4621
Designated sample less ineligibles, vacant households, and other[2]	213	510	169	366	215	578	117	783	484	261	3696
% Respondents	81%	71%	86%	85%	77%	70%	58%	66%	73%	66%	72%
% Non-respondents[3]	19%	29%	14%	15%	23%	30%	42%	34%	27%	34%	
Could not be reached (by city)	14%		3%			14%			21%		15%
Refused (by city)	12%		12%			16%			11%		13%
Total (by city)	26%		15%			30%			32%		28%

[1]This number does not include persons designated for interview in strata later dropped from the analysis. Including these designated persons would increase the N for St. Louis by 19 high-rise designated persons to 699 total, and for San Francisco public by 61 walk-up and 11 row house designated persons to 2121 total. For an explanation of why these strata were dropped, see Appendix B.

[2]"Other" includes any assignment which was not an apartment, and any assignment not made because of administrative error or lack of time remaining for field work.

[3]Non-respondents are defined as designated persons who could not be contacted (i.e., not at home) or who declined to participate in the study. Figures are available only at the city level for these finer distinctions in the percent non-respondents.

The rate of response, overall, was 72 percent (of the 3,696 households remaining after subtracting vacant apartments and ineligibles), with somewhat higher rates in St. Louis (85%) than in Newark (74%), San Francisco moderate-income developments (70%) or San Francisco public housing (68%). There also appeared to be a slight relationship between response rate and building type in Newark and San Francisco moderate-income developments, with relatively lower proportions of obtained interviews in high-rises than in walk-ups or row houses.

The 72% rate of response may seem low but it compares favorably with recently reported survey response rates. For example, a survey of households in Chicago conducted in 1973-1974 had a response rate of 68% (Gove, Hughes, and Galle, 1979). It should also be noted that our non-response rate of 28% includes both designated respondents who could not be reached after repeated visits (15% overall) and actual refusals (13% overall).

A total of 2,655 interviews were obtained in the 63 sites that were used in the analysis. This represents 27 percent of the total of 9,764 occupied dwelling units in these sites.

Characteristics of Respondents

Table 2.5 shows, for a number of characteristics, the percentage of respondents possessing each attribute by city and by building type. Four out of every five respondents

Table 2.5

Characteristics of Respondents by City and Building Type

Characteristics of Respondents[1]	Newark		St. Louis		San Francisco Moderate Income			San Francisco Public			Average
	Walk-up	High-rise	Row house	Walk-up	Row house	Walk-up	High-rise	Row house	Walk-up	High-rise	
Sex of Respondents:[2]											
% Female	73%	76%	74%	84%	80%	69%	78%	87%	87%	81%	80%
% Male	27	24	26	16	20	31	22	13	13	19	20
Length of Residence[3]											
% there less than one year	0	0	9	4	1	1	5	3	3	5	3
% there 1 - 2 years	7	12	16	25	17	18	29	21	22	28	19
% there 3 years	8	18	14	18	19	24	21	15	13	21	17
% there 4 or more years	85	71	61	54	63	58	46	60	61	46	61
Age of Respondents:[4]											
16 - 19	0%	1%	1%	1%	0%	0%	0%	2%	4%	2%	1%
20 - 34	31	49	66	55	45	36	63	48	45	46	47
35 - 64	61	39	29	36	52	54	36	47	43	46	45
65 and over	8	12	4	9	3	9	1	4	8	6	7
Total Number of Respondents[5]	172	361	146	310	165	405	68	514	352	162	2655[5]

[1]Percentages are based on the number of respondents who answered each particular question (excluding refusals, don't know, etc.). Thus, the N differs slightly for each characteristic listed in the table.

[2]From the household roster, question R5.

[3]From question C1.

[4]From the household roster, question R5.

[5]Respondents included in Table 2.5 are only those respondents who reside in the 63 sites retained for site-level analysis.

were women, with little variation by city or by building type. On the average, over three out of every five respondents had resided at their developments for at least four years (61%). No more than a handful had been residents for fewer than 12 months (3%). On the average, respondents were fairly evenly divided between two age categories: 20 to 34 years old and 35 to 64 years old.

CHAPTER 3: MEASUREMENT OF VARIABLES

Two steps were used in the analysis of data: in step one composite measures were constructed for each of the independent, dependent, and intervening variables in the model; in step two the parameters of the model were estimated using the techniques of path analysis. This chapter describes the construction and content of the variables and Chapter 4 describes the use of path analysis. This chapter is divided into four sections: the first section gives a brief description of the technique used to form the composite measure; the second, third, and fourth sections deal with the independent, intervening, and dependent variables respectively. Please refer to Appendix D for the exact wording of the individual items and for the inter-item correlations.

Construction of Composite Measures

Almost all of the independent, intervening, and dependent variables used in this investigation were constructed as composite measures. Composites can be derived either theoretically or empirically, and in this study we have examples of both. In some situations the conceptual definition of a variable dictated the items which should be combined in order to measure it. In others, the theoretical guidelines were less specific so that the combination of items into a scale was determined empirically, e.g. according to high inter-item correlations or factor loadings.

Standard psychometric techniques were followed for constructing scales according to their empirical properties in this research. Specifically, items which we judged to reflect the same construct domain were intercorrelated and factor analyzed by the MINRES method (Harman, 1967). After a set of relatively homogenous items had been identified (i.e., they exhibited high intercorrelations with the other items in the set or they loaded on a single factor) Cronbach's coefficient alpha was computed. Alpha indexes the degree of internal consistency of a set of items and is interpreted as a measure of the reliability of the scale. It ranges in value from 0.0 (no reliability or internal consistency) to 1.0 (perfect reliability or homogeneity). Since errors of measurement can badly bias the estimation of regression (path) coefficients, we decided that Cronbach's alpha must equal or exceed .70 in order for a composite to be used as a measure of one of the independent, intervening, or dependent variables. In some instances we tried out a variety of item combinations. Of these, we selected the one with the highest value of Cronbach's alpha <u>and</u> fit our general theoretical framework. All composites were computed as the unweighted sum of the items in standardized form.

The process of constructing composites was further complicated by the fact that the data were gathered from different (hierarchically ordered) sources: individual residents within buildings responded to the household questionnaire; managers responded about the housing developments for which they were responsible; local police responded about patrolling of housing developments; Institute staff rated the design and accessibility of building types within each development. In the construction of some variables we were confronted with the problem of having to combine data from more than one of these sources. Our composite construction process can be described as follows: For each data source separately we constructed composites according to theoretical and/or empirical criteria. Then, for the respondent data, the composite means for each site were calculated. This procedure generated a set of items and composites from the respondents', managers', police, and Institute data with N = 63. Most of our variable definitions were taken from these composites and items. However, in some cases composites from different sources, e.g., the respondents and managers, measured the same underlying construct. In those cases the composites were intercorrelated, coefficient alpha evaluated, and "composites of the composites" formed. For example, the independent variable "guard service" to be described later was constructed as a composite of items and composites from the respondents' and managers' questionnaires. As before these "composites of composites" were formed as the unweighted sum of the z-scored composites. When data were only available at the development-level of analysis and a given development contained two sites, then the value of a composite measure for that development was assigned to both sites.[1]

Independent Variables

A total of seven independent variables are included in the study's causal model: building size and building accessibility as the two physical design features; low-income/AFDC, ratio of teenagers to adults, and cooperative ownership as the three social characteristics of sites; and, finally, police service and guard service as two measures of security services provided to residents. These variables, a brief description of each one, and its source are listed in Table 3.1 below. Each variable was described briefly in Chapter 1; a more detailed description follows.

Building Size

Building size is an index that combines two physical characteristics of sites: (1) the number of apartment units that share a building entry or, in the case of outdoor stairways, the number of apartment units that share a stairway;

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[1]This system of assigning the development value to both sites within a development was used for the following composites: police service; guard service; rent collection; and instability. The value for cooperative ownership was also assigned to both sites in a development where the development contained two developments. The value on all other variables was determined for each site separately.

Table 3.1

Independent Variables

Variable Name	Description	Source
Building size	Index: Units per entry and building type	Site visits & site plans
Accessibility	Rating of vulnerability of buildings and apartments to intrusion by outsiders	Site visits
Low-income/AFDC	Index: Mean household income of residents and percent of one-parent welfare families	Household survey
Teen-adult ratio	Ratio of total number of teenagers (10-20 year olds) to number of adults	Household survey
Cooperative	Cooperative ownership by residents	Manager interview
Police service	Index: Frequency and type of police patrols	Police interview
Security guard service	Index: Presence and quality of security guard service	Manager interview & household survey

and (2) the building type. Buildings are classified into four types: row houses; two types of walk-up buildings -- regular walk-up buildings and gallerias, which are walk-up buildings with an open, single loaded corridor; and high-rise buildings.

In row houses the apartment entrance is the same as the building entrance; therefore, row houses are rated as having only one apartment unit per entry. As shown in Table 3.2, the number of units per entry for regular walk-up buildings ranges from 2 to 19, with a mean of about 7. For gallerias, the range is from 4 to 116 units with the mean being about 25. The range of units per entry for high-rise sites is 32 to 425 with the the average being 183. Units per entry and building type are naturally correlated (r = .67) since all row houses have one unit per entry and most high-rises have more than 100 units per entry.

Table 3.2

Number of Units Sharing an Entry in Each Building Type

	Row House	Walk-up	Galleria type walk-up	High-rise
Number of sites of each type	18	25	9	11
Range in units per entry	1[a]	2-19	4-116	32-425
Mean number of units per entry	1[a]	6.9	24.6	183.2

[a]All row houses by definition have one unit per entry.

The rationale for combining units per entry with building type is that together these two variables best capture those physical characteristics of building design that are expected to most strongly determine crime, fear of crime, and community instability. Units per entry alone would not meet this objective as well since in some cases the number of units per entry in a galleria is larger than the number per entry in a high-rise. This would then give the high-rise a better rating on defensibility than the galleria, which is inaccurate since some of the qualities intrinsic to gallerias -- no elevators, no fire stairs, and all apartments fairly close to the ground -- make it by definition more defensible than a high-rise. On the other hand, using building type alone as a measure of building design could cause some distortions as well. The variation in the number of units per entry within each building type, except row houses, is quite large, and this variation is lost when building type alone is used as a measure of design.

Accessibility

The accessibility of buildings and apartments in a site was measured with a rating system designed especially for this study. Because of the unique qualities of each of the building types, apartments in each type are vulnerable to intrusion in decidedly different ways. That is to say, the characteristics that make row house apartments easily accessible are different from the characteristics that make either walk-up or high-rise apartments accessible, and similarly the design features that make walk-up units accessible are different from those that make high-rise units accessible. For this reason, the criteria used to rate accessibility are different for the three building types (row houses, both types of walk-ups, and high rises). In the end, then, the accessibility ratings reflect the variability in accessibility *within* each building type, which results in a very low correlation between building size and accessibility ($r = -.12$).

The accessibility to the interior of row house units is measured solely in terms of the accessibility of the ground floor windows, front and back, since it is the design of the windows which makes row house units more, or less, vulnerable to intrusion. The exterior doors, front and back, are not included in the accessibility rating system for row houses because these are the doors to individual units, not to public circulation areas as they are in walk-ups and high-rises. The doors to row house units, being the entrances to the dwellings of individual families, are always equipped with locks and are almost invariably kept shut. There is too little variability in the condition of the doors to row house units to warrant rating them.

High-rise buildings present the opposite picture from row houses. The primary means of access by an intruder to the interior of most individual high-rise units is through the building's common ground floor entrances and then through the common circulation areas of the building rather than through the windows to units because the overwhelming majority of high-rise units have windows that are inaccessible from the ground. For these reasons the accessibility of high-rise units is rated solely in terms of the design and condition of the building's common ground floor entry and exit doors.

Walk-up and galleria type buildings share traits with both row houses and high rises: that is they suffer the vulnerabilities of both. Walk-up buildings are similar to row houses in that the windows of ground floor units -- and the windows to second and third floor units in gallerias -- are vulnerable to access either from the ground of from the circulation areas. They are similar to high-rises in that the doors to individual units are vulnerable to access via the common building entrances and the common circulation areas which are hidden from public view. In walk-up buildings designed with an outdoor stair usually no common entry door is provided. In such buildings the visibility of the individual apartment door from the interior of other units and from the street below usually helps to decrease the accessibility of the units.[2] Because of these different design features walk-up sites were rated on all three characteristics: the design of windows; the design and condition of common entry and exit doors; and the visibility of individual apartment doors.

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[2]Some high-rises with outdoor corridors are also designed without common entry and exit doors. However, since most doors to high-rise units are not visible from the street or from other units, the visibility of apartment doors was not included in the rating system for high-rises.

Like the doors of row house apartment units, the doors of individual apartments in walk-up and high-rise buildings are equipped with a lock and are usually in a shut and locked position. Thus, there is too little variation in the condition of individual apartment unit doors in any of the three building types to warrant rating them.

The accessibility rating system for each building type is described in detail below. The scoring system that was used ranges from 0 for accessible to 3 for inaccessible. For ease of presentation of the results, the scale was later reversed so that the direction of the scale throughout this report is toward increasing accessibility, rather than toward increasing inaccessibility.

Row Houses. In row houses a single design feature is rated: the accessibility of ground floor windows, both front and back. This design feature is scored completely inaccessible (3) to completely accessible (0).

3 = both front and back windows are completely inaccessible. Row house windows are defined as completely inaccessible if: (a) the ground area next to the windows is enclosed by a real barrier at least six feet high; (b) the windows are narrow metal framed louvered windows or are provided with guards; or (c) there are no windows on one or more sides of the unit and the windows on the other sides meet either condition (a) or (b).

2 = either the front or the back windows are completely inaccessible in terms of the design features listed above.

1 = the front windows face the street, and the grounds area next to the back windows are enclosed by a symbolic barrier.[3]

0 = none of the above conditions applies.

High-rises. In high-rise buildings three physical design features are rated as either present (score of 1) or absent (score of 0). The overall score for a high-rise site is the sum of the values for these three items and hence ranges from 0 to 3.

1. Doors with locks: This feature is considered present (score of 1) if the building was originally provided with a common front door and with doors for the common secondary exits and if these doors were originally equipped with locks.

2. Secondary exits locked: This feature is considered present (score of 1) if the common secondary exit doors are kept locked.

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[3]Symbolic barriers are demarcation devices which symbolically define, rather than restrict access to, the grounds around a particular unit. They may consist of one or more of the following elements: a change in the level of the ground of two or more feet; or a low fence or shrub.

3. <u>Intercom and front door locked</u>: This feature is considered present (score of 1) if the building is equipped with an intercom system <u>and</u> if the common front door is kept locked except when there is a guard on duty at the front door.

<u>Walk-ups</u>. In walk-up sites five different physical design features are rated either 0 or 1. These values are then added together to give the total score. Since no score received a summary rating of 5 (all 5 attributes present), the range is from 0 to 4. In order to make the range of values for walk-up buildings the same as the range of values for row house and high-rise buildings (0-3), the rating for each walk-up site was divided by 1.33.

1. <u>Visibility of apartment doors</u>. This feature is considered present (score of 1) if these doors are easily visible from the street <u>or</u> if they are easily visible from the windows of other apartment units in the development that face the apartment entry doors.

2. <u>Front common entry door with lock</u>. This feature is considered present (score of 1) if the buildings were originally provided with a common front entry door to the buildings <u>and</u> if these common doors were originally equipped with locks.

3. <u>Front door locked</u>. This feature is considered present (score of 1) if the common front doors to at least 50 percent of the buildings in a site are kept locked. (If the

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1 OF 4

buildings were not originally provided with common entry doors and with locks, this feature is considered absent.)

4. Inaccessibility of front windows. The ground floor windows in the front of a walk-up building and the windows of a galleria that face the corridor are considered inaccessible (score of 1) if they possess one of the following attributes: (a) they cannot be reached from the ground without a ladder; (b) the area next to them is enclosed by a real barrier (at least six feet high; or (c) they are narrow metal framed louvered windows or they are provided with metal guards.

5. Inaccessibility of rear windows. The ground floor windows at the rear of a walk-up building are considered inaccessible (score of 1) if one of the following conditions exists: (a) the windows cannot be reached from the ground without a ladder; (b) the area next to the windows is enclosed by a real barrier; (c) the windows are narrow metal framed louvered windows or they are provided with metal guards; or (d) there are no windows at the rear of the building.

Low-income/AFDC

Low-income/AFDC is an index composed of two items: the mean adjusted income of households in the site and the percent of one-parent, female-headed families on welfare (AFDC). The index ranges from a low proportion of AFDC families and a high estimated mean income to a high proportion of AFDC families and a low adjusted mean income. Previous defensible space research indicated that the percent of households receiving welfare and the percent of one-parent families were the two most important social characteristics in predicting robbery rate in New York City Public Housing (see Table I-1). These two social characteristics were highly correlated (r = .72, reported in Table A6 in DEFENSIBLE SPACE), suggesting that most of the one-parent families in that study were receiving welfare under the program Aid to Families with Dependent Children and that it was primarily the proportion of this type of household that determined the rate of robbery. For some types of crime, per capita disposable income replaced percent of single-parent families and families on welfare as the social characteristic most predictive of crime rate (Newman, 1973).

Because both of these variables, percent AFDC and mean income, proved to be important in earlier research, it seemed important to include them as independent variables in this study. However, entering them as separate independent variables would have resulted in exceedingly high standard errors for the regression coefficients of each one since, at the site-level of analysis, the mean income of households and the percent of AFDC families are highly correlated (r = .73). Entering only one of the variables and excluding the other was considered. However, to use only the percent of AFDC families as the primary social characteristic of sites would have eliminated some of the variation in the level of income between moderate-income sites, where there is often a very low proportion of AFDC families (in fact 10 of the moderate-income sites house no AFDC families at all). On the other hand the use of mean income alone would not capture the particular problems and vulnerabilities of developments that house a high proportion of single-parent, welfare families. For these reasons mean adjusted income of households and percent AFDC were combined to form a single index. Table 3.3 presents the descriptive statistics on percent AFDC and mean adjusted income.

Table 3.3

Descriptive Statistics for Key Physical and Social Variables Used in Composites
(N = 63 sites)

	Range	Mean	Standard deviation
Units per entry[1]	1-425	38.7	83.1
Percent AFDC[2]	0-63%	22.2%	19.4%
Mean adjusted income[2]	$68-$7,094	$2,366	$1,903
Teen-adult ratio	0-2.1	1.5	.45

[1]Units per entry was combined with building type to form the variable "building size."

[2]Percent AFDC was combined with mean adjusted income to form the variable "low income/AFDC."

Ratio of Teenagers to Adults

The ratio of teenagers to adults is the total number of residents aged 10 through 20 in a site, divided by the total number of residents over 20 years old. The ratio of teenagers to adults was included as an independent variable in the model because past research has shown that, at least in public housing projects, it is primarily teenagers who live in the project who commit the crime (Newman, 1972; Repetto, 1974). Teen-adult ratio is expected to be highly correlated with AFDC families for two reasons: AFDC families usually have only one adult in the household; and AFDC families frequently have large numbers of children.

Cooperative Ownership

Cooperative ownership is a simple dichotomous variable: whether or not a development is cooperatively owned by the residents. There are only 6 sites in the study that are cooperatives, and they are all moderate-income sites. Nonetheless, it did seem important to include cooperative ownership as a variable in the analysis for two reasons: first because researchers in the field of multifamily subsidized housing have given it some importance (Cooper, 1970; Sadacca, Drury and Isler, 1972) and second, critics of the earlier defensible space research, particularly in England, suggested that residents' control over the space outside their apartments that was posited to result from certain physical design features of the environment was indicative of a sense of ownership among residents and that this sense of ownership could be instilled among residents by actually giving them title to their homes regardless of the physical design of that environment. These critics considered actual ownership to be more important than physical design in determining residents' sense of control. In order to explore this possibility, cooperative ownership was included in the analysis for the present study.

Police Service

An index of police service was constructed from items from the police interview that concern the nature and frequency of police patrolling of a development. Police estimates of patrolling practices were used as the measure rather than managers' or residents' evaluations of the quality of police service as it seemed probable that the latter two measures would be more biased. It seemed likely that residents' fear of crime (a dependent variable) would be inextricably bound up with their estimates of the quality of police services. Residents who are afraid, or who have been victimized, are likely to give lower estimates of police service than residents who have not been victimized or are less afraid. Although police estimates are also probably biased to some degree, it was our opinion that they would be a less biased measure of police service than either managers' or residents' estimates.

The index of police service consists of the following items:

12. Type of patrolling of development
(Three-point scale: cruising; systematic patrolling by car; systematic patrolling on foot)

13. Estimated number of patrols of development 8 a.m. to 5 p.m.
(Number of patrols coded into 5 categories: No patrols or only cruising to 16 or more patrols)

14. Estimated number of patrols of development 5 p.m. to 1 a.m.
(Number of patrols coded into 5 categories: No patrols or only cruising to 16 or more patrols)

15. Estimated number of patrols of development 1 a.m. to 8 a.m. (Number of patrols coded into 5 categories: No patrols or only cruising to 16 or more patrols)

Cronbach's alpha coefficient for this index is .95. The matrix of inter-item correlations are shown in Table D.1 in Appendix D.

Guard Service

Guard service is an index measuring the presence and nature of security guard service provided at a site. It is measured by items from the managers' interview and the household survey.

The index measuring guard service consists of four items from the manager's interview (G1a, G1b, G2, and G5) and one item from the household survey of residents (P2). These items are:

G1a. Greatest number of guards on duty at any one time

G1b. Fewest number of guards on duty at any one time

G2. Guards on duty only at night or both day and night

G5. Whether or not guards are armed

(No guards at all is the zero point for each of these items)

P2. Evaluation of guard service by residents (Six-point scale: No guards to Very good job)

Cronbach's alpha coefficient of reliability for this index is .80. The matrix of inter-item correlations can be seen in Table D.2 in Appendix D.

Intervening Variables

The model specifies four intervening variables that mediate the effects of the independent variables on burglary, personal crime, fear, and instability. These four intervening variables are rent collection, residents' use of space outside their apartments, social interaction among residents, and residents' control over space outside their homes. A description and the source of each of these variables are given in Table 3.4.

Rent Collection

Rent collection is an index used to measure management effectiveness. It is composed of four items taken from the manager's interview. This index was selected over other possible measures because it met three criteria: it is a less biased estimate of management performance than such measures as residents' evaluation of management, for example;

Table 3.4

Intervening Variables

Variable Name	Description	Source
Rent collection	Index: Management firmness and success in rent collection	Manager interview
Use of space	Index: Frequency of residents' use of space outside the apartments	Household survey
Social interaction	Index: Nature and frequency of social interaction and sense of belonging among residents	Household survey
Control of space	Index: Perceived likelihood that residents will intervene in criminal or suspicious situations	Household survey

it is applicable to both public and moderate-income housing; and it possesses an adequate degree of reliability. Other measures that might have met these criteria were rejected because it was unclear whether they were indicators of management performance or of the need for management service. For example, the frequency with which repairs are made or the amount of money spent on repairs seemed to indicate how much repair services were actually needed as much as management's ability to provide them: a low frequency of repairs in a site could mean _either_ that such repairs are not needed or that management is unable to make them.

The first item in the index (C 6) concerns management's willingness to accept late rent payments and was used by the Urban Institute as a measure of management firmness (Isler, Sadacca and Drury, 1974). Monthly delinquency rate (C 10 and C 11) and rent collection losses (C 12) were also used in that study as part of a management performance measure.

The four items in the rent collection index are:

C 6. Number of days before resident is considered rent delinquent
(Number of days)

C 10. Number of rent delinquent households in average month
(Number of rent delinquent households per 100 occupied units)

C 11. Number of rent delinquent households at end of previous month
(Number of rent delinquent households per 100 occupied units)

C 12. Total amount of back rent owed by residents
(Number of dollars coded into four categories: From "Less than $1,500" to "$12,001 or more")

The four items were reversed to form a scale of increasing firmness and success in collecting rent and hence increasing ability to provide services. Cronbach's Alpha Coefficient of reliability for this index is .65. Although the reliability of this index failed to meet our .70 criterion, we decided to use the index since .65 is close to our criterion. Furthermore, no other combination of possible management items provided any greater degree of reliability. Please refer to Table D.3 in Appendix D for the inter-item correlations.

Use of Space

The purpose of the use of space index is to measure the intensity of residents' use of the areas outside their apartments. Defensible space theory suggests that it is the intensity of use of outdoor areas on the ground level that is most likely to affect the occurrence of crime and residents' fear of crime in all building types. Accordingly, the items included in the index refer only to the use of yards, patios, and shared outdoor areas on the ground level. Items referring to the use of interior public areas or to porches and balconies were excluded.

Items referring to the use of private areas -- yards or patios -- were used to form one subscale and items referring to the use of shared outdoor areas were used to form another subscale. A respondent's overall score is the sum of his or her standardized scores on these two subscales. Two types of items are included in each subscale: the overall frequency of use and the total number of different activities pursued there.

The items included in the first subscale are:

J 7. Frequency of use of yard or patio
(Seven-point scale, from "Almost never" to "Everyday")

J 8. Whether or not 5 different types of activities are pursued in the yard or patio
(Yes or no for each activity)

The value of Cronbach's alpha coefficient for this subscale is .92. Table D.4 in Appendix D lists the inter-item correlations for this subscale.

The items included in the second subscale are:

J 9. Frequency of use of area just outside this building (Seven-point scale from "Almost never" to "Everyday")

J 10, J 11. Frequency of use of area outside building for 5 different activities (Recoded to four-point scale for each activity from "Never" to "Often")

The value of Cronbach's alpha for this second subscale is .83. The correlations between these items can be found in Table D.5 in Appendix D.

Social Interaction

The social interaction index measures the overall degree of social contact among residents in a site without differentiating between types of contact. Items from the household survey that refer to friendship and kinship ties among residents were included along with items that refer to acquaintance or neighborliness. An additional item attempted to measure the sense of belonging among residents since this is also likely to reflect the degree of social contact among residents.

The items in the social interaction index are:

F 8. Number of close friends and relatives in development (Actual number coded into 10 categories from "None" to "More than 30")

F 9. Frequency of contact with close friends and relatives in development (Six-point scale from "About once a year" to "More than once a week")

F 1. Frequency of casual conversations with residents
(Seven-point scale from "Less than once a month" to "Several times a day")

F 2. Number of families can count on in emergency
(Five-point scale from "None" to "Very many")

A 14. How much of development feels part of
(Seven-point scale from "None of it" to "All of it")

Cronbach's alpha coefficient of reliability for this index is .76. The matrix of inter-item correlations can be seen in Table D.6 in Appendix D.

Control of Space

The extent to which residents exercise control over the use and the users of areas outside their apartments is an intervening variable of crucial importance in defensible space theory. It is the bridge that explains how the physical design of buildings and grounds affects residents' fear and victimization. Defensible space theory posits that residents of large, accessible buildings are unable to exert control over the space outside their apartments and that this lack of control results in high crime rates and instills fear in residents.

For the purpose of testing this aspect of defensible space theory an index of control was constructed with five items from the household survey that refer to the perceived likelihood that other residents would intervene in suspicious or criminal situations occurring outside their apartments. The items in the control index are:

L 1. Estimated likelihood of intervention by resident in act of graffiti painting by 13 year old boys
(Five-point scale from "Very unlikely" to "Very likely")

L 2. Estimated likelihood that boys will stop painting graffiti
(Five-point scale from "Very unlikely" to "Very likely")

L 3. Estimated likelihood that resident would call police or management if boys do not stop
(Five-point scale from "Very unlikely" to "Very likely")

L 7. Type of intervention by resident when sees two suspicious looking men outside building
(Responses coded into 4 categories from "No intervention" to "Direct intervention")

L 8. Likelihood of help by resident in attack on person outside building
(Five-point scale from "Very unlikely" to "Very likely")

Cronbach's alpha coefficient of reliability for this index is .71. Inter-item correlations for the items in this index are in Table D.7 in Appendix D.

Dependent Variables

There are a total of four dependent variables in this study: burglary rate, personal crime rate, fear, and instability. As indicated in the theoretical model, burglary or personal crime also functions as a cause of fear and instability, and fear functions as a determinant of instability as well. Our major concern is, however, the examination of how these four variables are affected by the independent and intervening variables in the model. For this reason these variables are all classified as dependent. A short description and the source of each of these variables are given in Table 3.5

Table 3.5

Dependent Variables

Variable name	Description	Source
Burglary rate	Burglaries and attempted burglaries per 1,000 residents	Household survey
Personal crime rate	Robberies and assaults per 1,000 residents	Household survey
Fear	Index: Residents' fear of crime	Household survey
Instability	Index: Turnover rate, vacancy rate, and residents' desire to move	HUD records, or manager interview, and household survey

Burglary and Personal Crime

Two measures of crime rate were used in this study: burglary and personal crime. Burglary consists of burglary and attempted burglary, and personal crime includes robbery and assault. We expect that these two types of crime will be affected by different characteristics of the housing environment and therefore should be kept separate and not combined into a single index.

The procedure for estimating burglary rate and personal crime rate was: to divide the total number of such experiences in a site, as reported in the household survey, by the number of residents interviewed in that site, and to multiply that figure by 1,000. In each case only those victimization experiences that occurred within the development were included. The items from the victimization section of the residents' questionnaire that were used to compute these rates are listed below.

Burglary rate:

Q 1. During the past 12 months did anyone enter your apartment without your permission and then steal something? (Number of times occurred within development)

Q 2. (Other than that) Did you find any sign that someone tried to break into your apartment but did not succeed, such as a forced window or lock, or a jimmied door? (Number of times occurred within development)

Personal crime rate:

Q 8. During the past 12 months did anyone try to take something from you, such as a wallet or purse, by using force or threat of force? (Number of times occurred within development)

Q 9. Other than during such a robbery or attempted robbery, were you or any member of your household threatened or injured with any weapon or tool, beaten up, or attacked? (Number of times occurred within development)

The descriptive statistics for both types of crime are shown in Table 3.6.

The results indicate that burglary and attempted burglaries occur far more frequently than robberies and assaults: the ratio of burglary to personal crime is almost 6 to 1. It is also worth noting that burglary rate and personal crime rate are not highly correlated: $r = .11$ (Table F.1 in Appendix F).

Table 3.6

Burglary Rate and Personal Crime Rate[1]
Per 1,000 Residents
(N = 63 sites)

	Range	Mean	Standard deviation
Burglary rate	0-1046	260.86	184.22
Personal crime rate	0-159	44.44	43.22

[1]Source is household survey items Q 1 and Q 2 for burglary rate and items Q 8 and Q 9 for personal crime rate.

Apparently those sites where residents are experiencing a high rate of burglary are not the same sites where residents are experiencing a high rate of personal crime.

The average burglary rate per resident in these sites is .26: a resident has about one chance in four of being burglarized in a year's period. In a total of 4 sites no one reported being burglarized; in a total of 8 sites the burglary rate was equal to or greater than .50 burglaries per resident. And in one site the rate was as high as one burglary per resident.

The average personal crime rate per resident is only .04. The chance of being robbed or assaulted is thus quite low: 4 chances out of 100. In 20 sites, or almost one-third of the cases, no one reported experiencing a robbery or an assault within the development during the previous 12 months.

Fear of Crime

The purpose of the fear of crime index is to measure the overall fear of crime among residents in a site without distinguishing between types of crime or types of areas in the development. For this reason the eight items included in the index refer to various aspects of fear: perceived safety of certain areas; estimated likelihood of being burglarized; fear of being robbed or attacked; comparison of crime in the development to crime in the surrounding area; and estimate of the change in crime.

The eight items in the fear index are:

N 3. Safety of area in back of building at night
(Five-point scale from "Safe" to "Very unsafe")

N 6. Safety of nearest public sidewalk at night
(Five-point scale from "Safe" to "Very unsafe")

N 7. Safety of area right outside front door at night
(Five-point scale from "Safe" to "Very unsafe")

B 4. Safety of development
(Five-point scale from "Safe" to "Very unsafe")

O 2. Degree of worry about being mugged or attacked
(Five-point scale from "Not at all worried" to "Very worried")

O 3. Estimated likelihood of burglary
(Five-point scale from "Very unlikely" to "Very likely")

O 4. Degree of crime in development compared to surrounding area
(Three-point scale from "Less crime in development" to "More crime in development")

O 5. Estimated change in crime in development
(Three-point scale from "Decreased" to "Increased")

Cronbach's alpha coefficient for this index is .81. The matrix of inter-item correlations can be seen in Table D.8 in Appendix D.

Community Instability

The final dependent variable in the causal model is community instability: it is expected to be causally affected by all the other variables described in this chapter.

Community instability can be conceptualized and measured in a variety of ways. During the early planning stages of this study instability was viewed as the inability of a moderate-income housing development to attract moderate-income and middle-income families. However, since we are also studying public housing in San Francisco which, as far as most projects are concerned, has long since ceased to attract moderate-income families, we devised a more general measure of instability that would be applicable to both types of housing. Thus instability, as it is measured here, refers to population change and not to changes in the demographic characteristics of the population. Moreover, instability is viewed and measured here not just as actual change (turnover and vacancy rates) but also as the tendency to or trend toward change (residents' desire to move).

The index of instability includes three items: the rate of turnover; the rate of vacancy and abandonment; and residents' desire to move as expressed in the household survey. The turnover rate is figured as the number of households who moved out of a development during a one year period divided by the total number of occupied apartment units in that development at the end of that one year period. The rate of vacancy and abandonment is the number of apartment units that are vacant plus the number of apartment units that are no longer rentable at the end of the one year period divided by the total number of apartment units in the development. Both the rate of turnover and the rate of vacancy and abandonment are computed for an entire development since the records from which these data were gathered are kept for entire developments. If a development is composed of two building types and hence two sites, the rates for the whole development are applied to each of the two sites.

The primary source of vacancy, abandonment, and turnover data was housing agency records. Housing agency records for the year July 1, 1975 to July 1, 1976 were used when the records for that year were available. In 12 developments records for that year (July 1, 1975-July 1, 1976) were not available. A comparison was made between data for the year 1975-1976 with data from the preceding one year period, using housing agency records that covered both periods. The differences in turnover and vacancy-abandonment rates between the two time periods was small enough to indicate that we could substitute 1974-1975 data for the 1975-1976 data without distortion. In four cases records for neither year were available, and this information was obtained from interviews with managers who looked up the information in their own files.

Residents' desire to move was measured with the following item in the household survey:

> C 5. Right now, if you could have your way about it, how likely is it that you would move out of this development?
> (Five-point scale from "Very unlikely" to "Very likely")

The mean score on this item for each site was the third item included in the instability index. Cronbach's alpha for the instability index is .76 and the inter-item correlations are in Table D.9 in Appendix D.

The advantage of including the attitudinal variable of the likelihood of moving if able is that both turnover and vacancy-abandonment may reflect the availability of other housing options to residents, and these options may vary between cities and with the economic status of residents. These two archival measures of instability may also reflect different management policies. For example, the manager of one development may be more careful in tenant selection and allow units to remain vacant longer. The likelihood of moving if able reflects residents' own desires, independently of their options and of management policy.

Table 3.7 presents descriptive statistics for each of the three items used in the instability index.

Table 3.7

Turnover Rate, Vacancy-Abandonment Rate,[1] and Residents' Desire to Move[2]
(N = 63 sites)

	Range	Mean	Standard deviation
Turnover rate	3-70%	23%	15%
Vacancy-Abandonment rate	0-26%	5%	6%
Residents' desire to move	2.08-4.65	3.36	.66

[1]Source for vacancy, turnover, and abandonment data is primarily housing agency records.

[2]Source is household survey, question C 5: Very unlikely to move = 1; Very likely to move = 5.

CHAPTER 4: USE OF PATH ANALYSIS

After the composite measures had been constructed, the coefficients for all the direct and the indirect paths in both versions of the study's causal model were estimated using path analytical procedures. Path analysis, like other causal modeling techniques, allows one to draw inferences about causal effects from a pattern of relationships in an entire system. Thus, it gives one the opportunity to go a step beyond simple associations, and assumptions about the presumed causal nature of relationships, which usually remain implicit in the interpretation of results from multivariate analysis, are made explicit. However, neither path analysis nor any other analytic technique in social research allows one to demonstrate empirically or to "prove" causal relationships. While one can find out if observed relationships are consistent with given hypotheses, statements that these relationships are causal remain working assumptions (Blalock, 1961). Similarly, not all possible causes can be included in any model and it is always possible that the introduction of additional variables might change the coefficients that were estimated when those variables were not included. For this reason, no causal model can ever be established as *the* correct one.

The causal model for this study, described in Chapter 1, is recursive: the causal paths go in one direction only and there are no feedback loops. This is because we believe that the effects that operate in the hypothesized direction are stronger than the effects that may operate in the opposite direction. Testing whether this assumption is supported requires procedures more elaborate than path analysis. The use of such procedures is based on assumptions not met by this study (e.g. multivariate normal distribution and a sample of at least 200) and would make the analysis and the interpretation of results far more complicated. For these reasons path analysis was chosen over other estimation techniques.

Path analysis was used in this study to estimate direct effects, indirect effects, and total effects. After a brief discussion of the unit of analysis and sample size, these three types of effect are defined and the decision rules for interpreting effects are presented. At the end of the chapter a short review of the system for presenting results is given.

Unit of Analysis and Sample Size

The unit of analysis in this study is the site, not the individual household. The site is either an entire housing development, when it is composed of a single building ty[illegible], or a group of buildings within a development that are of the same type, when the development contains buildings of two different types. It is the theory and objectives of a given study which determine the appropriate unit of analysis. Thus, the site is the unit of analysis in this study because the effects specified by the study's causal model are hypothesized as operating at the level of the site. The model specifies, for example, that building size will have a positive effect on community instability: sites composed of high-rise buildings will experience more instability than sites composed of low-rise buildings. The size of the building and the level of community instability are site-level characteristics. This is true for the relationships examined throughout the study, and therefore conclusions can only be made about sites and not about individual households.

The number of sites used in the path analysis is 63. There is no doubt that this is a relatively small sample and this places certain limitations on the study. The small sample size in this study causes the confidence intervals around the coefficients and the sampling error to be very large, which means that if the study were repeated the coefficients might be quite different. A larger sample size would have allowed us to have greater confidence in our results. The sample size does not, however, cast doubt on our use of path analysis: the number of cases is not a constraint on the estimation of coefficients. It is, of course, a constraint on their interpretation in the sense that sample size is taken into account in testing the significance of coefficients: coefficients in this study that are not significant might prove to be significant in a study where they were of the same magnitude but the sample was larger. Thus, if a given coefficient is shown to be significant in this study, it is significant based on the small sample.

Direct Effects

A direct effect is the estimate of the causal influence that one variable, say X_1, exerts on another variable, say Y_1, that follows it in the causal sequence when all other variables exerting an influence on Y_1 are held constant. Thus, the direct effect of building size on personal crime rate is the influence building size exerts on personal crime when the effects of all other independent and intervening variables are held constant. The direct effect of building size on personal crime is the effect that is not transmitted through rent collection, use of space, social interaction, or control of space, and it is indicated in the causal model by an arrow drawn from building size directly to personal crime.

The study's causal model specifies that each of the seven independent variables will have a direct effect on each of the four intervening variables and on each of the four dependent variables. So, for example, building size is expected to have a direct effect on rent collection, use of space, social interaction, control of space, burglary, personal crime, fear of crime, and community instability. In addition each variable that follows the set of seven independent variables (that is, all intervening variables as well as burglary, personal crime, and fear) is expected to have a direct effect on each of the variables that follows it in the causal sequence. So, for example, there are direct paths from rent collection to use of space, social interaction, control of space, burglary, personal crime, fear, and instability. Since the model is recursive and the errors are assumed to be uncorrelated, Ordinary least squares regression was used to estimate the coefficient for each of the direct paths in the burglary and personal crime versions of the model.[1] The coefficient for any given direct path, say from X_1 to Y_1, is equal to the standardized partial regression coefficient, or beta weight, associated with that particular predictor variable, X_1, when all other predictor variables that are expected to affect that particular intervening or dependent variable, Y_1, are also included in the regression equation. Thus, for example, in order to estimate all the direct effects on personal crime, personal crime is regressed on all the variables that precede it in the model.

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[1] In computing the effects using multiple regression, the pairwise deletion option was used to deal with a small amount of missing data on certain variables. The degrees of freedom for the full model were taken to be n-1=62. Inspection of the correlation matrix constructed with pair-wise deletion (Nie, et al, 1975) indicated no linear dependencies among variables.

Each intervening variable and each dependent variable was regressed on all the variables that precede it in the model. Therefore the estimation of all direct paths in each version of the study's causal model required the solution of seven regression equations, since each version of the model consists of seven intervening and dependent variables.

Indirect Effects

As described above, the direct effect of X_1 on Y_1 is the influence that X_1 has on Y_1 that is not transmitted through any other variables. The indirect effect of X_1 on Y_1 is the influence of X_1 on Y_1 that is transmitted through variables that come between X_1 and Y_1 in the causal model being used. There are two categories of indirect effects: individual indirect effects and total indirect effects. An individual indirect effect is an effect that is transmitted by one or more intervening variables in the causal model. An individual indirect effect is equal to the product of the two or more direct effects that form that indirect effect. The total indirect effect is then the sum of all the individual indirect effects.

The causal model for this study specifies an individual indirect path from each independent variable to each dependent variable via each intervening variable alone and via all possible combinations of intervening variables while still following the causal sequence of variables. This means, for example, that building size affects personal crime through rent collection alone, through use of space alone, through social interaction alone, through control of space alone, through rent collection and use of space, through rent collection and social interaction, and so on. In the end, building size has a total of 16 different individual indirect effects on personal crime. Each of these individual indirect effects of building size on personal crime was computed by multiplying the coefficients associated with the appropriate direct paths. So, for example, the indirect effect of building size on personal crime that is transmitted by control of space was estimated by multiplying the coefficients for two direct paths -- building size to control of space, and control of space to personal crime. Each one of the individual indirect effects of the seven independent variables on each of the four dependent variables was computed in this way. The individual indirect effects of each independent variable on each dependent variable were then added together to obtain the total indirect effect of, for example, building size on personal crime.

Total Effects

The total effect is equal to the sum of the direct effect and the total indirect effect. The total effect represents the total causal impact that one variable has on another. It shows how much change in a dependent variable, Y_1, for example, is produced by a change in the independent variable, X_1, regardless of the mechanisms by which the change in the dependent variable is produced. So, for instance, the amount of change in personal crime that is produced by a change in building size, regardless of how this change in personal crime is produced, is provided by the coefficient for the total effect of building size on personal crime.

Any causal effect, like any correlation, can be either positive or negative in sign. The direct effect and the total indirect effect of one variable on another may be of the same magnitude but of opposite signs. This causes the direct effect to cancel out the total indirect effect, producing a total effect that is near zero.

Decision Rules for Interpreting Effects

Path coefficients for direct effects and for total effects were tested for statistical significance by forming the ratio of the regression weight to its standard error, which is distributed as the square root of *F*. An alpha level of .15 was used to judge statistical significance. The rationale for choosing this alpha level is given in Appendix E.

A particular path coefficient may not be statistically significant because of the magnitude of its standard error although the coefficient is as large or larger than other coefficients that have smaller standard errors and are, therefore, significant. Not to interpret or consider a coefficient only because it is not statistically significant may be a mistake when the coefficient is comparable in magnitude to other coefficients that are being considered (Heise, 1975). Therefore, a second criterion, the criterion of relative size, was used to evaluate each direct effect and each total effect. The following standards were adopted for judging the magnitude of effects: large effects are greater than or equal to .30; moderate effects are between .15 and .29 in size; and small effects are from .06 through .14. Any effects that are equal to or smaller than .05 are considered to be virtually zero.

Since there are no techniques within path analysis for testing the significance of indirect effects, the importance of a total indirect effect is best judged by its magnitude relative to the magnitude of other total indirect effects. The standards for judging effect size were given above. Individual indirect effects tend in this study, as in most research, to be quite small: they range from 0 to .34 , but few are larger than .12. For this reason no distinctions are made regarding the relative size of individual indirect effects. Individual indirect effects that are greater than .05 are the only ones interpreted.

Key to Presentation of Findings

Throughout this report the terms positive and negative refer exclusively to the sign of causal effects. A positive effect means that an increase in the magnitude of the independent variable produces an increase in the magnitude of the dependent variable, whereas a negative effect means that an increase in the magnitude of the independent variable produces a decrease in the magnitude of the dependent variable. The terms positive and negative effects as used in this report do not therefore refer to the normative concepts of good and bad consequences.

In three of the four results chapters the relationships between independent and dependent variables are broken down into: total effect, direct effect, total indirect effect, non-causal component, and total association. Table 4.1 is an example of a typical table presenting such a breakdown.[2] The direct effect, listed in the second column, is the effect that is not transmitted by any intervening variables.

Table 4.1

Typical Table of Effects

	Effects of an Independent Variable				
	A=B+C Total effect	B Direct effect	C Total indirect effect	D Non-causal component	E=B+C+D Total association
Dependent Variable					

[2]In the results tables that follow the format of Table 4.1 the effects and non-causal components for relationships between the independent variables and burglary, fear, and instability are estimated using the burglary version of the causal model. Effects and non-causal components for relationships to personal crime are estimated using the personal crime version. All direct effects in the personal crime model are listed in Table F.3 in Appendix F.

The total indirect effect, listed in the third column of Table 4.1, is the sum of all the effects of the independent variable on the dependent variable that _are_ transmitted or mediated by the intervening variables. _The total indirect_ _effect_ is thus the sum of _all_ the _individual_ indirect effects. While the total indirect effect is listed in tables similar to Table 4.1, the important individual indirect effects are shown in path diagrams, also included in each results chapter.

The total effect, listed in the first column of the table, is the sum of the direct effect and the total indirect effect and represents the total causal impact of the independent variable on the dependent variable. It is the extent of change in the dependent variable produced by a change in the independent variable regardless of the mechanisms by which the change in the dependent variable is produced.

The direct effect, the total indirect effect, and the total effect are all estimates of causal relationships. Each of these effects is an estimate of the amount of change in the dependent variable, measured in standard deviation units, that is produced by a change of one standard deviation in the independent variable.

The noncausal component of the relationship between an independent and a dependent variable is listed in the fourth column of Table 4.1. It represents that part of the total association between the two variables that is due: to causes that the independent variable and the dependent variable have in common but that are not included in the causal model; to correlations among these unknown common causes; and to unanalysed correlations among the independent variables in the model (Alwin and Hauser, 1975). The size of the total association between the two variables is listed in the fifth column of Table 4.1. This is the zero-order correlation, and by definition it is the sum of the causal components (direct and total indirect effects) and the non-causal component of the relationship.

Path diagrams are also included in each results chapter. In order to be included in these diagrams a direct path must be either: statistically significant ($p < .15$) or part of an individual indirect path (with a coefficient larger than .05) from an independent variable to one of the four dependent variables. The standard error for each path coefficient is written in parentheses. The coefficients, standard errors, and p levels for all direct paths are listed in Tables F.2 and F.3 in Appendix F. The zero-order correlations between all variables in the model are given in Table F.1.

The causal model in this study was designed to explain how features of a housing development affect burglary, personal crime, fear, and community instability. The best way of determining how well the model explains these variables is to examine and test for significance the percentage of variance in each of these dependent variables that is accounted for by the model.[3] This is done in Chapter 8.

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[3]Unlike other causal modeling procedures, path analysis does not have a significance test for the goodness of fit of the entire model.

CHAPTER 5: EFFECTS OF BUILDING SIZE AND ACCESSIBILITY

The primary objective of this study is to determine which are the major factors that affect crime, fear of crime, and community instability in federally-assisted housing developments. The effects of three types of causal factors are examined: physical design characteristics of the site; social characteristics of the residents; and the nature of city police and security guard service.

This chapter focuses exclusively on the effects of the physical design characteristics of sites, building size and accessibility. The coefficients for these effects were estimated when the effects of all other independent variables in the model, such as low-income/AFDC and teen-adult ratio, were partialled out. Thus the effects of building size and accessibility presented below are independent of the influence of these other variables. Chapter 6 focuses on the effects of the social characteristics of residents and Chapter 7 presents the effects of police and guard service. The organization of each of these three results chapters is the same: after a brief introduction, the total effects, total indirect effects, and direct effects of the selected independent variables are examined. This is followed by an examination of the individual indirect effects of the selected independent variables with the help of a path diagram and a brief conclusion. Chapter 8 summarizes the findings with a comparison of the effects of all the independent variables on crime, fear, and instability.

As indicated in the causal model presented in Chapter 1, the larger the building and the more accessible it is, the higher the crime rate, the fear of crime, and the level of community instability were expected to be. In the terminology of causal models both these design features were expected to have positive total effects on crime, fear of crime, and instability.

We hypothesized that building size would have a greater impact on personal crime, fear, and instability than would building accessibility. On the other hand, accessibility, because it measures the ease of access to apartment units by intruders, should prove to be a stronger determinant of burglary. Both design features, but particularly building size, were expected to affect crime, fear, and instability, both directly and indirectly via the intervening variables included in the model. According to defensible space theory, building size was expected to have negative effects on rent collection, use of space, social interaction, and control of space. These variables in turn were expected to have negative effects on crime, fear, and instability.

The results presented in this chapter confirm many of these hypotheses. Building size has large positive total effects on both fear of crime and community instability. Accessibility has a large positive total effect on burglary rate. Building size exerts the predicted negative direct effects on rent collection, use of space, social interaction among residents, and residents' control of space outside their apartments. Use of space and control of space function as important intervening variables in transmitting indirect effects from building size to personal crime and from building size to fear of crime.

Overview of Effects of Building Size and Accessibility

Table 5.1 presents the breakdown of the relationship between building size and accessibility, and each of the dependent variables.[1] As shown in the first column of Table 5.1, the total effect of building size on burglary rate is -.05. This means that an increase of one standard deviation unit in building size will produce a decrease of .05 standard deviation units in burglary rate when the effects of the other independent variables on burglary are held constant. This coefficient is so small that we can conclude that building size has no total effect on burglary rate in this study.

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[1] The effects and the non-causal components listed in Table 5.1 and in similar tables throughout this report are estimated using the burglary version of the causal model. When there is a large discrepancy between these estimates and those derived from the personal crime version, these discrepancies will be noted.

Table 5.1

Effects of Building Size and Accessibility on Crime, Fear, and Instability

I Effects of Building Size

	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	-.05	-.12	.07	-.08	-.13
Personal Crime	.11	-.12	.23	-.16	-.05
Fear	.41[a]	.22[d]	.19	-.06	.35
Instability	.39[a]	.25[d]	.14	-.02	.37

II Effects of Accessibility

	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	.43[b]	.39[b]	.04	.06	.49
Personal Crime	-.03	-.02	-.01	.05	.02
Fear	.06	.04	.02	.30	.36
Instability	.16	-.05	.21	.24	.40

[a] $p < .01$ [b] $p < .05$ [c] $p < .10$ [d] $p < .15$

Building accessibility on the other hand (Part II of Table 6.1) has a large total effect on burglary rate that is positive and significant (.43). The total effect is almost entirely due to its direct effect (.39), which is also significant. Thus, regardless of building size, the social characteristics of the residents, the nature of police or guard service, or the level of any of the intervening variables, the greater the accessibility of buildings and apartments, the higher the burglary rate. Building accessibility, however, has virtually no total effect on personal crime (-.03).

The total effect of building size on personal crime is positive, as predicted, but small (.11). And yet the total indirect effect of building size on personal crime is not small: the total indirect effect is .23, and, by the standards adopted for this study, this is a moderate effect. Moreover, it is the largest total indirect effect that building size has on any of the dependent variables. This total indirect effect of building size on personal crime is examined in greater detail later in this chapter.

Although building size shows little total influence on either personal crime or burglary, it has a large total impact on both fear of crime (.41) and community instability (.39). In both cases the effect is significant and in the positive direction as expected: the larger the building, the greater the fear of crime and also the higher the community instability. The influence of building size on fear and instability is both direct and indirect, and both direct effects are significant.

Unlike building size, building accessibility has only a small (but positive) total effect on fear of crime (.06). Its total effect on instability, however, is of moderate size (.16) and is primarily due to the total indirect effect of accessibility on instability (.21). This effect is the only total indirect effect of any size that accessibility has on any of the dependent variables: all the other total indirect effects of accessibility are virtually zero (.04, -.01, .02).

Direct and Indirect Effects of Building Size and Accessibility

Figure 5.1 is a path diagram showing the direct and indirect effects of building size and accessibility on burglary, fear, and instability. Figure 5.2 is a comparable diagram showing the effects on personal crime, fear, and instability. In order to be included in these diagrams a direct path must be either: statistically significant ($p < .15$) or part of an individual indirect path (with a coefficient larger than .05) from an independent variable to one of the four dependent variables.

As shown in Figure 5.1, building size has direct effects in the predicted direction on: rent collection (-.19), use of space (-.51), social interaction (-.31), control of space (-.29), fear of crime (.22), and community instability (.25). Building accessibility has direct effects on social interaction (-.32) and burglary (.40). All of these direct effects are significant (see Table F.2 in Appendix F for *p* levels). These findings indicate that regardless of the social characteristics of residents or the nature of police and guard service, the physical design of buildings has a substantial influence on various aspects of life in low- and moderate-income housing developments. Moreover, the nature of this influence is consistent: the larger and the more vulnerable to intrusion the building is, and thus the less defensible the environment, the more problematic is life in these communities. The results suggest that lower defensibility leads to poorer rent collection, lower use of space, lower social interaction, lower control of space, higher burglary, higher fear of crime, and higher community instability.

Figure 5.1 also allows us to trace the important individual <u>indirect</u> effects of building size and accessibility. (To be "important" an individual indirect effect must be larger than .05.) As listed in Table 5.1, building size has substantial total indirect effects on both fear (.19) and instability (.14). As shown in Figure 5.1, the total indirect effect of building size on fear is transmitted primarily through two intervening variables: residents' use of areas outside their apartments (indirect effect = .10); and residents' control over these areas (indirect effect = .12). We can conclude that residents in large buildings are more afraid of crime than residents in small buildings for two reasons: first, because the areas outdoors are less frequently used in large buildings and lower use results in higher fear; and second, because residents have less control over these areas in large buildings and lack of control also leads to fear. The role of these two variables (residents' use and residents' control over outdoor areas) in helping to explain the effect of building size on fear of crime gives important empirical support to defensible space theory. Of course,

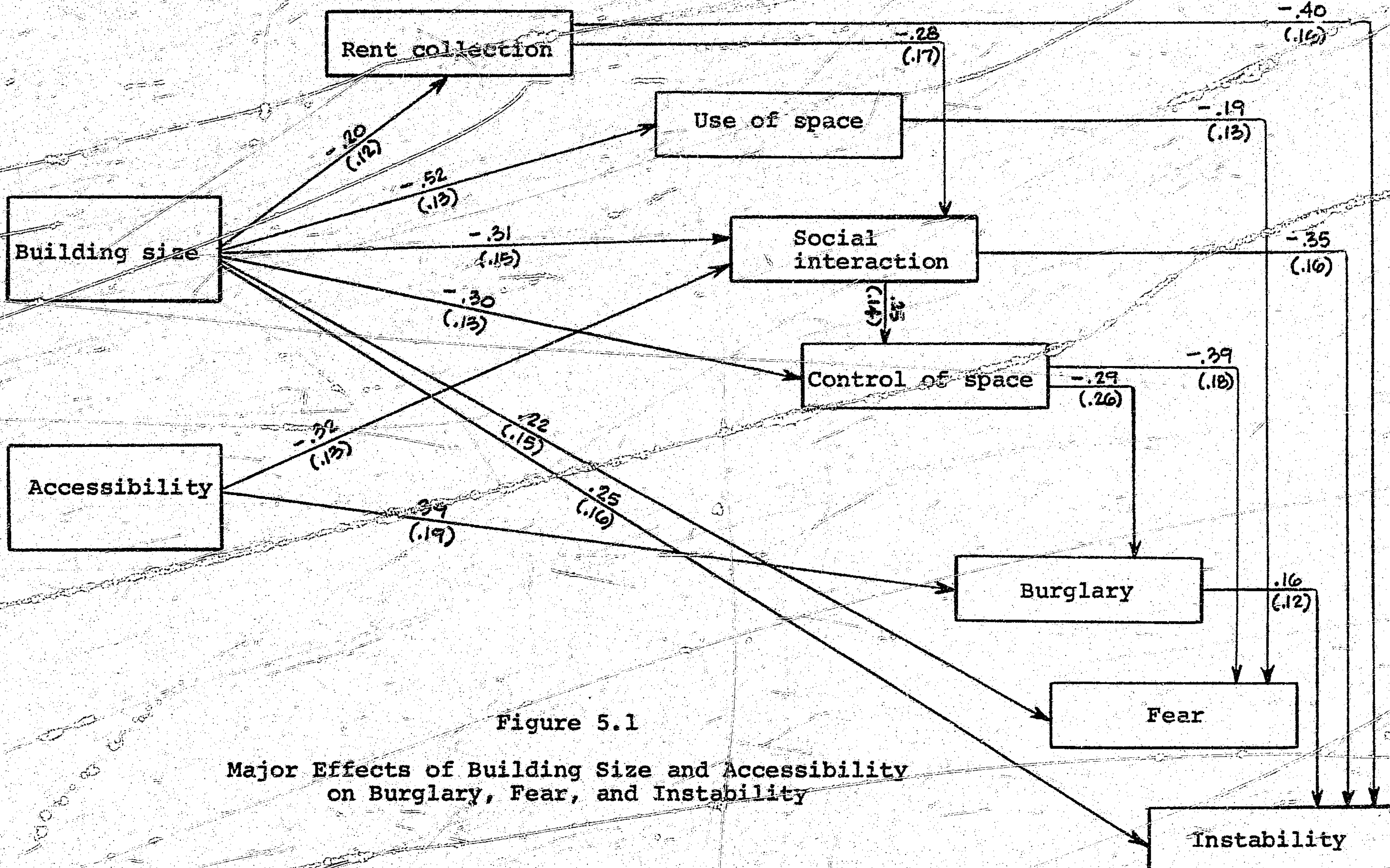

Figure 5.1

Major Effects of Building Size and Accessibility on Burglary, Fear, and Instability building size also has a direct effect on fear. This means that regardless of how frequently outdoor areas are used or how much control residents have over the areas, residents in large buildings will be more afraid than residents in small buildings.

The total indirect effect of building size on instability is transmitted through two <u>other</u> intervening variables: rent collection (indirect effect = .08); and social interaction among residents (indirect effect = .11). Thus, the ways in which building size affects instability are different from the ways in which building size affects fear. Instability is higher in large buildings than in small buildings: first, because rent collection is lower in large buildings and low rent collection, which is indicative of poor management performance, causes high instability; and second, because social interaction among residents is lower in large buildings and low social interaction also causes high instability. In addition, building size has a direct effect on instability. Thus, building size has an effect on instability that is independent of its effects that are transmitted through rent collection and social interaction.

Accessibility has virtually no total indirect effect on <u>fear</u> (.02), but it does have a moderate total indirect effect on <u>instability</u> (.21), primarily via social interaction (indirect effect = .11) and burglary (indirect effect = .06). High accessibility seems to discourage social interaction among residents which, in turn, leads to high instability. Similarly, high accessibility results in higher burglary which, in turn, leads to higher instability.

Figure 5.2 provides the opportunity to trace the individual indirect effects of physical design on personal crime. Building size has four major indirect effects on personal crime: via rent collection (indirect effect = .10); via use of space (indirect effect = .10); via control of space (indirect effect = .13); and via social interaction (indirect effect = -.10). The first three of these effects are all in the predicted direction, that is, positive: the larger the building, the higher the personal crime rate. The fourth indirect effect, however, is in the opposite direction: building size has the expected negative effect on social interaction but social interaction has an unexpected positive effect on personal crime. Therefore, building size has a negative effect on personal crime rate via social interaction. That is to say, increasing the size of a building reduces the social interaction among residents but, surprisingly, the less the social interaction among residents, the lower the personal crime rate. Increased building size therefore ends up producing lower personal crime rates when examined through the mechanism of social interaction.

That social interaction has a positive effect on personal crime rate is unexpected; a negative effect was anticipated.

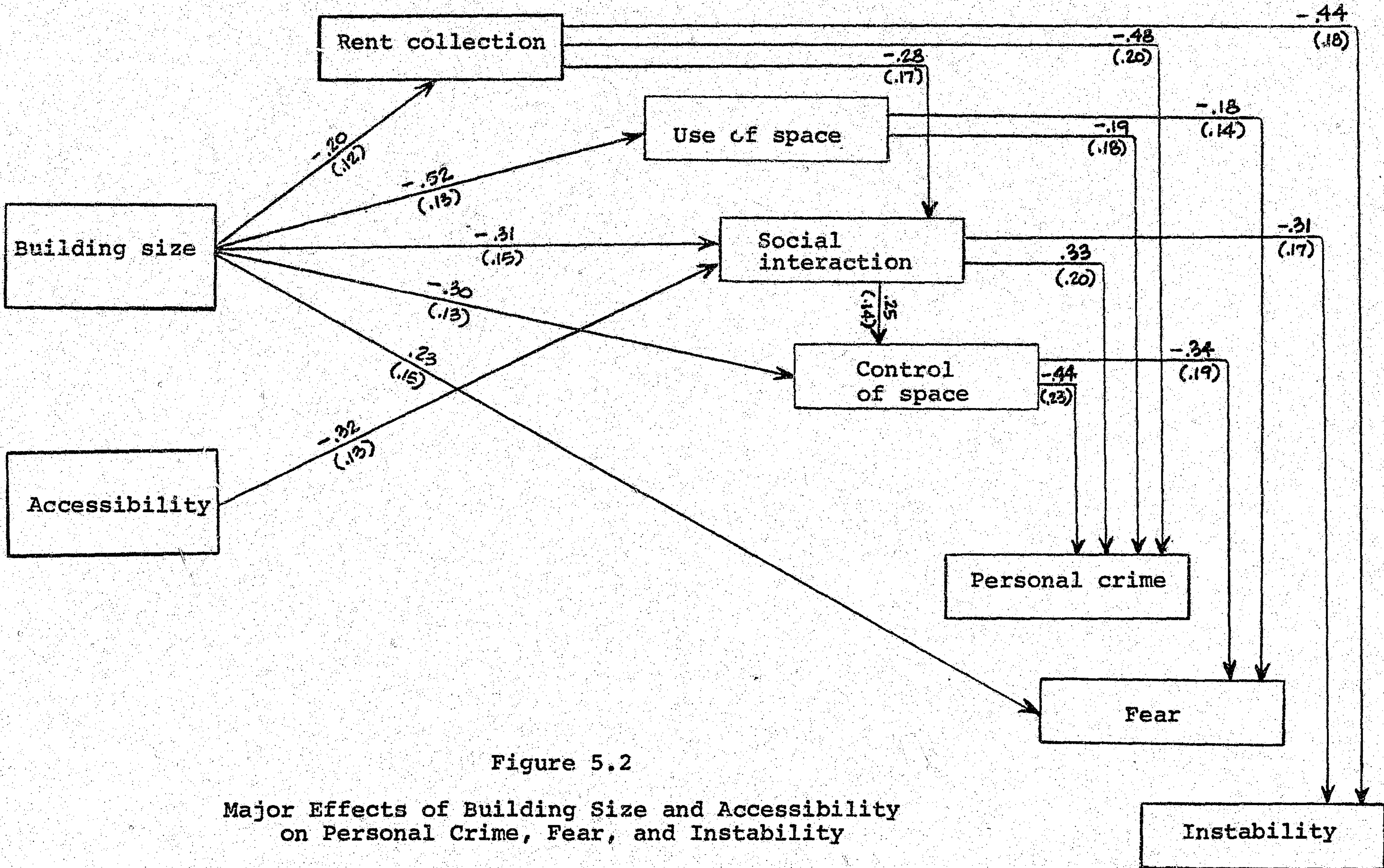

Figure 5.2

Major Effects of Building Size and Accessibility on Personal Crime, Fear, and Instability

There are at least two explanations. If we interpret the effect strictly in terms of this study's causal model, we would conclude that the more residents interact with each other in a housing environment, the more likely they are to victimize each other. Based on existing theories about community this seems unlikely. Another explanation is that incidents of person to person crime in a housing environment bring people together to solve the crime problems, and in this way they come to know each other better and to interact more frequently. In designing the causal model for the study, we assumed that the direction of causal influence was primarily from social interaction to personal crime rate and not vice versa. The positive effect that we found suggests that this may have been a mistaken assumption. The relationship could be one of reciprocal causation, where each affects the other but where the effect of personal crime on social interaction outweighs the reverse effect. A nonrecursive model would be required to simulate such a relationship. Moreover, a longitudinal study would be required to understand the process of how initially low social interaction may result in a high personal crime rate, and then how several incidents of personal crime may, in turn, result in a higher level of interaction. We do not deny the unexpected relationship found. Given the competing explanation, however, we are wary of making a judgment based on this finding.

Whatever the reasons for the unexpected relationship between social interaction and personal crime rate, the positive indirect effect it generates acts to reduce the total indirect effect of building size on personal crime to .23, which is still in the predicted direction and moderate in size. The direct effect, however, is in the opposite (negative) direction (-.12), and although it is small and not significant, it offsets the total indirect effect and makes the total effect of building size on personal crime quite small (.11).

We can conclude that use of space and control of space do act as important intervening variables in a positive relationship between building size and personal crime, as posited by defensible space theory. These effects, however, are partially offset by other negative effects which cause building size to have only a small positive total effect on crime rate. This finding stands in sharp contrast to the finding that building size has powerful positive effects on both fear of crime and community instability.

Differences Between Building Types

In this study building size is an important determinant of fear of crime and community instability: the larger the building, the greater the fear of crime and the higher the level of community instability. To determine whether these differences occur only between high-rise and low-rise buildings or between each pair of building types, we employed the following strategy. A multivariate analysis of variance for three levels of building type (row houses, the two types of walk-ups, and high-rises) and several dependent variables, including fear and instability, produced a significant multivariate F ($p < .01$). The univariate F's for both fear and instability were also significant ($p < .10$). We, therefore, tested the differences in the mean levels of fear and instability between each pair of the three building types using Fischer's procedure of least significant differences.[2]

Table 5.2 presents the mean level of fear for each of the three building types and the differences in mean ratings of fear between each pair of building types. As predicted, the mean ratings indicate that residents' fear of crime is lowest in row house sites (-.17), highest in high-rise sites (.33), and in-between in walk-up sites (-.06). The differences between two of the three pairs of building types are significant. Residents' fear of crime is significantly greater in high-rise sites than in either row house or walk-up sites but there is no significant difference in fear of crime between row house and walk-up sites.

The relationship between instability and building type is similar to the relationship between fear and building type. The mean levels of instability for each category of building type, shown in Table 5.3, indicate that instability is lowest in row house sites (-.21), highest in high-rise sites (.46),

[2]For a justification of this approach see Boch, 1975.

Table 5.2

Fear of Crime by Building Type:
Means and Differences between Means

I Mean Levels of Fear

	Row house sites	Walk-up sites	High-rise sites
	-.17	-.06	.33

II Differences in Mean Levels of Fear

	Row house sites	Walk-up sites	High-rise sites
Row house sites	--	.11	.50[a]
Walk-up sites	--	--	.39[a]

NOTE: Walk-ups and gallerias are combined into one category -- walk-up sites.

[a]Difference is significant ($p < .01$) using Fischer's least-significant-difference procedure.

and-in-between in walk-up sites (.06). The differences between two of the three pairs of building types are significant. As was true for fear, community instability is significantly higher in high-rise sites than in either walk-up or row house sites but there is no difference in instability between walk-ups and row houses.

Conclusion

Building size has large positive effects on fear of

Table 5.3

Community Instability by Building Type: Means and Differences between Means

I Mean Levels of Instability

Row house sites	Walk-up sites	High-rise sites
-.17	-.06	.46

II Differences in Mean Levels of Instability

	Row house sites	Walk-up sites	High-rise sites
Row house sites	--	.11	.63[b]
Walk-up sites	--	--	.52[c]

[b] Difference is significant ($p < .05$)
[c] Difference is significant ($p < .10$)

crime and on community instability; both of these effects are significant. The effect of building size on fear of crime is both direct and indirect; the indirect effect is mediated by residents' use of space and residents' control of space outside their apartments. The total effect of building size on community instability is also composed of direct and indirect effects; the indirect effect is mediated by rent collection and social interaction among residents. Building size has no effect on burglary rate and only a small positive total effect on personal crime rate. This positive effect is due to two positive indirect effects of building size on personal crime -- via use of space and via control of space. Accessibility has a large total effect on burglary rate that is positive and significant. Accessibility also has a moderate total effect on instability that is positive, but accessibility has no effect on personal crime or fear of crime. The largest effects of building size are its effects on fear of crime and community instability. Both fear and instability are significantly higher in high-rise sites than in row house or walk-up sites.

CHAPTER 6: EFFECTS OF SOCIAL CHARACTERISTICS

Although defensible space theory emphasizes the role of physical design, the objective of this study is to examine how a variety of characteristics of housing environments affect crime, fear of crime, and instability. We have seen that the physical design features, building size and accessibility, have important effects. The question to be addressed in this chapter is: What are the effects of the social characteristics of the housing environment. The three social characteristics examined are: low-income/AFDC (which is an index composed of mean family income and the percent of single-parent families receiving welfare); the ratio of teenagers (aged 10 to 20) to adults; and whether the development is cooperatively owned by the residents.

We expected that low-income/AFDC would have negative effects on rent collection and control of space, and positive effects on crime, fear of crime, and instability. Teen-adult ratio was expected to have a negative effect on control of space and positive effects on crime, fear of crime, and instability. Cooperative ownership, like income, was expected to have positive effects on rent collection and control of space and negative effects on crime, fear of crime, and instability. We also expected that teen-adult ratio and cooperative ownership would have positive effects on residents' use of space and their social interaction.

The results to be presented in this chapter indicate that low-income/AFDC is the most important of the three social characteristics of housing developments: it has large, positive, total effects on fear and instability; and a moderate, positive, total effect on personal crime. Low-income/AFDC also has negative direct effects on rent collection, residents' use of space, and residents' control of space. The ratio of teenagers to adults has moderate total effects on burglary, personal crime, and fear that are positive, as expected. Cooperative ownership has only one sizeable total effect on any of the dependent variables: that is a moderate effect on personal crime that, counter to expectations, is positive.

Overview of Effects of Social Characteristics

Table 6.1 shows the breakdown of the relationship between each social characteristic and burglary, personal crime, fear, and instability. Low-income/AFDC has virtually no total effect on burglary rate (-.02). Low-income/AFDC does, however, have a moderate total indirect effect on burglary (.16) but this is offset by a moderate direct effect that is in the opposite direction (-.18).

Table 6.1

Effects of Social Characteristics on Crime, Fear, and Instability

I Effects of Low-Income/AFDC

	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	-.02	-.18	.16	.31	.29
Personal Crime	.29[d]	-.32	.61	-.05	.24
Fear	.57[a]	.32[d]	.25	.12	.69
Instability	.40[a]	.10	.30	.18	.58

II Effects of Teen-adult Ratio

	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	.16	.09	.07	.12	.28
Personal Crime	.21	.06	.15	-.05	.16
Fear	.18[d]	.16	.02	.19	.37
Instability	.07	.06	.01	.18	.25

III Effects of Cooperative Ownership

	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	-.04	-.05	.01	-.13	-.17
Personal Crime	.29[c]	.15	.14	-.11	.18
Fear	.03	.03	0	-.29	-.26
Instability	-.14	-.13	-.01	-.25	-.39

[a] $p < .01$ [b] $p < .05$ [c] $p < .10$ [d] $p < .15$

Although, overall, low-income/AFDC does not affect the rate of burglary, it does have an overall (total) effect on the rate of personal crime that is significant and in the predicted direction (.29): the higher the proportion of low-income and AFDC families, the higher the rate of personal crime. This overall positive effect is due to the total indirect effect of low-income/AFDC on personal crime which is quite large (.61). This large total indirect effect is somewhat offset by the direct effect of low-income/AFDC on personal crime that is negative (-.32). Although this direct effect is large, it is not significant. Its size, nevertheless, suggests that there is a tendency for the rate of personal crime to be lower in low-income developments than in high-income developments when all the intervening variables in the model are held constant. Thus, there is evidence of a negative effect of the proportion of low-income and AFDC families on crime that is independent of rent collection, use of space, and control of space. This effect, however, is overshadowed by the larger total indirect effect (.61) causing the low-income/AFDC to have a moderate total effect on personal crime rate that is positive and significant (.29).

As expected, low-income/AFDC has large total effects on fear of crime and community instability that are positive and significant. The lower the level of low-income/AFDC, the higher the fear of crime and the higher the instability. The total impact on fear (.57) is due to both direct (.32) and indirect effects (.25). The total impact of low-income/ AFDC on instability (.40) is primarily due to indirect effects (.30) since the direct effect is small (.10).

The total effect of teen-adult ratio on burglary is moderate and positive (.16) and is due to direct (.09) and indirect effects (.07). Similarly its total effect on personal crime rate is moderate and positive (.21) and is due to direct (.06) and indirect effects (.15). The total influence of teen-adult ratio on fear is moderate, positive and significant (.18) and is due primarily to its direct effect (.16) on fear. Thus, although none of the effects of teen-adult ratio is large, they are moderate in size and consistently positive, as predicted. The higher the ratio of teenagers to adults, the higher the burglary rate, the personal crime rate, and the fear of crime. Teen-adult ratio, however, has only a small total effect on community instability (.07). The ratio of teenagers to adults is correlated with low-income/ AFDC (r=.46). Therefore, the finding that teen-adult ratio has only moderate effects may in part be due to the overlap in these two measures of the social composition of sites.

Cooperative ownership has virtually no total effect on burglary (-.04) or on fear of crime (.03). Cooperative ownership has only a small total effect on community instability (-.14). Finally, the only noticeable total effect that cooperative ownership has on any of the dependent variables is its effect on personal crime (.29) that is positive and significant. This indicates that developments that are cooperatively owned by residents tend to have higher rates of personal crime than those that are not cooperatively owned. This total effect is made up of both direct (.15) and indirect (.14) effects.

Direct and Indirect Effects of Social Characteristics

Figure 6.1 shows the major effects of each of the social characteristics on burglary, fear, and instability. Figure 6.2 shows the major effects on personal crime, fear, and instability. Low-income/AFDC has a number of significant direct effects: negative effects on rent collection (-.73), use of space (-.44), and control of space (-.57); and a positive effect on fear of crime (.32). The lower the level of low-income/AFDC, the lower the rent collection, the lower the use of space, the lower the control of space, and the higher the fear of crime. Each of these effects is independent of all the other effects. (See Table F.2 in Appendix F for significance levels of all direct effects.)

As noted in Table 6.1, low-income/AFDC also has a moderate-sized total indirect effect on fear of crime (.25). This indirect effect is due primarily to two intervening variables: residents' use of space (indirect effect = .08) and residents' control of space (indirect effect = .22).

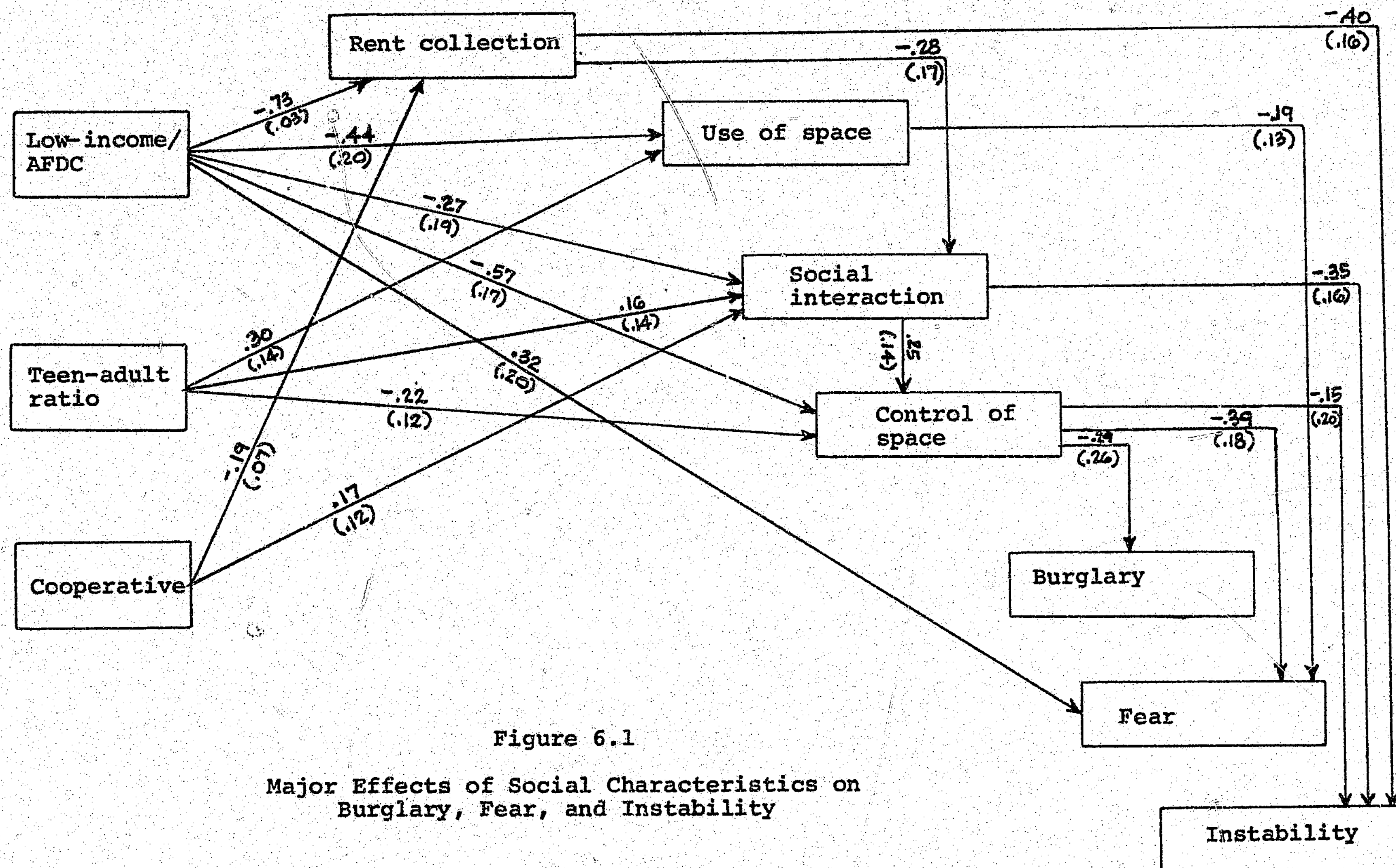

Figure 6.1

Major Effects of Social Characteristics on Burglary, Fear, and Instability

Residents' fear of crime is higher in low-income communities because residents in low-income communities use the space outside their apartments less frequently and because they exert less control over this space, and both low use and low control result in a high level of fear. These are the same reasons that residents' fear is greater in large buildings than in small buildings. In both cases the characteristic of the community, building size or proportion of low-income and AFDC, also has a direct impact on fear, suggesting that regardless of the degree of use of space or the degree of control of space, residents in low-income, high-rise sites are going to be more afraid of crime than residents in high-income, low-rise sites.

Figure 6.1 shows that the total indirect effect of low-income/AFDC on burglary (.16) is transmitted primarily through control of space (indirect effect = .17). This positive indirect effect is offset by a direct effect that is negative (-.18) causing low-income/AFDC to have virtually no total effect on burglary (-.02).

Figure 6.2 illustrates the major effects of the social characteristics on personal crime. The large total indirect effect of low-income/AFDC on personal crime (.61) was noted in Table 6.1. The intervening variables that account for this are: rent collection (indirect effect = .35); use of space (indirect effect = .08); and control of space (indirect

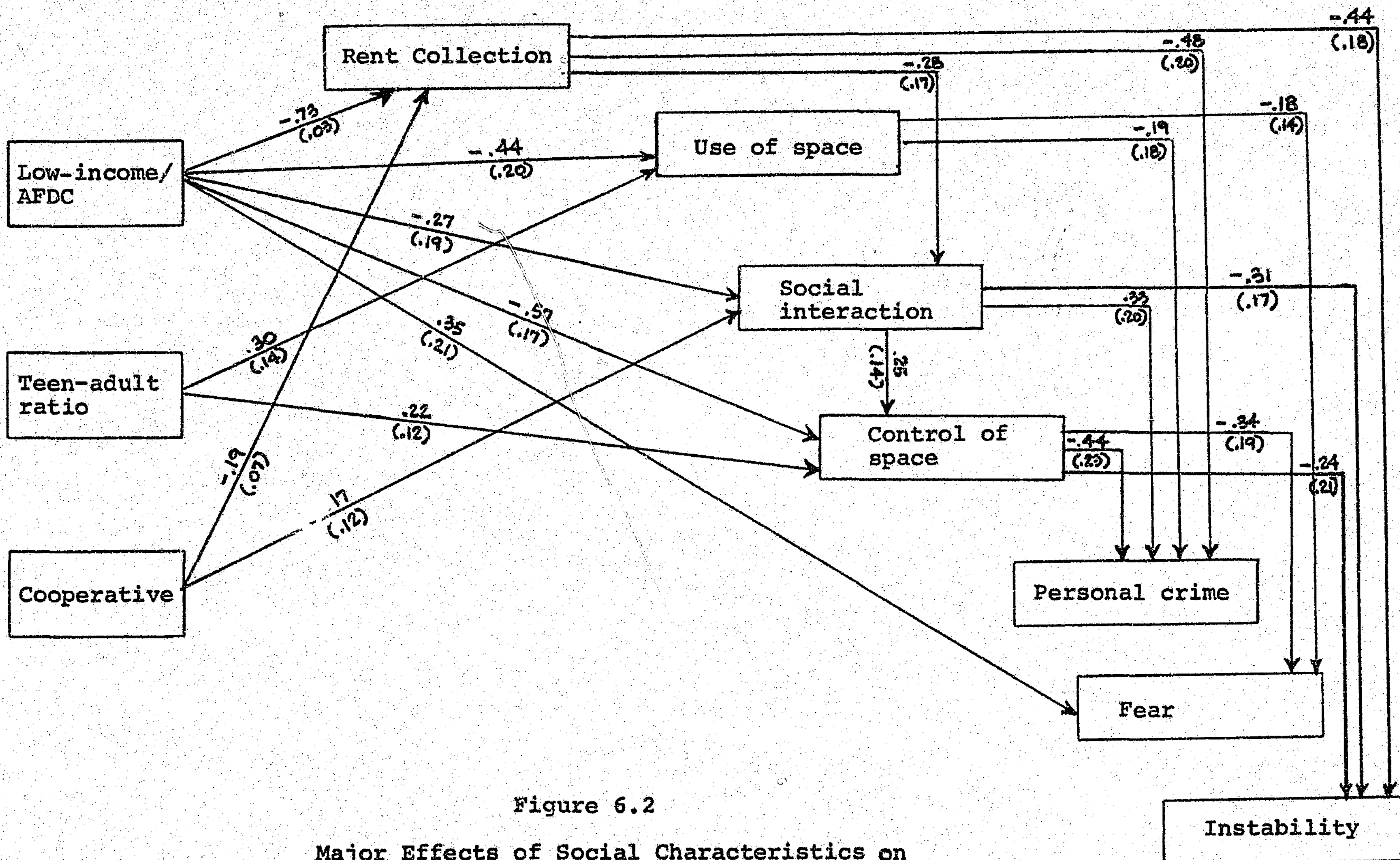

Figure 6.2

Major Effects of Social Characteristics on Personal Crime, Fear, and Instability effect = .25). At the same time, however, low-income/AFDC has a negative effect on social interaction which, in turn, has the unexpected positive effect on personal crime rate that we noted earlier. This produces a negative indirect effect of -.09 of low-income/AFDC on personal crime <u>through</u> social interaction. Overall, however, the total effect of low-income/AFDC on personal crime is positive (total effect = .29). Since the positive effects outweigh the negative ones, the role of the three intervening variables listed above suggests that personal crime is higher in low-income communities than in high-income communities because rent collection losses are greater in low-income settings and because residents in low-income communities make less use of and have less control over the space outside their apartments, and low rent collection, low use, and low control result in a high personal crime rate.

Low-income/AFDC also has a total indirect effect on instability that is large and positive (.30). This effect is mediated by three intervening variables: rent collection (indirect effect = .32); social interaction among residents (indirect effect = .08); and control of space (indirect effect = .14). These effects suggest that instability is higher in low-income sites because rent collection losses are greater, there is less social interaction among residents, and residents exert less control over space outside their apartments; and low rent collection, low social interaction, and low control all cause high community instability.

The ratio of teenagers to adults has a significant direct effect on use of space that is positive (.30) and a significant direct effect on control of space that is negative (-.22). Thus, the higher the teen-adult ratio, the <u>higher</u> the <u>use</u> of space but the <u>lower</u> the <u>control</u> of space. The total indirect effects of teen-adult ratio on the four dependent variables are all small, as shown in Table 6.1. Teen-adult ratio does, however, have some individual indirect effects that are greater than .05 and therefore should be noted. As shown in Figure 6.1, teen-adult ratio affects burglary rate through control (indirect effect = .06) and it affects instability through social interaction (indirect effect = .06). As shown in Figure 6.2, teen-adult ratio affects personal crime through control (indirect effect = .10) and it also affects fear through control (indirect effect = .07).

Cooperative ownership has only one significant direct effect and that is on rent collection and it is negative (-.19): cooperatives have more difficulty with rent collection than developments that are not cooperatives. The only sizeable total indirect effect that cooperative ownership has is on personal crime (.14) and that is transmitted through rent collection (indirect effect = .09) and through social interaction (indirect effect = .06). As indicated in Figure 6.1, cooperative ownership also has two indirect effects on instability that offset each other: through rent collection (indirect effect = .08) and through social interaction (indirect effect = -.06).

Conclusion

The index measuring mean household income and the percent of AFDC families is the social characteristic of housing developments which shows the greatest impact on crime, fear of crime, and instability. Its total effects on personal crime, fear, and instability are all negative and either large or moderate in magnitude. Low-income/AFDC affects personal crime indirectly through rent collection, use of space, and control of space. It also affects fear indirectly via use of space and control of space and it influences instability through rent collection and social interaction. The ratio of teenagers to adults has moderate, but consistently positive total effects on burglary, personal crime, and fear. Cooperative ownership has very little impact with the exception of a moderate, positive effect on personal crime rate.

CHAPTER 7: EFFECTS OF POLICE AND GUARD SERVICE

The causal model for this study was designed primarily to estimate the effects of physical design features and social characteristics of housing developments on crime, fear, and instability. In order to estimate these effects as accurately as possible, it was necessary to control for the possible effects of municipal police service and guard service. These two variables were, therefore, included as independent variables in the model in order to partial out their effects. As described in Chapter 3, police service is an index composed of one item measuring the type of patrol and three items measuring the estimated frequency of patrolling of a given development. Guard service is an index composed of items measuring the number of guards, whether they are present both day and night or only at night, and a rating of their quality by residents.

Given the findings of previous research, it seemed unlikely that police service would have any effect at all on personal crime or burglary. It did seem possible, however, that it would have negative effects on residents' fear of crime and community instability. Guard service was expected to have negative effects on personal crime, burglary, fear of crime, and instability. Police service turns out to affect personal crime but in a surprising way: the more frequently police patrol, the higher the rate of personal crime. However, police service shows virtually no total effects on burglary, fear, or instability and guard service has no total effect on burglary and only small total effects on personal crime, fear, and instability.

Overview of Effects of Police and Guard Service

The breakdown of the total effects of police service and guard service into direct and indirect effects is shown in Table 7.1. The total effects of guard service on personal crime (.10), fear (-.10), and instability (-.10) are all small, and in the case of burglary the total effect is virtually zero (-.04). These results indicate that the presence and nature of security guard service seem to have little impact.

Police service has virtually no total effects on burglary (-.01) or instability (.01) and only a small total effect on fear (.05). The only total effect of any noticeable size that police service has is a positive and significant effect on personal crime (.42), and this effect is almost entirely direct (.30). This suggests that in terms of the hypothesized causal model more frequent police patrolling leads to a higher rate of personal crime. We do not deny this effect but we hesitate to place too much importance on it since there is a very reasonable counter interpretation: intuitively, it seems probable that where the rate of personal crime is high, police are likely to patrol more frequently. Thus a high personal crime rate in a development would lead to frequent police patrolling. The major direction of influence would then be from crime rate to police service rather than vice versa. As stated in Chapter 4, testing which effect is stronger, from police service to personal crime or the reverse, requires a nonrecursive model and is beyond the scope of this study.

The causal model for this study may be misspecifying a relationship of reciprocal causation between police patrolling and personal crime. It may be that a sudden increase in personal crime results in the assignment of more patrols, and this increase in patrolling may then cause the crime rate to drop at least for a short period of time. These changes may occur within very short time periods -- within a number of weeks or months. The examination of such an interplay between crime rate and police service would require a longitudinal study where changes in crime and changes in the assignment of police are carefully and continuously monitored over time.

It should also be noted in Table 7.1 that although police service has a significant direct effect on instability that is negative (-.25), this is offset by a total indirect effect that is positive (.24). So overall, police service shows no total effect on instability.

Table 7.1

Effects of Police and Guard Service on Crime, Fear, and Instability

I Effects of Police Service	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	-.01	-.10	.09	-.05	-.06
Personal Crime	.42[b]	.30[d]	.12	-.15	.27
Fear	.05	-.03	.08	-.16	-.11
Instability	.01	-.25[d]	.24	-.12	-.11

II Effects of Guard Service	Total effect	Direct effect	Total indirect effect	Non-causal component	Total association
Burglary	-.04	-.06	.02	-.14	-.18
Personal Crime	.10	.04	.06	-.16	-.06
Fear	-.10	-.10	0	-.04	-.14
Instability	-.10	-.15	.05	-.04	-.14

$^a p < .01$ $^b p < .05$ $^c p < .10$ $^d p < .15$

Direct and Indirect Effects of Police and Guard Service

Since guard service has no significant direct effects and no total indirect effects of any substance, it has been omitted from Figures 7.1 and 7.2. Similarly, since residents' use of space does not enter into any indirect relationships with coefficients larger than .05 between police service

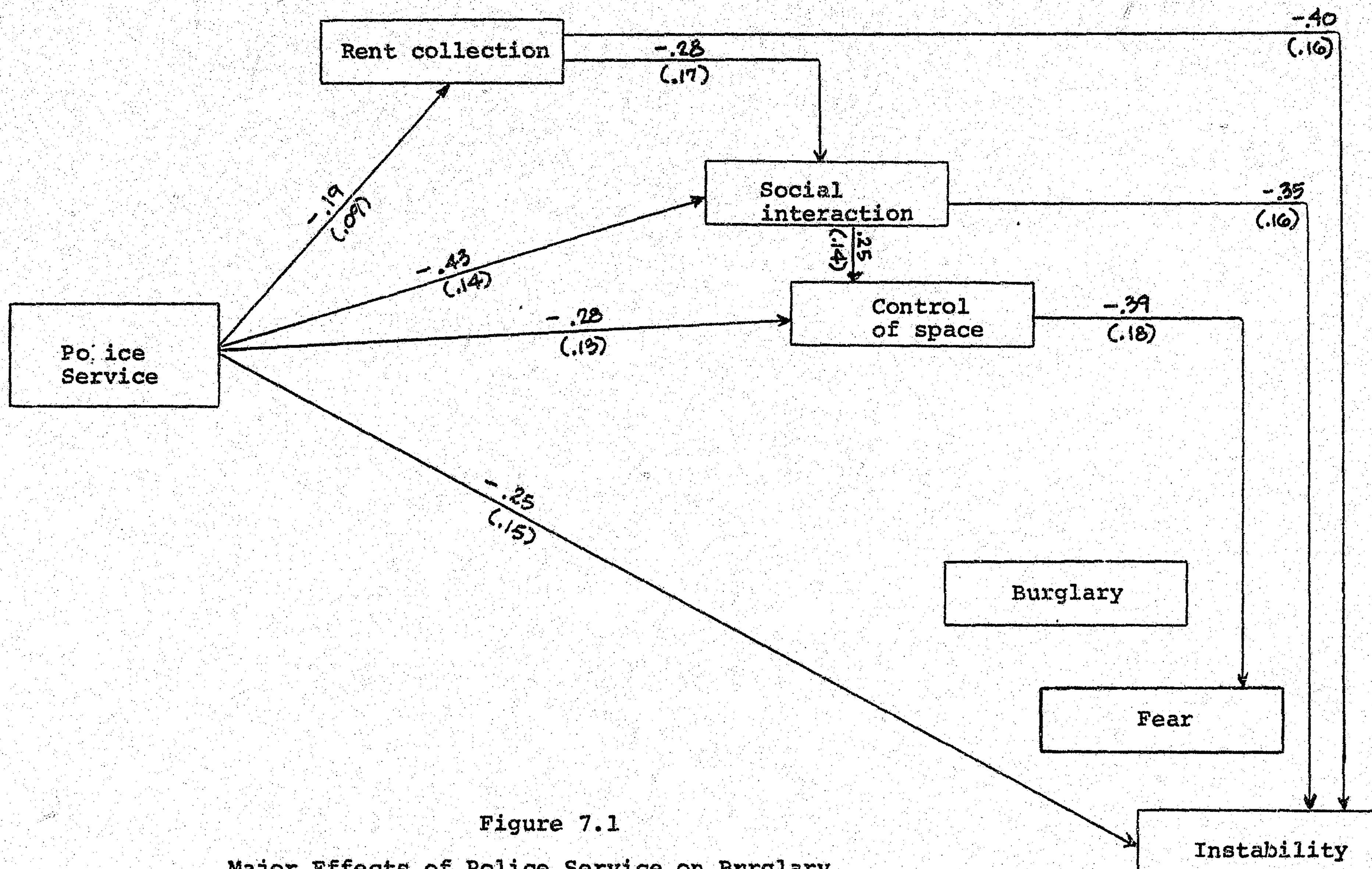

Figure 7.1

Major Effects of Police Service on Burglary, Fear, and Instability and the dependent variables, it too has been omitted from these path diagrams.

Police service shows two more surprising effects in Figure 7.1: significant direct effects on residents' social interaction (-.43) and residents' control of space (-.28) that are both negative. These effects, in the context of this model, indicate that the more the police patrol, the less interaction there is among residents and the less control residents have over space outside their apartments. Both social interaction and control of space were included in the causal model for this study because of their importance as intervening variables in defensible space theory, not because there was a strong theoretical basis for expecting them to be causally affected by police service. Nevertheless, the model we designed requires that we interpret the effects of police service in these causal terms. Again, however, we are hesitant to draw strong conclusions for much the same reason given earlier. A reasonable counter explanation is that low social interaction among residents and residents' low control of space are frequently characteristics of environments that require more police patrolling than environments where interaction and control are high. This same argument could be made for the negative direct effect of police service on rent collection--low rent collection is another characteristic of an environment with problems.

Sorting out the causal pattern of relationships between

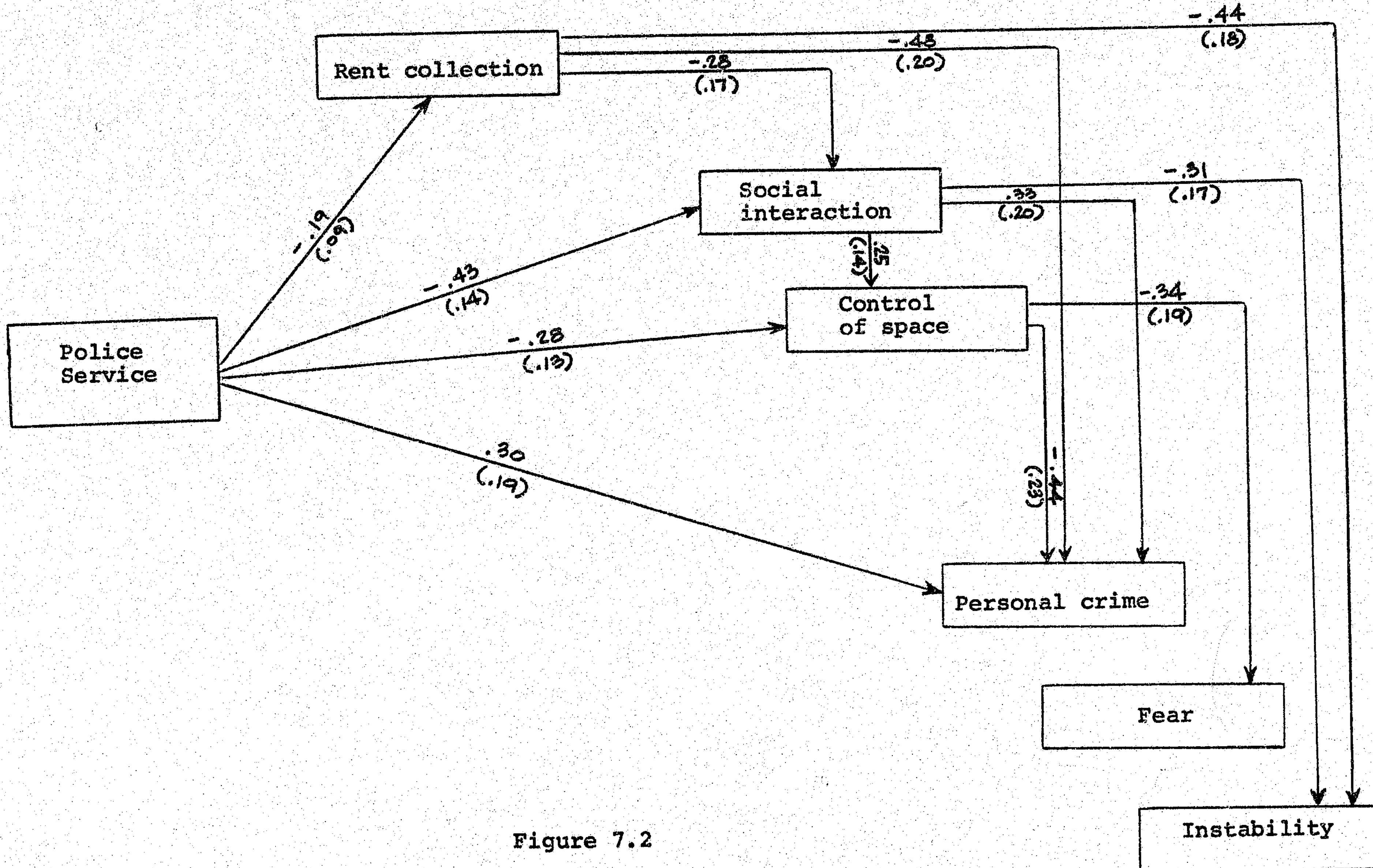

Figure 7.2

Major Effects of Police Service on Personal Crime, Fear, and Instability these different problems and police service would be a difficult theoretical task and would require, at the very least, a nonrecursive model. The causal model for this study was not designed for and is not suitable for such a task. Clarification of the nature of the relationship of police service to control of space, social interaction, and personal crime requires further research.

Conclusion

On the whole, guard service has little if any effect on crime, fear of crime, or community instability. Police service, however, has an unexpected significant and positive impact on personal crime rate and significant direct effects on social interaction and control that are negative. These unexpected effects of police service suggest that the causal pattern of relationships that involves police service is more complex than allowed for in this particular causal model. In this study we are cutting into an ongoing process of change at a particular point in time in order to estimate the effects of certain characteristics of environments on certain problems. The major direction of influence is assumed to be from those characteristics to those problems. But, over time, the problems are likely, in turn, to affect the characteristics of environments; this is particularly true for police and guard service which can both be increased quite quickly in response to serious crime problems. Since physical design and social characteristics cannot change, or <u>be</u> changed, as rapidly, we are willing to interpret their effects in causal terms with less caution than we are willing to do with police and guard service. This particular model, designed primarily to assess the ways in which physical and social factors affect crime, may be inaccurately specifying the effects of police service. This possibility does not, however, affect the validity of the findings concerning the effects of physical design or social characteristics. The fact that the relationship between police service and crime may involve reciprocal causation does not affect the relationships between physical design or social characteristics and crime. The purpose for including police service in the model was to partial out its effects: that has been successfully done. While the model may not be adequate for assessing the effects of police service, it is still valuable for demonstrating the effects of these other factors.

CHAPTER 8: SUMMARY OF MAJOR FINDINGS

Each of the three previous chapters has focused on the effects of a particular type of characteristic of housing developments. The present chapter is a synthesis and extension of these earlier chapters. In the first section of this chapter the total effects of each of the independent variables are compared. The second section presents the proportion of variance explained at each stage of the model. And the third section is a review of the ways in which the effects of the independent variables are mediated by the model's intervening variables.

Total Effects of Independent Variables

Table 8.1 presents the total causal effect of each of the independent variables on burglary, personal crime, fear, and instability. The only two characteristics of housing developments that have any effect on burglary rate are accessibility to buildings and apartment units (.43) and the ratio of teenagers to adults (.16). The greater the accessibility and the higher the teen-adult ratio, the higher the rate of burglary experienced by residents. The effect of accessibility on burglary is significant.

Table 8.1

Total Effects of Independent Variables on Burglary, Personal Crime, Fear, and Instability

	Burglary	Personal crime	Fear	Instability
Building size	-.05	.11	.41[a]	.39[a]
Accessibility	.43[b]	-.03	.06	.16
Low-income/AFDC	-.02	.29[d]	.57[a]	.40[a]
Teen-adult ratio	.16	.21	.18[d]	.07
Cooperative	-.04	.29[c]	.03	-.14
Police service	-.01	.42[b]	.05	.01
Guard service	-.04	.10	-.10	-.10

[a] $p < .01$ [b] $p < .05$ [c] $p < .10$ [d] $p < .15$

Four independent variables have either large or moderate effects on personal crime: low-income/AFDC (.29), teen-adult ratio (.21), cooperative ownership (.29), and police service (.42). Both low-income/AFDC and the ratio of teenagers to adults have the predicted effects: the higher the proportion low-income and AFDC and the higher the teen-adult ratio, the higher the personal crime rate. Cooperative ownership and police service, however, have unexpected effects: cooperatives have higher personal crime rates than non-cooperatives; and the more frequently police patrol, the higher the rate of personal crime. The effects of low-income/AFDC, cooperative ownership, and police service on personal crime are all significant.

Fear of crime is most strongly determined by building size (.41), low-income/AFDC (.57), and teen-adult ratio (.18). All of these effects are significant and in the predicted direction. Residents' fear of crime increases with building size, the proportion of low-income and AFDC families, and the ratio of teenagers to adults.

Community instability is most strongly determined by building size (.39), accessibility (.16), and low-income/AFDC (.40). These effects are also the expected ones. Community instability increases with building size, accessibility, and the proportion of low-income and AFDC families. The effects of building size and low-income/AFDC are both significant.

While building size, accessibility, low-income/AFDC, and teen-adult ratio all have at least two total effects that are either large or moderate in magnitude, guard service has no large or moderate effects, and cooperative ownership and police service have large or moderate effects only on personal crime rate. This suggests that building size, accessibility, low-income/AFDC and teen-adult ratio are, overall, more important in determining the success of a housing development in terms of the pattern of crime, fear, and instability than cooperative ownership, police service, or guard service. The two most important characteristics are building size and low-income/AFDC.

Percentage of Variance Explained

Table 8.2 lists the cumulative percentages of variance in each of the four dependent variables explained at various stages of the burglary and the personal crime versions of the causal model. Beginning with the percentage of variance explained by the independent variables only, the percentage of variance is presented for each stage of the model.[1]

The last figure in each column tells us how much variance in total is explained by the model. The proportion of

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1. The variance explained by each one of the independent variables separately is not listed in Table 8.2 because all the independent variables together constitute a single stage in the model. That is to say, there are no causal relationships posited among the independent variables.

Table 8.2

Cumulative Percentages of Variance in Burglary, Personal Crime, Fear, and Instability Explained at Various Stages of the Model

I Burglary Model

Independent and Intervening Variables	Percentage of Variance Explained		
	Burglary	Fear	Instability
Independent Variables	27%	63%	53%
Rent collection	27	63	56
Use of space	27	65	57
Social interaction	27	65	63
Control of space	30	69	64
Burglary		69[a]	66
Fear			67[a]

II Personal Crime Model

Independent and Intervening Variables	Percentage of Variance Explained		
	Personal crime	Fear	Instability
Independent variables	26%	63%	53%
Rent collection	37	63	56
Use of space	38	65	57
Social interaction	40	65	63
Control of space	45[a]	69	64
Personal crime		69[a]	65
Fear			65[a]

[a] $p < .01$

variance in fear (69%) that is explained is sizeable and significant. Similarly, the proportion of variance in instability is large and significant (67% in the burglary version; 65% in the personal crime version of the model). The proportion of variance in personal crime that is explained (45%) is not as large, but it is still a sizeable amount and is significant. On the other hand, the proportion of variance in burglary that is explained is considerably lower (30%) and is not statistically significant.

Overall, we can conclude that the causal model allows us to account for a large and significant proportion of the variance in fear of crime and community instability. It allows us to account for a smaller, but significant, proportion ofcthe variance in personal crime. And finally, the model accounts for a relatively small portion of the variance in burglary.

The independent variables (physical design, social characteristics, and police and guard service) account for almost all of the variance explained in burglary rate (27% of a total of 30%). The only intervening variable that adds to the variance in burglary explained by the independent variables is control of space: it adds 3%. Similarly, almost all of the variance in fear explained by the model (69%) is explained by the independent variables (63%). The two intervening variables that add to that are use of space (adds 2%) and control of space (adds 4%).

The independent variables also account for much of the variance in instability but less so than is true for burglary or fear: of the total variance explained (67%), 53% is explained by the independent variables alone. Rent collection adds 3% to this; use of space adds 1%; social interaction adds 6%; control adds 1%; burglary adds 2%; and fear adds 1%.

Personal crime again presents a different picture. Only a little more than half of the total variance explained in personal crime is explained by the independent variables: the characteristics of the development explain 26% of the variance while the intervening variables add a total of 19%. Rent collection adds 11%; use of space adds 1%; social interaction adds 2%, and control of space adds 5%.

Role of Intervening Variables

Table 8.3 lists the path and the coefficient for each of the individual indirect effects that is greater than .05 from the four most important independent variables to burglary, personal crime, fear, and instability. This table gives us a chance to compare the different ways in which physical design and social characteristics influence crime, fear, and instability. (Figures 8.1 and 8.2 can be used to supplement Table 8.3. Figure 8.1 shows all the major direct and indirect paths in the burglary version of the causal model and Figure 8.2

Table 8.3

Individual Indirect Effects[1] of Building Size, Accessibility, Low-Income/AFDC, and Teen-adult Ratio on Burglary, Personal Crime, Fear, and Instability

I Burglary	
Building size via Control of space	.09
Low-income/AFDC via Control of space	.17
Teen-adult ratio via Control of space	.06
II Personal Crime	
Building size via Rent collection	.10
Building size via Use of space	.10
Building size via Social interaction	-.10
Building size via Control of space	.13
Accessibility via Social interaction	-.11
Low-income/AFDC level via Rent collection	.35
Low-income/AFDC level via Rent collection and Social interaction	.07
Low-income/AFDC via Use of space	.08
Low-income/AFDC via Social interaction	-.09
Low-income/AFDC via Control of space	.25
Teen-adult ratio via Control of space	.10
III Fear of Crime	
Building size via Use of space	.10
Building size via Control of space	.12
Low-income/AFDC via Use of space	.08
Low-income/AFDC via Control of space	.22
Teen-adult ratio via Use of space	-.06
Teen-adult ratio via Control of space	.09
IV Community Instability	
Building size via Rent collection	.08
Building size via Social interaction	.11
Accessibility via Social interaction	.11
Accessibility via Burglary	.06
Low-income/AFDC via Rent collection and social interaction	-.07
Low-income/AFDC via Rent collection	.29
Low-income/AFDC via Social interaction	-.09
Low-income/AFDC via Control of space	.09
Teen-adult ratio via Social interaction	.06

[1] Only individual indirect effects > .05 are listed in this table.

shows all the major direct and indirect paths in the personal crime version of the model.)

The one intervening variable that transmits effects to <u>each</u> of the four dependent variables is residents' control over space outside their apartments. In each case the effect of control of space is negative: the greater the control, the lower the burglary, the personal crime, the fear of crime, and the instability. In three cases the effect is transmitted from <u>building size</u> through control of space: to burglary, to personal crime, and to fear of crime. These results provide important empirical support for defensible space theory which posits that the design of the environment can discourage residents from exerting control over the use and users of areas outside their apartments and that the lack of such control will result in crime and fear of crime. In particular, the larger the building and hence the lower its defensibility, the less control residents are able to exert and, as a consequence, the greater the crime and the fear of crime. The individual indirect paths from building size to burglary, personal crime, and fear of crime through control of space indicate that this is, indeed, the case.

The effect of low-income/AFDC is transmitted through control of space to all four dependent variables: to burglary, to personal crime, to fear of crime, and to community instability. Since the proportion of low-income and AFDC

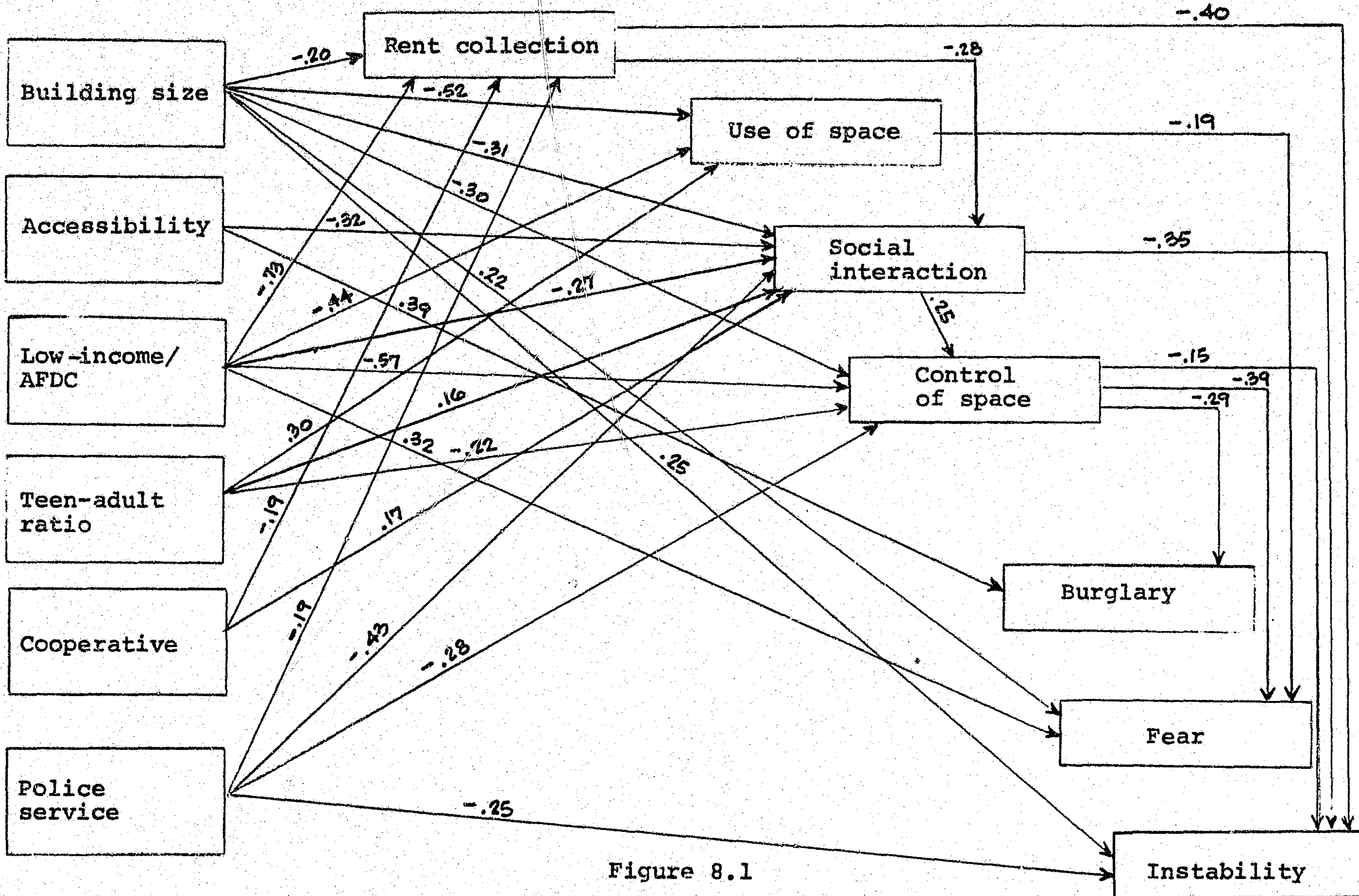

Figure 8.1

Major Effects of Characteristics of Housing Developments on Burglary, Fear, and Instability

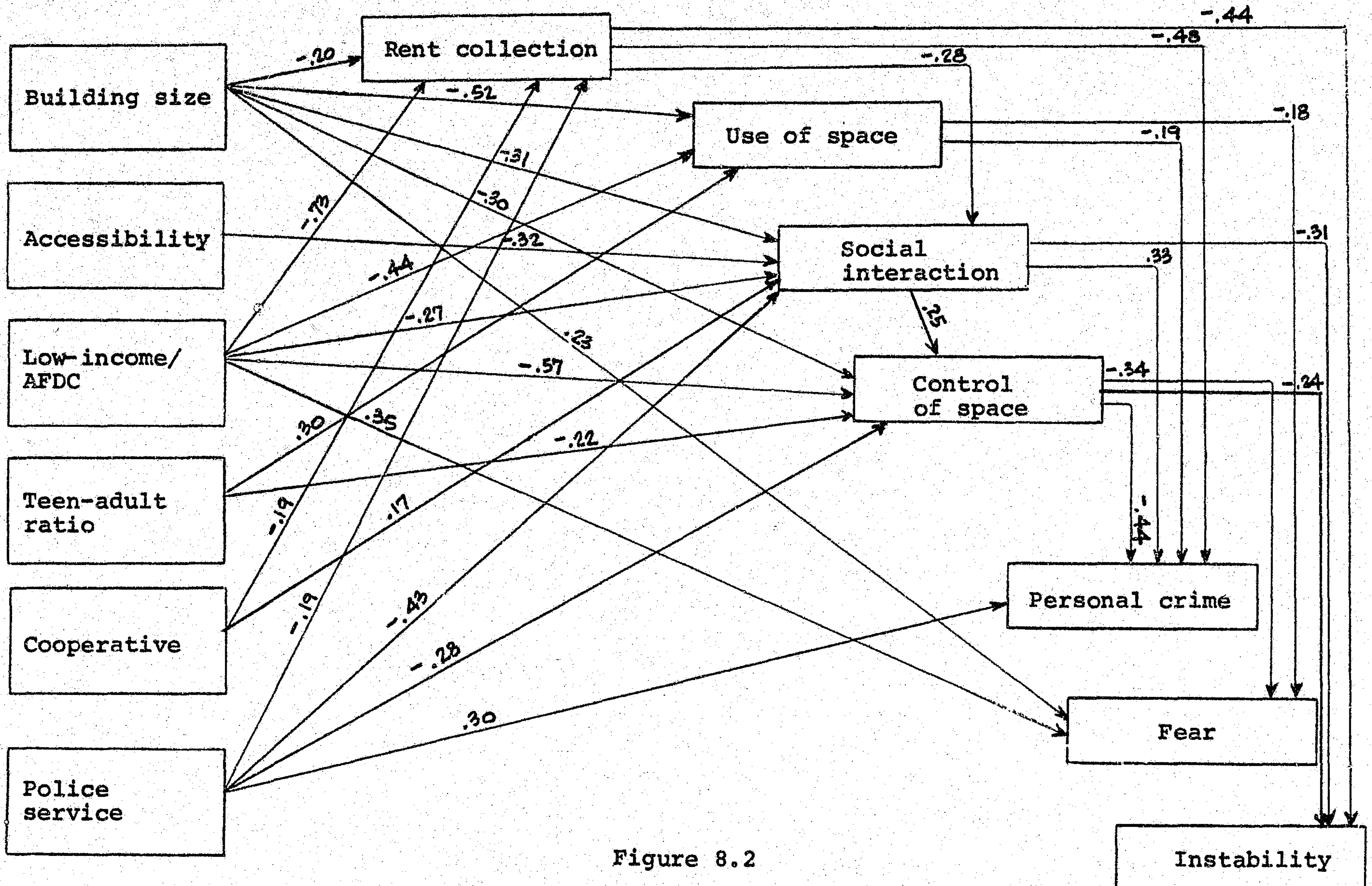

Figure 8.2

Major Effects of Characteristics of Housing Developments on Personal Crime, Fear, and Instability families is a negative determinant of control, and control in turn, exerts a negative effect on each of these three dependent variables, the indirect effects transmitted are consistently positive: the higher the proportion of low-income and AFDC families the higher the personal crime rate, the fear of crime and the community instability. The ratio of teenagers to adults exerts indirect effects on burglary, personal crime, and fear of crime through control of space. As expected, these effects are consistently positive: the higher the teen-adult ratio, the lower the control and, in turn, the higher the personal crime, the fear of crime, and the community instability.

Another intervening variable that is deemed important in defensible space theory is residents' use of space outside their apartments. The larger the building and hence the more people who share such space, the less intensively it will be used. Infrequent use, in turn, will allow more crimes to occur and will instill a sense of fear among residents. This tenet of defensible space theory is also supported by the coefficients listed in Table 8.3. Building size has the expected positive effects, through use of space, on personal crime and fear of crime (but not on burglary). The larger the building, the less intensively outside areas are used, and infrequent use produces personal crime and fear of crime.

Low-income/AFDC also affects personal crime and fear of crime through use of space. Since low-income/AFDC has a negative effect on use and use, in turn, has a negative effect on personal crime and fear, the indirect effects of low-income/AFDC are positive. Teen-adult ratio has a negative indirect effect on fear through use of space. The higher the ratio of teenagers to adults, the more frequently space outside the apartments is used, and this, in turn, discourages fear.

Social interaction functions as an intervening variable in transmitting effects from building size, accessibility, and low-income/AFDC to personal crime. Since, however, social interaction has an unexpected positive effect on personal crime rate, the effects it transmits from these three independent variables to personal crime run counter to the expected effects. As stated earlier, further research is needed to clarify the relationship between social interaction and personal crime rate.

Social interaction also mediates the effects of all four major independent variables on community instability. Building size, accessibility, and teen-adult ratio all have negative effects on social interaction which, in turn, has a negative effect on instability. Thus, social interaction accounts for three positive indirect effects from these characteristics of housing developments. Social interaction also accounts for a negative indirect effect of low-income/AFDC on community instability.

Rent collection functions as an intervening variable between two independent variables, building size and low-income/AFDC, and two dependent variables, personal crime and instability. The larger the building, the lower the rent collection, and consequently the higher the personal crime rate and the community instability. Similarly, the lower the level of low-income/AFDC, the lower the rent collection, and consequently the higher the personal crime rate and the community instability.

Since rent collection is an indicator of management's ability to provide services, it is reasonable that poor rent collection and thus poor services would result in both a high rate of personal crime and a high level of community instability. What the results also show is that management's ability to perform, as measured by the variable rent collection, is itself determined by building size and low-income/AFDC: management's ability to provide services decreases with building size and with the proportion of low-income and AFDC families. (See Table F.2 in Appendix F for all the direct effects of the independent variables on rent collection.)

And finally, it is worth noting that the only crime variable that plays a role as an intervening variable is burglary rate: it mediates the effect of accessibility on instability. The higher the accessibility of buildings and apartments, the higher the burglary rate and, in turn, the higher the level of community instability. Neither personal crime nor fear of

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2 OF 4

crime mediates any effects of the independent variables on instability.

In sum, control of space plays an important and consistent role in the causal model. Rent collection and use of space have important and consistent roles but they are not as widely influential as control of space. And social interaction, while mediating the expected effects on instability, shows an unexpected effect on personal crime rate.

Conclusion

Building size, accessibility, low-income/AFDC, and teen-adult ratio prove to be more important causes of crime, fear of crime, and community instability than cooperative ownership, police service, or guard service. The two most important causes are building size and low-income/AFDC. Building size, accessibility, low-income/AFDC, and teen-adult ratio all have total effects in the expected direction. Cooperative ownership and police service, however, have unexpected positive effects but only on personal crime rate.

The proportions of variance explained by the model suggest that the model is best suited to explaining fear of crime and community instability and that it is somewhat less suitable but adequate for explaining personal crime. Although accessibility alone is a significant determinant of burglary rate, the model as a whole is not well suited for explaining burglary.

The magnitude and direction of individual indirect effects suggest that, as posited by defensible space theory, both use of space and control of space are important intervening variables in mediating the effects of building size on crime and fear of crime. These two variables also serve to mediate the effects of low-income/AFDC and teen-adult ratio. Social interaction mediates the effects of independent variables on instability as expected but it has an unexpected positive effect on personal crime rate. Rent collection also proves to be an important intervening variable in transmitting effects to personal crime and to instability.

It is worth noting here that all of the unexpected effects of independent or of intervening variables on the dependent variables are effects on personal crime rate. Thus, although the model explains a significant proportion of the variance in personal crime rate, some of the effects of particular variables are surprising.

Although the model as a whole does not explain a significant proportion of the variance in burglary rate, accessibility does exert a significant influence and there are no unanticipated effects on burglary rate. With respect to both fear of crime and community instability, a large and significant percentage of the variance is explained; there are no unexpected effects; and building size and low-income/AFDC prove to be the two most important causes of both fear and instability.

CHAPTER 9: DISCUSSION

This chapter is divided into five sections: the major causes of crime, fear, and instability; the causal mechanisms that account for the effects of the characteristics of housing developments on crime, fear, and instability; the relationships between crime, fear, and instability; a comparison between the results of this study and the results of the original defensible space study conducted in New York City; and implications for future research. The results from the present study that are discussed in this chapter are presented in detail in Chapters 5, 6, 7, and 8 and in the four tables in Appendix F.

Major Causes of Crime, Fear, and Instability

The primary objective of this study was to determine which characteristics of federally-assisted urban housing developments determine the level of crime, fear of crime, and community instability they experience. The results indicate that both fear of crime and community instability are primarily determined by building size and low-income/AFDC. The larger the building, the greater the fear of crime and also the higher the level of community instability. Similarly, the higher the proportion of low-income and AFDC families, the greater the fear of crime and, also, the higher the level of community instability. Fear of crime is also somewhat determined by the ratio of teenagers to adults: the higher the teen-adult ratio, the greater residents' fear. And community instability is affected by the accessibility of buildings and apartments: the greater the accessibility, the higher the instability.

The results indicate that burglary rate is largely determined by the accessibility of apartments and buildings and, to a lesser extent, by the ratio of teenagers to adults. The more accessible buildings and apartments are and the higher the teen-adult ratio, the higher the rate of burglary. Personal crime rate is mostly determined by low-income/AFDC, cooperative ownership, police service, and, to a lesser extent, the ratio of teenagers to adults. Both low-income/AFDC and teen-adult ratio have their expected effects: the higher each one of these social characteristics, the higher the rate of personal crime. Cooperative ownership and police service, however, have surprising effects: cooperatives tend to have higher rates of personal crime than non-cooperatives; and the more frequently police patrol, the higher the rate of personal crime. The one causal factor which burglary rate and personal crime rate have in common is teen-adult ratio: the higher the ratio, the higher the crime rate. The impact of teen-adult ratio on crime and fear of crime is weaker than expected; this may be due in part to the correlation between teen-adult ratio and low-income/AFDC.

While accessibility affects burglary rate, it does not affect personal crime rate. This is surprising since the original defensible space study showed that robberies occur primarily in the common interior areas of buildings and one would therefore expect that accessibility to such areas would have a positive effect on personal crime rate in this study. The most plausible explanation for the lack of any such effect in the present study involves the types of building that were studied. Almost all of the buildings in the original defensible space study were high-rises. In high-rises the interior common areas are large and are shared by many families: therefore they become the setting for robberies and assaults. Accessibility to such areas should then affect the rate of such crimes in this study. However, most of the sites in the present study consist of row house and walk-up buildings. Row houses have no common interior areas and the common areas in walk-ups are relatively small and are shared by relatively few families. The high-rises are provided with guards, as public housing in New York is not. Because of the design features of row houses and walk-ups, and the use of guards in the high-rises, accessibility to interior common areas has little impact on the amount of personal crime that occurs in them. The predominance of row house and walk-up buildings in the present study may therefore account for the finding that accessibility does not affect personal crime rate.

Cooperative ownership has only one effect of any substance on any of the four types of community problems, and that is an unexpected positive effect on personal crime rate. It may be that cooperative developments become targets for personal crime, in particular for robberies, because outsiders may know they are cooperatives and may assume the residents are likely to be richer than residents of other housing developments. Such a strong relationship between cooperative ownership and wealth, as measured by low-income/AFDC, is not borne out by the results of this study (r = -.30) but within any particular neighborhood, cooperative residents may indeed be wealthier than other residents of the surrounding area and, at the very least, may be perceived to be wealthier.

It should also be noted that unlike building size or low-income/AFDC, cooperative ownership has very little impact on the intervening variables in the causal model. The reason for including cooperative ownership as an independent variable was precisely to see if actual ownership, rather than the physical design of multifamily housing, encourages people to express proprietary feelings over the space outside their homes by using and controlling these areas. The findings indicate no such relationship. However, the research was not expressly designed to compare the effects of building size with the effects of cooperative ownership. Moreover, there are only 6 cooperative sites in the study: such a skewed distribution makes it very difficult for cooperative ownership to have an effect on anything. Also, not one of the high-rise sites is cooperatively owned. For these reasons, the relatively weak impact of cooperative ownership should be viewed with caution.

The results indicate that while building size does have significant effects on both use of space and control of space in the predicted direction, cooperative ownership has only a small effect on use of space and virtually no effect on control of space. As far as these particular sites are concerned, building size is a more important determinant of proprietary feelings, as expressed by control and use of space, than cooperative ownership. The question of whether the deleterious effects of building size, say for example in high-rise buildings, can be combatted by giving title to the apartments to the residents awaits further research, as does a more rigorous comparison between the impact of physical design and the impact of cooperative ownership.

The major reason for including police service and guard service as independent variables was to control for their possible effects and thereby to estimate more accurately the effects of the physical design variables and the social characteristics. Nonetheless, the findings concerning both these variables are somewhat surprising. Police service turns out to be an important determinant of personal crime but in the following way: the more frequently police patrol, the higher the rate of personal crime. As suggested earlier in this report, the causal model for this study may be misspecifying the relationship between police service and personal crime rate. It may be that the amount of personal crime is a determinant of police service rather than vice versa and that the higher the crime rate, the more frequently police are required to patrol a development.

Guard service has virtually no effect on crime, fear, or instability. Its effects on fear and instability are in the predicted direction -- that is, sites without guard service have higher levels of fear and instability, but these effects are too small to suggest that the absence of guard service determines either of these problems. That guard service should have so little influence is only somewhat surprising It is likely that the presence of guards is only effective where the guard is able to fully control all the entrances to a building. This can only happen in a high-rise site where a doorman is constantly present at the front door and all secondary exits are kept locked at all times. Of the 21 sites in the study that have any guards at all, there is only one site which meets these criteria. Moreover, the overwhelming majority of sites in the study are row houses and walk-up sites where security guards, if they are present at all, are unable to monitor who enters the many different buildings. What the findings from this study demonstrate then is that the mere presence of guards has little, if any, impact on crime, fear, or instability. It may still be true, however, that the degree to which guards actually control access to a building or to its grounds does affect crime or fear of crime. Confirmation of this hypothesis awaits further research since, for the most part, guards in this study did not control access to buildings or grounds properly.

Each of the characteristics of housing developments that has effects in the expected direction also affects more than one type of community problem. Building size affects fear and instability; low-income/AFDC affects personal crime, fear, and instability; accessibility affects burglary and instability; and teen-adult ratio affects burglary, personal crime, and fear. Both the number and the consistency of the effects that these four characteristics of housing developments exert suggest to us that overall in this study they are the major causes of crime, fear of crime, and community instability in federally-assisted urban housing developments.

Causal Mechanisms

A second major objective of this study was to determine how particular characteristics of housing developments produce problems of crime, fear, and instability. The question to be answered was: What actions and attitudes on the part of management and residents mediate the effects that physical and social characteristics have on crime, fear, and instability? The answer to this question lies with the indirect effects that the independent variables exert on the four dependent variables, that is, with the effects that are transmitted through the intervening variables. These indirect effects appear to be the most important new findings in defensible space research.

The most interesting indirect effects in the study are those that are exerted by the four most important characteristics of housing developments: that is, the indirect effects of building size, accessibility, low-income/AFDC, and teen-adult ratio. The indirect effects of building size and accessibility are discussed first.

Indirect Effects of Building Size and Accessibility

Control of space mediates effects from building size to burglary, personal crime, and fear of crime. Thus, although the overall (total) effect of building size on crime is not large, building size does show important indirect effects on both forms of crime and on fear through control of space. These two indirect effects provide important empirical support for the theory of defensible space. The theory posits that residents' control of space is the link between the physical design of the housing environment and crime or fear of crime: the larger the building, the less control residents are able to exert, and, in turn, the greater the crime and the greater the fear of crime. Up until this time, however, this relationship has not been studied and therefore there has been no empirical support for this postulate prior to this study.

The findings from this study demonstrate that, indeed, the deleterious effects of building size are largely due to the inability of residents in large buildings to control the areas outside their own homes -- both indoors and outdoors. In the absence of such control, minor crime problems and low levels of fear may quickly escalate into major problems. In low-rise buildings the interior circulation areas and outdoor ground areas are shared by only a few families. Control of these areas and identification with them is therefore simplified for each family. This provides an important mechanism for self-help in communities threatened with survival because of high-crime rates. Such possibilities suggest directions for future research concerning the influence of building design on community stability.

Another tenet of defensible space theory that has not previously been studied concerns the importance of residents' use of space outside their homes as an additional link between design and crime or fear of crime. The postulate is much the same as for control: the larger the building, the less frequently residents will use the space outside their homes, and in turn, the greater the crime and fear of crime. This study provides empirical support for this postulate as well: residents' use of space transmits effects from building size both to personal crime and to fear of crime in the expected manner. Thus, a second explanation for the deleterious effects of building size is the inability of residents in large buildings to make use of the space outside their apartments. When buildings are large, and hence use is low, personal crimes are more likely to occur and residents are more likely to feel afraid.[1]

Both use of space and control of space reflect the degree to which residents have extended the realm of their own homes beyond the interior of their apartment units to encompass adjacent areas. Newman, as well as others such as Rainwater (1966), Yancy (1973), and Cooper (1972), have long suggested that the degree to which such an extension of the home environment occurs is a function of the design of that environment, particularly of the number of apartments that share the adjacent areas (which is measured by building size in this study). Prior to this study the evidence for such an effect was meager (McCarthy, 1978) or largely impressionistic (Yancy, 1973; Rainwater, 1966; Cooper, 1970). The findings from this study help to document this expected relationship between the design of the environment outside the apartment unit and the degree to which residents extend the realm of use and control beyond the confines of their own

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[1] We recognize the possibility that the relationship between use of space and crime, as well as between use of space and fear, or between control of space and crime, may be relationships of reciprocal causation whereby, for instance, low use of space causes high fear of crime and vice versa. We believe, however, that the predominant effect is from use to fear and, similarly, from use to crime and from control to crime.

apartments. Moreover, this study indicates that such an extension of the home can work to inhibit both the occurrence of crime and the fear of crime.

As it turns out, the level of social interaction among residents also functions as a link between design and crime in this study, but not in the expected way. The larger the building, the less frequently residents interact, and in turn, the lower the rate of personal crime. Social interaction does, however, form the expected link between building size and community instability: the larger the building, the less residents interact and, in turn, the higher the level of instability. Social interaction among residents can also be viewed as a form of extension or enlargement of the home beyond the apartment itself. This study shows that this form of extension is also affected by the design of the environment and that it, in turn, helps to determine the level of instability in a community.

The final intervening variable to be considered with respect to the indirect effects of building size is rent collection, which is used as a measure of management's ability to provide services. Rent collection mediates effects from building size to two dependent variables: personal crime and instability. The larger the building, the less able management is to provide services, as measured by rent collection, and, in turn, the higher the level of community instability. Similarly, the larger the building, the less able management is to provide services and, in turn, the higher the rate of personal crime. Thus building size not only affects actions and attitudes on the part of residents but it also affects management's ability to perform its duties and that affects both the occurrence of personal crime and residents' willingness to remain in that environment.

While building size affects all four of the study's intervening variables -- rent collection, use of space, social interaction, and control of space -- accessibility only affects social interaction. This effect is similar to the effect of building size: the greater the accessibility of buildings and apartments and thus the greater their vulnerability to intrusion by outsiders, the lower the social interaction among residents. Social interaction, in turn, affects community instability; thus, accessibility affects instability through social interaction. Accessibility also affects instability through burglary: the greater the accessibility, the higher the burglary rate and, in turn, the higher the level of community instability.

Apparently, high accessibility, like large building size, discourages residents from interacting with each other and, at least in this way, tends to limit the realm of the home to the apartment unit itself. The result of this limitation is higher community instability.

Indirect Effects of Low-Income/AFDC and Teen-Adult Ratio

Residents' control over space outside their apartments mediates the effects of low-income/AFDC and of teen-adult ratio on the various dependent variables. Indeed, control appears to be a highly important intervening variable in the causal model. It is the only intervening variable that has substantial effects on all four dependent variables. This means that residents' control over the environment outside their own apartments plays a role in determining the severity of each of the four types of community problems: the greater residents' control is, the less severe the problem, whether it be burglary, personal crime, fear, or instability.

Low-income/AFDC and teen-adult ratio both have negative effects on control. Through control, both social characteristics exert positive effects on burglary, personal crime, and fear of crime in much the same way that building size has indirect effects on these same three dependent variables. That is to say, the higher the proportion of low-income and AFDC families, the lower the sense of control, and as a result, the higher the rates of burglary and personal crime and also the higher the fear of crime.

Low-income/AFDC also has positive effects on personal crime and fear of crime through residents' use of space. The higher the level of low-income/AFDC, the lower the use of space, which results both in personal crime and fear of crime. Teen-adult ratio, however, has a negative effect on fear through residents' use of space since teen-adult ratio has a positive effect on use: the higher the ratio of teenagers to adults, the more intensively outdoor space is used and the more intensively it is used, the lower the fear of crime.

A high proportion of low-income and AFDC families in a community, like large buildings, tends to discourage residents from extending the realm of their homes beyond the walls of their individual apartments. As with building size, the consequences are serious: burglaries and personal crimes are more likely to occur and residents are more likely to feel afraid. A high ratio of teenagers to adults also limits the extension of the home as it is measured by control. At the same time, however, a high teen-adult ratio facilitates the extension of the home in that a high ratio results in more intensive use of outdoor space.

Low-income/AFDC and teen-adult ratio also have positive effects on instability through social interaction. The higher the proportion of low-income and AFDC families, the lower the social interaction among residents, and this in turn contributes to a high level of instability. A high ratio of teenagers to adults has the same effect on instability through social interaction. Low-income/AFDC also affects community instability through control: the higher the proportion of low-income and AFDC families, the lower the control, and in turn the higher the level of community instability.

Low-income/AFDC, like building size, has a negative effect on rent collection: the higher the level of low-income/AFDC, the lower the rent collection and, thereby, the less able management is to provide services. Rent collection, in turn, affects both personal crime and community instability. The lower the quality of services, as measured by rent collection, the higher the personal crime rate and the higher the level of community instability.

When we look over the set of intervening variables that mediate the effects of the characteristics of housing developments on each of the four types of community problems, an interesting pattern emerges. Those variables that best reflect the degree to which residents have extended their domain of concern beyond their individual apartments, namely use of space and control of space, are important links from building size, low-income/AFDC, and teen-adult ratio to each of the crime-oriented variables -- burglary, personal crime, and fear -- but not to community instability. The less residents have extended their domain of concern, the higher the crime and the fear of crime.

Social interaction, which perhaps reflects links to other residents rather than concern or interest in space, affects neither fear nor burglary and has the puzzling positive effect on personal crime. Social interaction, however, does affect community instability in the expected way. Links between residents, then, for the most part are not one of the primary causal mechanisms underlying the crime-oriented problems, except for the positive effect on personal crime. And finally rent collection appears to be a major precipitating factor in the causation of personal crime and of instability but not of burglary or fear of crime.

Relationships Between Crime, Fear, and Instability

One of the secondary objectives of this study was to explore the relationships between crime, fear of crime, and community instability. We expected that crime would have positive effects on both fear and instability and that fear would have a positive effect on instability. In order to gain a complete understanding of the relationships between crime, fear of crime, and community instability, two types of results are discussed below -- zero-order correlations and standardized partial regression coefficients.

The zero-order correlations suggest that these three types of community problems are indeed related to each other. Residents' fear of crime is significantly correlated with burglary rate ($r = .18$, $p < .15$) and with personal crime rate ($r = .26$, $p < .05$). Community instability is significantly correlated with burglary rate ($r = .34$, $p < .01$) and with fear of crime ($r = .50$, $p < .01$), but not with personal crime rate ($r = .06$). Taking the two strongest correlations as examples, these results indicate that sites with high levels of fear also have high levels of community instability and that sites with high rates of burglary also have high levels of community instability. These correlateions, however, do not take into account the possible influences of other variables on crime, fear, and instability. Thus, for example, the zero-order correlation between fear and instability does not tell us the relationship between fear and instability when the effects of the other variables in the causal model are also taken into account. For this information, we turn to the standardized partial regression coefficients or path coefficients. Moreover, in the context of our causal model the path coefficients estimate the direct causal effect of one of these variables upon another. In this case the path coefficients are considerably smaller than the zero-order correlations. The direct effect of personal crime on fear is only .07 and the direct effect of burglary on fear is also small and negative, -.07 (Tables F.2 and F.3 in Appendix F). The direct effect of personal crime on instability is small and negative (-.08) and the direct effect of fear on instability is also small and negative (-.13). The only direct effect in this set that is at least moderate in size and also in the expected direction is the positive effect of burglary on instability (.16).

Thus the only direct causal effect that is consistent with our expectations is the moderate positive effect of burglary on instability. Otherwise crime, fear, and instability appear to be fairly independent of each other when the effects of the independent and intervening variables in the model are partialled out. This suggests that when the other attributes of housing developments and the attitudes and actions of residents (as measured by the intervening variables) are held constant, a high rate of crime does not result in a high level of fear or in a high level of instability nor does a high level of fear result in a high level of instability.

How does one interpret the apparent contradiction between the zero-order correlations and the path coefficients? The significant zero-order correlations tell us that crime and fear or crime and instability are related to each other; the insignificant path coefficients for the direct effects tell us that they are not causally related. That is to say, residents' fear of crime is related to burglary and, to a greater extent, to personal crime because both fear and crime are caused by a common system and not because crime itself causes fear. Similarly, community instability is related to burglary and to fear of crime because burglary, fear, and instability are all caused by a common system of characteristics of housing developments and actions and attitudes on the part of residents.

We can conclude on the basis of the evidence from this study that crime, fear of crime, and community instability in federally-assisted housing developments are symptoms of the same underlying process of community decline. Moreover, any attempts to reduce crime by changing the characteristics of such housing developments are also likely to reduce fear and instability since whatever is done to reduce crime will also lead to reductions in fear and in instability.

Comparison Between This Study and DEFENSIBLE SPACE

The present study and the study conducted in New York City that formed the basis of DEFENSIBLE SPACE (Newman, 1972) are very different in terms of objectives, research design, sites, and measures. At the same time, however, the two studies are closely linked in terms of theory since the rationale and the theoretical framework for the present study were largely drawn from the earlier work. In particular, the two studies share a set of underlying hypotheses about how the physical design of multifamily housing affects crime. Therefore it seems reasonable to compare the two sets of results as long as the differences in method between the two studies are also kept in mind. After a summary of the most important differences in method, comparable sets of results from the two studies ~~will be~~ compared and possible explanations for the differences in results given.

The original defensible space study was conducted in only one city and all the sites were low-income public housing projects under the management of a single housing authority. The present study was conducted in three different cities and the sites consist of both low-income public housing projects and federally-assisted, moderate-income developments. The public housing projects in this study are all managed by a single housing authority, but the moderate-income developments are managed by many different management companies or by managers selected by the sponsoring board of the development. The source of crime data in the earlier study was New York City Housing Authority Police records whereas the source of crime data in the present study is a victimization survey conducted with residents at each study site. The distributions of the size of buildings and the size of sites are dramatically different in the two studies. These differences are described in detail in subsequent sections of this chapter.

The most important hypothesis that the two studies share is that building size and crime rate are expected to be positively related. The theory underlying both studies hypothesizes that, regardless of the variables used to measure the constructs, the larger the building, the higher the crime rate. In the earlier work building size was measured by building height, and in this study building size is measured by an index of the number of units per entry and building type. The two measures are comparable in that each is an indicator of building size.

In the earlier work crime rate was measured by various types of crime, each figured as a rate per 1,000 residents. In this study crime is measured by two types of crime per 1,000 residents. The two measures of crime that are most alike in the two studies are: the overall robbery rate in the earlier work and the rate of personal crime in the present study, which includes both robbery and assault. Therefore it is the findings related to these two measures of crime that are compared below.

For the 53 cases in the original defensible space study on which correlations were based, the correlation between building height and robbery rate was .36 ($p<.01$).[2] In the present study the correlation between building size and personal crime rate is -.05. These two zero-order correlations are significantly different from each other ($p<.05$).

The standardized partial regression coefficients from the two studies can also be compared.[3] In the earlier study the effect of building height on robbery when all other variables were held constant was .47 (beta weight on last step of step-wise multiple regression). In the present study the total effect of building size on personal crime rate that is transmitted through intervening variables and directly is .11. Giving the present study the benefit of the doubt by using

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[2] The correlation and regression results for total robbery rate (occurring in all locations) do not appear in DEFENSIBLE SPACE. The source of the results concerning robbery rate is the Final Report from the Project for Security Design in Urban Residential Areas to the National Institute for Law Enforcement and Criminal Justice (Newman, 1973). The regression and correlation results that do appear in the appendix of DEFENSIBLE SPACE are based on the same set of 53 sites that were used in the analysis of robbery rate.

[3] This, however, should be done with caution since both the sign and the magnitude of such coefficients are determined by the other variables included in the analysis. Thus, partial regression weights from the two studies may differ because different explanatory variables were used. Also, differences in regression weights may be caused by differences in variance between the two studies (Hanushek and Jackson, 1977).

both types of coefficients as the means of comparison, the earlier findings indicated that building size had a positive effect on robbery rate whereas the present findings suggest that it does not have any effect on the rate of robbery and assault or, at best, a very small one.

In order to determine whether the effect of building size in the earlier research is significantly larger than the effect of building size in the present study, we tested the difference between the two partial correlations. In the earlier study, the correlation between building height and robbery rate, when the effects of all other independent variables were partialled out, was .27. In the present study, the correlation between building size and personal crime rate, when the effects of all other independent variables are partialled out, is .07.[4] Thus, the effect of building size in the earlier study is much larger than the effect of building size in the present study. However, the difference between these two partial correlations is not statistically significant.

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[4]The independent variables that were partialled out in the earlier study were: the percent of residents receiving welfare, the total number of apartment units in the site, the percent of female-headed households, the percent of residents over 60 years old, mean family size, per capita income, visibility of the lobby, visibility of the elevator from outside the primary entry door, felony rate of the precinct, percent of windows facing the street, rating of height of project compared to height of buildings in surrounding area, rating of number of other projects in vicinity. The independent variables partialled out in the present study are: accessibility of buildings and apartments to intrusion, index of mean income and percent AFDC families, ratio of teenagers to adults, cooperative ownership, guard service, and police service.

This lack of significance is primarily due to the low power we have to detect a significant difference.[5] The combination of the large difference between the two partial correlations (.20) and the low power we have for detecting a significant difference presents a somewhat ambiguous picture. On balance, we consider the results of the two studies to be, in effect, different. We therefore conclude that building size had a stronger impact on crime in the earlier study than it has in the present research.

There are many possible explanations for this difference in results. The studies were conducted in different cities; the predominant type of housing (public or moderate-income) differed; and the source of the crime data was not the same. There are, however, two additional differences between the two studies that are more plausible explanations for the contrast in results and that suggest possible refinements to defensible space theory. The first explanation concerns the distributions of building size in the two studies and the second explanation concerns the distributions of project size.

Size of Buildings

The distributions of building size are very different in the two studies and each distribution has its own particular

[5]Low power results from the relatively large number of variables and the relatively small number of sites in both studies. Given the power we have, in order to be statistically significant at the .05 level, the difference between the two partial correlations would have to be at least .41.

shortcomings (see Figure 9.1). Of the 53 cases used in the regression analysis for the original defensible space study, only two were row house sites, only one was a walk-up site, and the remaining 50 were high-rise buildings ranging from 6 stories in height to 21. In the present study 18 of the total of 63 sites are row houses, 34 are walk-up sites, and only 11 are high-rise sites, ranging in height from 5 stories to 28. Thus, in the earlier work the overwhelming majority of the sites (50 sites or 94%) were high-rises of different heights whereas in the present study row houses and walk-ups form a very large portion of the total number of sites (52 sites or 83%).

The precision of the estimated mean crime rate for sites with a particular building size is a function of the number of sites with buildings of that size: the greater the number of sites, the more precise the estimate is. Thus the estimated crime rates in the earlier study were most reliable for the high-rise sites and the least reliable for the row house and walk-up sites. The exact opposite is true of the present study: the estimates for the high-rise sites are the least reliable and the estimates for the row house and walk-up sites are the most reliable.

The most accurate comparison in the first study was among high-rises of various heights whereas the most accurate comparison in the present study is between row houses and walk-ups. This suggests then that the focus of the earlier

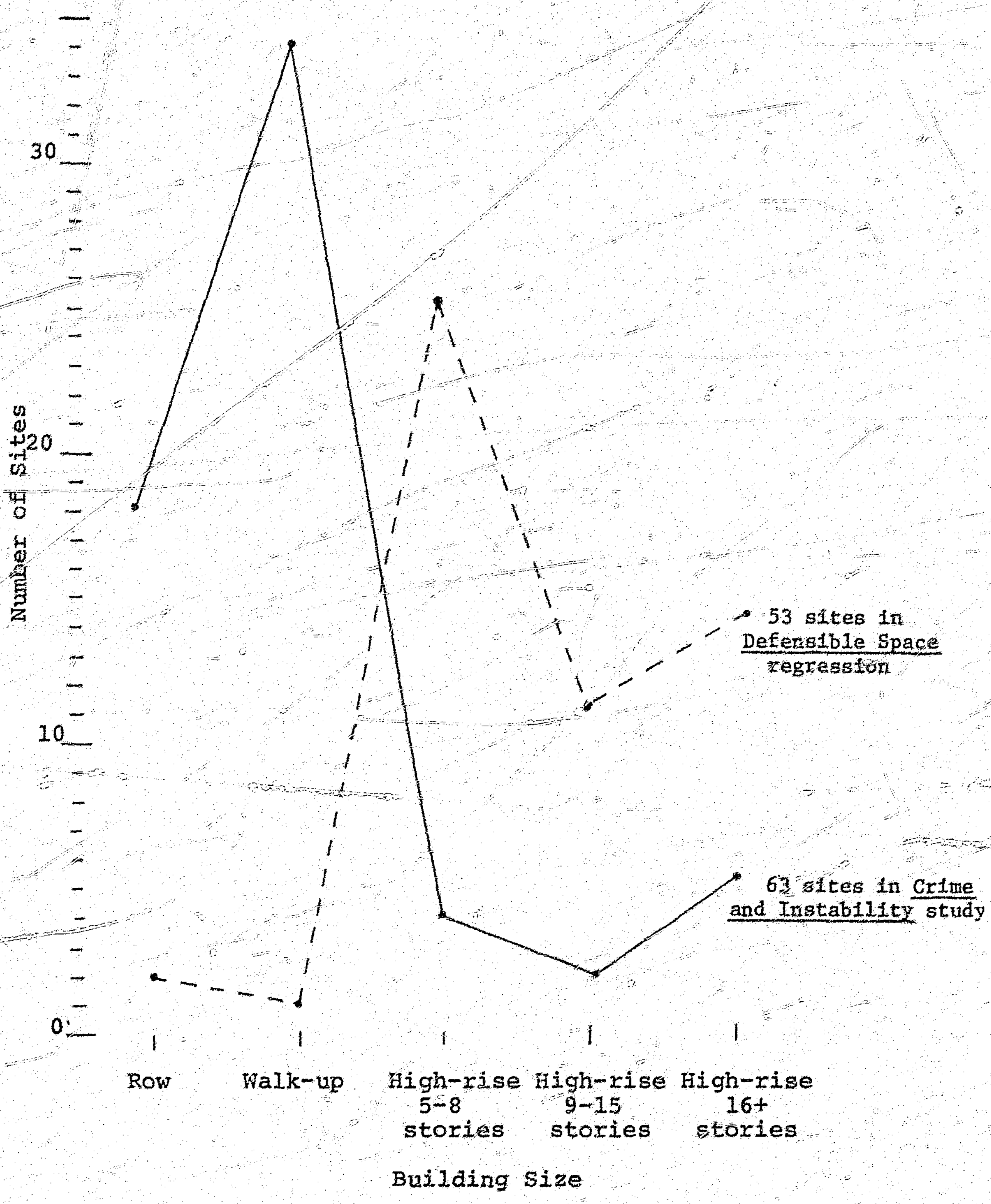

Figure 9.1
Distribution of Sites Across Five Categories of Building Size: Defensible Space and Study of Crime and Instability

study was on the differences among high-rises of different heights whereas the focus of the present study is primarily on the difference between row houses and walk-ups.

Figures 9.2 and 9.3 present the mean crime rates for five categories of building size for each study.[6] As shown in Figure 9.2, the mean robbery rate for the row house sites in the original defensible study was actually higher than the mean rate for high-rises less than 16 stories in height. The mean rate for the row houses, however, was based on only two sites. On the other hand, the steady increase in robbery rate from high-rises that are between 5 and 8 stories in height to those that are between 9 and 15 to those that are 16 and higher is based on sample sizes of 25, 11, and 14 respectively. The effect of building height on robbery rate thus appears to be primarily due to the differences between high-rises of different heights.

As shown in Figure 9.3, the mean personal crime rates for high-rises of different heights in the present study form a very erratic pattern. The high-rise sites that are between

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[6]Figures 9.2 and 9.3 indicate that the mean personal crime rate in the present study is considerably higher than the mean robbery rate in the earlier work. This discrepancy is due to differences in the measures of crime rate. First, in the present study personal crime rate includes robbery and assault whereas robbery rate in the earlier research consisted of robbery only. Second, the source of crime data in the present study is a victimization survey whereas the source of crime data in the earlier research was police reports and not all crimes are reported to the police. Even with these differences we would expect the relative magnitude of mean rates to remain the same.

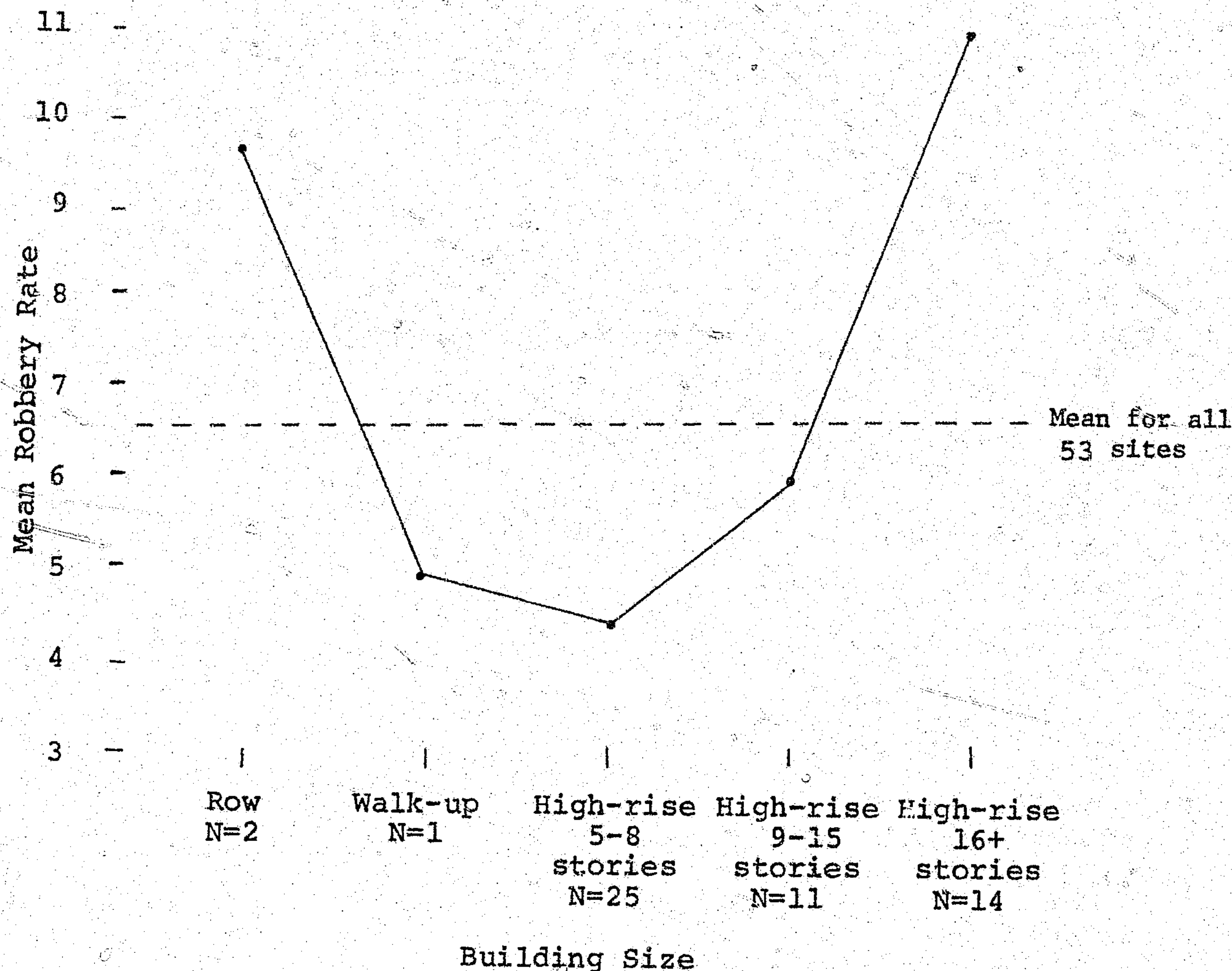


Figure 9.2

Mean Robbery Rate for Five Categories of Building Size:
Defensible Space

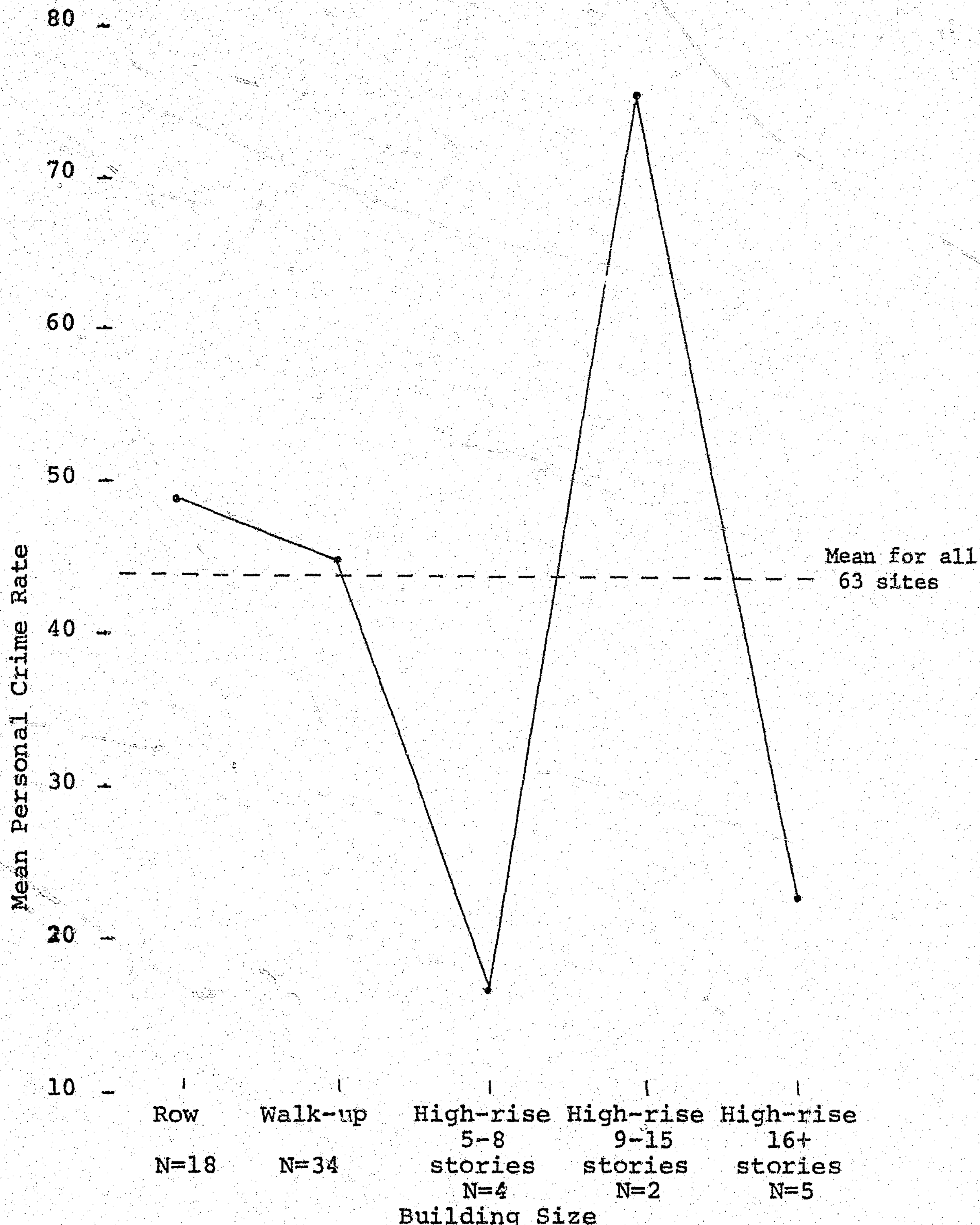


Figure 9.3

Mean Personal Crime Rate for Five Categories of Building Size: Study of Crime and Instability

5 and 8 stories high have the lowest mean crime rate of any group. Buildings 9 to 15 stories high have the highest mean rate for any group and then the rate decreases steeply for high-rises larger than 16 stories. These means are, however, based on sample sizes of 4, 2, and 5. The sample sizes for row houses and walk-ups are relatively large and the difference in mean personal crime rate between these two groups is very small.

These sample sizes put the findings from the two studies in a new light. The building size effect on robbery rate that was demonstrated in the original defensible space study may have been primarily due to differences among high-rises of different heights -- ranging from 5 stories to 16 stories and higher. The absence of any building size effect on personal crime rate in the present study may be due to the lack of any difference in crime rate between walk-ups and row houses. Only future research can demonstrate the plausibility of this explanation by clarifying, in more detail and with larger samples, at which points in the continuum of building size robbery rate begins to increase.

Size of Sites

The second possible explanation for the contrast in results from the two studies lies in the difference between the distributions of the size of sites. (Size of building refers largely to the type of building -- row house, walk-up, and high-rises of different heights -- whereas size of site refers to the total number of dwelling units in all the buildings making up the site.) In the earlier study only 3 of the sites (6%) were smaller than 300 units in size and 23 sites (43%) were larger than 1,000 units. In the present study 55 sites (87%) are smaller than 300 units, only one site is larger than 600 units, and no site is larger than 1,000 units. Table 9.1 lists the range, mean, and standard deviation for the size of sites in the two studies. On the average, the sites in the earlier study were almost six times larger than the sites in the present study.

Table 9.1

Total Number of Units in Sites

	Defensible Space Study	Present Study
Range	120-3,168	32-772
Mean	962.83	168.75
Standard deviation	584.51	140.40
Number of sites	53	63

It may be that the effect of building size on robbery rate that was found in the original defensible space study was due to the relatively large size of all the 53 sites that were analyzed whereas the absence of such an effect in the present study may be due to the relatively small size of the sites studied. This explanation, admittedly speculative, suggests that there is an interaction effect between building size and size of site on personal crime such that building size has an effect on crime only in large sites. The possibility that there is such an interaction effect is indicated by results from the original defensible space study. Table 9.2 below is taken from DEFENSIBLE SPACE. The measure of crime is total crime rate rather than robbery rate, but the results are nonetheless suggestive.

Table 9.2

Project Size and Building Height versus Crime[1]

	BUILDING HEIGHT	
	Equal to or Less Than 6 Stories	*Greater Than 6 Stories*
Equal to or Less Than 1,000 units	N = 8 M = 47 SD = 25	N = 47 M = 51 SD = 23
Greater Than 1,000 Units	N = 11 M = 45 SD = 26	N = 34 M = 67 SD = 24

[1]This table is reproduced from DEFENSIBLE SPACE (P. 28)

The means listed in the table indicate that crime rate was higher in sites composed of buildings higher than 6 stories than in sites composed of buildings 6 stories and lower, regardless of the size of the site. (In the text below the table these differences are reported to be significant.) However, the difference in crime rate between the two categories of building height was considerably greater in sites that are larger than 1,000 units (means of 45 and 67) than in sites that are 1,000 units or smaller (means of 47 and 51). Thus building size, as measured by these two categories of height, had a greater effect on crime rate in large sites than in smaller ones.

Overview

Together, the two possible explanations for the differences in results suggest a more qualified set of conclusions from both studies. The earlier work indicated that building size had a positive effect on crime rate. However, since the study sites consisted primarily of high-rise sites that were over 300 units in size, the effect of building size that was demonstrated may be peculiar to high-rise buildings, to sites larger than 300 units, or to high-rise buildings that also form sites larger than 300 units. The present study suggests that building size has no effect on crime rate but since the study sites consist primarily of row house and walk-up sites that are smaller than 300 units, the lack of a building size effect may be due to the absence of any difference in crime rate between row houses and walk-ups, to the absence of any building size effect in sites smaller than 300 units, or to the absence of any building size effect in row house and walk-up sites that are also less than 300 units in size. Of course all of these possibilities are in the realm of speculation. They are nonetheless plausible and indicate directions for future research regarding the main effects and the interaction effects of building size and size of site on crime rate.

Although in the present study building size does not have a large or significant <u>total</u> effect on personal crime rate, it does show a number of important <u>indirect</u> effects on personal crime rate. Building size has the predicted positive indirect effects on personal crime rate through residents' use of space and through residents' control of space. The role of these two intervening variables in the present study in accounting for the admittedly small relationship between building size and personal crime rate suggests that these same two variables, use and control of space, may also have accounted for the strong relationship between building height and robbery rate in the earlier study.

The present study extends the earlier findings in several other ways as well. Building size shows significant negative effects on rent collection, use of space, social interaction, and control of space, and significant positive effects on fear of crime and community instability. In other words, as building size increases, rent collection, use of space, social interaction, and control of space all decrease; and both fear of crime and community instability increase. Thus, regardless of the social characteristics of the residents or the nature of police or security guard service, building size affects the nature of life in federally-assisted housing developments in a variety of ways, and the character of this impact is consistent throughout: the larger the building, the more problematic life is.

Directions for Future Research

This study has produced a number of important findings on how physical design affects crime, fear of crime, and instability. At the same time, the absence of certain expected effects and the presence of some unexpected ones suggest a number of directions that future research might take to address some important, unanswered questions.

In selecting the cities and the sites for this research, we tried to give careful consideration to the range and distribution of, and the correlation between, the study's two major independent variables (building size and low-income/AFDC). As it turned out, however, this effort was not sufficient to ensure a good range and distribution of the physical design variables. In the end, by arbitrarily limiting the study to three cities, the total number of study sites proved too small; the distribution of building size favored row houses and walk-ups over high-rises; and there was only one site that had, what we would categorize as, high quality defensible space characteristics. The distribution of two other varibles was also poor: very few cooperatives were included and very few sites used guards effectively to control access to buildings and grounds. In all probability the sites we studied are a good representation of the distribution of these key variables throughout the United States, and in this respect the study is useful. However, the characteristics of our sample did not allow us to demonstrate the full capability of physical design for affecting crime, fear, and instability. Nor did it allow us to compare properly the effects of physical design with the effects of other variables, such as cooperative ownership or guard service.

Some of these weaknesses in the sample might have been avoided if we had pursued our original intention of studying developments in eight cities instead of only three. Certainly the sample of sites would have been larger. In future research far more attention (time, money, and effort) should be given to developing the study design than is typically given in research of this type, particularly with respect to determining the appropriate unit of analysis, the sample size of <u>those</u> units, and the ranges and distributions of variables that are properties of those units. The advantages and disadvantages of various study designs should be carefully spelled out and the selection made not only on the basis of the relative costs of conducting the field work (as was done in this study) but on the relative costs <u>and</u> the relative benefits of the various research designs. Granted some trade-offs have to be made, but these trade-offs should be fully understood by the research team and the funding agency before the final selection of a study design is made.

Given the importance of more balanced study design than this study possessed and the strong findings generated by this study concerning the importance of certain characteristics of urban housing developments, it is now possible to locate a range of housing developments throughout the country that possess various combinations of the characteristics studied in this research in order to conduct a study with a larger sample and with more optimal ranges, distributions, and combinations of variables. This would allow one to compare more fully the effects of various characteristics, to examine the interaction effects between certain characteristics and, in the end, to attain a better measure of whether a heavy investment in defensible space design or in tenant selection is cost-effective and desirable. For example, it would be very worthwhile to examine the possible interaction effects of social characteristics of residents and building size on crime and fear of crime. It is very likely that the percent of AFDC families and the ratio of teenagers to adults have stronger effects on crime and fear of crime in large buildings than in small ones. Similarly, if the study included large developments as well as small ones, one could investigate the interaction effect of building size and project size that was discussed earlier in this chapter. Given the size of the sample and the characteristics of the sites in this study, the examination of such interaction effects was not feasible. With a larger number of sites (at least 200) and sufficient funds for analysis, one might also develop and test a nonrecursive causal model and thereby assess, for example, which is the stronger effect -- from police service to crime rate or vice versa.

Finally, pursuit of further "defensible space" investigations should consider the adoption of an entirely different research approach: one which involves the modification of existing housing environments and the construction of entirely new environments. This will entail the building of a number of housing environments that fully meet defensible space design criteria, housing within them various mixes of residents, and studying these environments closely over time. In fact, building environments with truly excellent defensible space characteristics and then studying these environments may be the only way to assess the full impact these characteristics can have since there are so few housing developments that currently possess the full complement of defensible space design features. Considerable funds are now being made available for the construction of traditional public housing and for Section 8 housing. Instead of building without guidelines or evaluation, this housing could be built in accord with defensible space principles and systematically evaluated and tested against other housing.

The systematic social and physical modification of existing housing developments could also provide a rich testing ground for defensible space theories. There are, of course, limits to the extent to which existing environments can be modified. It will never be possible to construct an ideal defensible space environment through modification. Nevertheless, a lot can be done and its utility in improving existing conditions tested.

Other types of experiments could also be made: introducing guard service into various types of environments or converting developments to cooperative ownership. Experiments of this type would provide opportunities to conduct rigorous cost-benefit analyses of the various manipulations that were made.

With either the more balanced research design or the experimental approach, studies would benefit greatly from being longitudinal. By tracking police service, social interaction, and crime rate over time one might be able to explain some of the anomalous findings of the present study. Moreover, one might be able to document how a high level of control over space outside the home works to prevent small crime problems from escalating into large and insurmountable ones. And monitoring possible changes in tenant composition in different sites would allow one to analyse whether and how such changes lead to increases or reductions in crime and fear of crime and how these effects may be stronger in large buildings than in small ones. Balanced study designs with good ranges and distributions of variables, experiments that are carefully evaluated, and longitudinal research are all important directions for future research. In fact, it is essential that future studies employ one or more of these approaches if research concerning crime and the design of the physical environment is to make any substantial progress in the future.

CHAPTER 10: POLICY IMPLICATIONS

This research project set about to determine which factors are the strongest determinants of crime, fear, and instability in federally-assisted housing developments. The study's causal model explains 30% of the variation in burglary, 45% of the variation in personal crime, 69% of the variation in fear, and 65% of the variation in instability. But, in fact, most of the variation in each of these problems is explained by the set of causal factors consisting of the seven independent variables: building size, accessibility, low-income/AFDC, teen-adult ratio, cooperative ownership, police service, and guard service. These factors explain 27% of the variation in burglary, 26% of the variation in personal crime, 63% of the variation in fear, and 53% of the variation in instability. Of these seven factors it is building size, accessibility, low-income/AFDC, and teen-adult ratio that have the strongest and most consistent effects on crime, fear, and instability. The results show that it is these two physical design features and these two social characteristics that are the major determinants of crime, fear, and instability in federally-assisted housing developments. The policy implications of this research therefore hinge on our ability to manipulate these four factors.

Where the research findings have served to inform us about the dominant causes of crime, fear, and instability in federally-assisted housing, an exploration of their policy implications must serve to tell us what can be done about these causes. It is useful to learn what lies at the root of a problem that has plagued assisted housing developments and their surrounding communities for decades, but the new-found knowledge is of questionable utility when we realize that the factors identified as playing the most critical causal role are endemic to the program. Federally-assisted housing programs were, after all, created to serve low-income families, large families, welfare and one-parent families. The cost limitations placed on this program also mean that this housing will be built at comparatively high densities -- using large buildings -- and that there will never be funds enough for extras like fencing.

A discussion of the policy implications of research findings, if they are to serve the policy maker, must address the political realities of the function of government-assisted programs and the social and economic feasibility of implementing changes. The discussion of policy implications which follows is therefore a pursuit of alternative forms of implementable compromise. The discussion of policy implications is organized as follows: it begins with an initial examination of the overall program that may be best employed to address the effects of the four key characteristics of housing developments and it concludes with a detailed discussion of the changes that can be implemented to reduce the impact of each of these characteristics separately.

Looking at the four key characteristics of housing developments (low-income/AFDC, teen-adult ratio, building size, and accessibility) we find that three lend themselves to manipulation and change: the two social characteristics and accessibility. Building size cannot be altered easily. The only hope for large buildings is that a drastic change be made to the social composition of the population living in them. This will be discussed in detail later under building size. However, the fact that it is physically easier to alter the social composition of a housing development than it is to alter the physical design does not mean that it will be politically or socially more acceptable to do so. In fact, the opposite is true. There is a paradox here. Physical alterations are politically most acceptable but are mechanically more costly -- if not outright impossible -- to implement. Social changes are less costly to undertake but are often politically unacceptable.

Everyone may accept the fact that a high concentration of teenagers or low-income/AFDC families in a subsidized development is causing crime, fear, high turnover and vacancy rates. And, given the large attrition resulting from a high turnover and vacancy rate, it may even be comparatively easy to change the composition of the development to smaller families, two-parent families, and to working-class rather than welfare families. But the constituents of assisted housing who will be excluded in this manner, and the people who represent them, may find this politically unacceptable. (Some more or less acceptable ways to change the socioeconomic composition of a development are explored later.)

Given a set of circumstances in which changes to the socioeconomic composition of the resident population of a municipality's housing developments is unacceptable, and changes to the physical size of its buildings impossible, the only mechanism that remains available for reducing the effects of the social and physical factors primarily responsible for crime, fear, and instability is the provision of additional subsidies to address the secondary effects of these primary factors. One would expect that problems of crime, fear, and instability caused by residents themselves could be reduced through the institution of various social, educational, self-help, or security guard programs. Welfare families often suffer from problems which make them dependent on welfare in the first instance: alcoholism, drug-addiction, lack of job skills, unemployment, inability to budget income and expenditures, marital difficulties, etc. It is possible that social programs directed at assisting families with such difficulties may be beneficial not only to these families but to improving the stability of the development and in reducing crime and fear among neighboring residents. Maybe.

This research project, however, did not set out to test the effectiveness of such programs. It was not its purpose. For those who feel that such programs may be, or have been, successful in reducing crime, fear, and instability, their use is recommended -- but not as a consequence of our research having either confirmed or denied it. All our research findings can add to such a policy preference is that priority fundings for such social programs be allocated on the basis of the concentration of the factors we have identified: low-income/AFDC families; the ratio of teenagers to adults; and the size and accessibility of buildings.

Currently the allocation of government subsidies to public housing developments takes into account some of these factors (subsidies to moderate-income housing are not, however, allocated on such a systematic basis). The Performance Funding System (PFS) used by HUD to provide monthly subsidies to public housing projects employs a formula which considers: the age of the development; the height of buildings; the size of apartments; the fair market rent; and other factors which are regional and national rather than project based (i.e., rate of inflation, utility cost increases, etc.). During the past ten years building height has become an increasingly important factor in the PFS formula, accounting for 30% of current allocations where it previously accounted for only 20%. Apartment size is also a factor in the PFS formula and it does predict, roughly, the number of children likely to be present; large apartments are likely to house more children. But if the ratio of teenagers to adults is what governs, then apartment size alone is a poor surrogate.

The PFS formula is currently undergoing reassessment. Currently it does not now allow for any consideration of the socioeconomic make-up of the resident population. Nor does it in any way consider the accessibility of grounds, buildings, or apartment interiors. The socioeconomic composition of a housing project, as well as its accessibility, are considered elements which can be altered. As such they are not permanent and therefore cannot be considered in the PFS formula. This suggests that housing authorities should feel free to change the social composition of their projects should they find them troublesome. This, as we have seen before, is not always politically feasible. Many municipalities feel that they are committed to using their assisted housing projects to serve the poorest of the poor first. Why then should the municipality not be compensated for such a commitment if research findings bear out what is accepted wisdom: that the higher the percentage of low-income/AFDC families in a development, the higher the fear, crime, and instability?

The means by which additional funds should be allocated to projects with a high percentage of low-income/AFDC families is another problem. Outside of public housing the problem of providing good housing and services to welfare families is proving insolvable. H.E.W. has been putting billions of dollars into the hands of welfare residents and private landlords to provide residents with good housing. But survey after survey shows that the welfare resident is not getting his or her money's worth -- regardless of whether the money goes directly to the landlord or via the resident to the landlord. Programs which provide additional rental monies directly to the landlord do not appear to be able to motivate the landlord into making long-term commitments to improve his housing stock. Similarly, programs that provide additional rental monies to residents do not seem to be getting to the landlord or to be buying improved housing for welfare families.

In public housing the channeling of additional monies from government to ensure better quality housing is more successful: thus the allocation of additional subsidy monies on a continuing basis through the PFS for developments with certain physical and social characteristics would appear to be worthwhile, given the argument that these characteristics were more immutable than the PFS program originally envisioned. If we cannot change their characteristics, then projects with large and accessible buildings and high percentages of AFDC families and high teen-adult ratios should be given larger monthly subsidies. Part of the difficulty of adopting such a course of action is that the management of most housing developments do not have the resources or training to apply these monies to address the problems created by each factor. For example housing management may reason, and probably correctly, that a high ratio of teenagers to adults will generate more vandalism and higher maintenance costs. The additional subsidy monies will thus be spent on physical repairs. But this will not address the source of the problem, nor is it likely to reduce the crime, fear, and instability which result from it.

It is also questionable whether other programs exist which will address the problems produced by these specific factors more efficaciously. Each one of the four identified characteristics contributing to crime, fear, and instability of a development can, however, be altered environmentally: that is to say, the social composition, physical characteristics, or both, can be altered to reduce the impact of each factor. Given some of the difficulties in introducing and adopting other panaceas, we should like now to explore the implementation, and implications, of environmental changes. These changes are discussed in the following sections: accessibility, low-income/AFDC, teen-adult ratio, and building size. The information on which this discussion is based is drawn from this study as well as from other research and the first author's long experience as a consultant to public housing authorities.

Accessibility

Of the four key causal factors we identified as affecting crime and instability, the one which can be altered with least social and economic cost is accessibility. Where one cannot easily modify building size or find and implant a more suitable population, the accessibility of buildings is easily altered. Accessibility has a large and significant influence on burglary: the more accessible buildings and apartments are to intruders, the higher the rate of burglary. And through its effect on burglary, accessibility has a moderate effect on instability. The prevention of burglary and the reduction of instability through the simple mechanism of reducing the accessibility of apartments, buildings, and grounds seems a worthwhile, low-cost investment. Even those buildings which are rated as highly accessible can be rendered almost totally inaccessible at the cost of no more than 5% to 10% of the cost of a new unit. This cost will vary depending on the layout of the existing building and site plan. High-rises and walk-ups, in that order, have an advantage over row houses in that the higher the building, the less costly it will normally be to reduce its accessibility per unit. In addition, because row houses are considered much more desirable by families with children than high-rises, a high burglary rate in row houses is less likely to precipitate a large exodus of the population than a high burglary rate in high-rises. One can conclude, therefore, that an investment in reducing the accessibility of buildings is increasingly beneficial and less costly per unit with increased building size.

Although the reduction of access from the outside of a building or project is less costly in high-rises than in walk-ups or row houses, this caveat should be kept in mind: in large-sized buildings, a large number of families share a common entry and common internal circulation areas and these families themselves may be responsible for some of the burglaries. Therefore, securing the interior circulation area of a high-rise building from outside access is only effective if the criminals live outside the building. It is less costly per unit to reduce the accessibility of large-sized buildings but what is secured from access in the large-sized building is the common interior circulation areas. What is secured from access in row houses is access to the individual apartment unit. In a large-sized building the families living within the building continue to have access to the interior circulation areas and from those to the doors of individual apartments. In walk-up and row house buildings the cost per unit of preventing access is higher but the number of families sharing an internal area, and from it access to other units, is appreciably lower.

In a building shared by a small number of families the chances of finding one resident among the building's occupants who commits burglaries is proportionally lower than in a large-sized building. Also an in-house burglar in a small building shared by a few families stands a much greater chance of being spotted and recognized. The deterrence is therefore higher. An investment in reducing accessibility in row houses and walk-ups is therefore likely to be far more effective than in high-rises.

In high-rise buildings, therefore, cost investments in reducing accessibility are justified only when there is little chance that the resident population within the building will commit burglaries against other, in-house residents. The social characteristic found to affect burglary rate most in this study was the teen-adult ratio of the resident population. Except in high-rise buildings with a high teen-adult ratio, it is highly recommended that housing agencies make funds available to developments to reduce the accessibility of buildings and grounds. Such investment is particularly cost-effective for large-sized buildings in which the ratio of teenagers to adults is not high. An investment in reducing the accessibility of row house and walk-up buildings, although proportionally more costly per unit, is less subject to failure resulting from a high teen-adult ratio among residents.

Low-Income/AFDC

In this study the percent of low-income/AFDC families in residence proves to be the strongest single determinant of personal crime, fear, and project instability. This factor has a total effect on personal crime rate of .29, a total effect on fear of .57, and a total effect on instability of .40. Another way of gauging the effect of the percent of AFDC families-- a way which is probably of more usefulness to project managers -- is to say that an increase of 10 percentage points in the proportion of AFDC families (say from 12% to 22%) will produce 12 more personal crimes and 6 more burglaries per thousand population. This is the effect of a 10% increase in AFDC families alone, when the effects of all the other characteristics of developments that influence personal crime and burglary have been partialled out.

Most housing managers have a sense of these relationships from their own experience. It will come as no surprise to those familiar with assisted housing to learn that many managers, who balance their commitment to housing low- and moderate-income families with an equal commitment to making their developments a sound long-term investment, go to great lengths to exclude AFDC families from their developments. Such an exclusionary policy can obviously be more easily adopted and maintained in moderate-income developments than it can in public housing and, not surprisingly, some of the moderate-income sites in this study have no AFDC families in them whatever.

Despite the fact that some housing managers and non-profit owners of moderate-income housing have been able to exclude

AFDC families from their developments, it is fundamental to the purpose of federally-assisted housing programs to provide housing for low- as well as for moderate-income families, and for welfare, single-parent, and large families as well as working-class, two-parent, and small families. It is a further policy of the federal housing act to encourage the integration of low-income families in moderate- and middle-income developments. Moderate-income housing developments that have a policy of excluding AFDC families are therefore evading some of their basic responsibilities.

The opposite side of this exclusionary policy is the all-inclusive policy adopted by some public housing authorities. Some authorities see public housing as "housing of last resort." For them needy families have first priority for admission to public housing -- just because they are able to exercise the least choice in the housing marketplace. For such housing authorities and those others who have allowed the percent of AFDC families to climb uncontrolled, the consequences have been devastating. Their projects have become occupied by a high percentage of residual, non-mobile, AFDC families -- sometimes in excess of 75%. Their projects suffer high crime rates, high turnover and vacancy rates. Some of these projects are more than 50% vacant. Projects with such high vacancy rates -- where new residents often choose not to reside more than a week -- are obviously not succeeding in their goal of providing housing for the poorest of the poor either.

Between these two extreme and equally unsuitable policies must lie a course of action which will allow federally-assisted housing programs to best serve all the groups intended -- from moderate-income, working-class to low-income/AFDC -- without intentionally excluding any one group. The only way this can be done is to avoid the concentration of one ~~group in~~ any form of assisted housing to the exclusion of the other group. The experience and policies of the New York City Housing Authority -- which is rapidly being accepted as a guiding wisdom by project managers and housing agency executives throughout the country -- is that the percentage of AFDC families should not exceed 15% in moderate-income developments and not exceed 30% in public housing. It is also accepted wisdom among housing managers that the percentage of low-income/AFDC families that can be accommodated in a row house development is higher than the percentage that can be accommodated in walk-ups or high-rises without affecting the level of crime, fear or instability. Unfortunately, the size of the sample and the characteristics of the sites in this study did not allow us to confirm or reject this contention. Further research, as outlined in Chapter 9, is required.

The implication that follows from our findings is that housing managements who are still able to attract higher income, non-AFDC families to their developments should endeavor to do so before the low-income/AFDC families form too large a majority of residents. After that point it will become increasingly difficult to attract two-parent and working-class families to their development.

If a housing project has a very high percentage of low-income/AFDC families (60% or more), it will also have a high vacancy and turnover rate. Although high vacancy and turnover rates will contribute to the insolvency of the development, they will also simplify the problem of finding vacant apartments to lease to higher-income families.

However, attracting the higher-income, two-parent families to projects with a high percentage of AFDC families is not easy. Housing management will have to make a concerted effort to direct their advertising to specific groups that are most likely to produce suitable candidates. The appearance of the project will be very important to these prospective applicants. But most critical to their decision to move in will be management's stated policy of, and commitment to, maintaining an acceptable mix of two-parent, working-class and one-parent, welfare families.

Teen-adult Ratio

The teen-adult ratio in projects affects burglary (a total effect of .16), personal crime (a total effect of .21), and fear (a total effect of .18). The effects of this variable are not nearly as strong as the effects of low-income/AFDC, accessibility, or building type. This finding is surprising but it is most likely due to the fact that sites with a high percent of low-income/AFDC families also have high teen-adult ratios (r=.46) In this study the effects of teen-adult ratio were measured separately from the effects of low-income/ AFDC. The finding that the effects of teen-adult ratio are only moderate in size is therefore in part an artifact of the overlap between these two social characteristics of the population.

Control of the ratio of teenagers to adults in existing housing projects can be achieved two ways: by renting the large units in housing projects to as small a family as is permitted, and by giving preference to large families that have two adult heads of household. A third solution is provided by some housing managers who have taken to subdividing their very large units (four and five bedrooms) into smaller units.

The difficulty with the above policies is that, although they are effective in lowering the ratio of teenagers to adults, they also decrease available subsidized housing for large, one-parent families. A compromise policy is required if we are not to end up with a subsidized housing market which provides no housing whatever for large, one-parent families. The maintenance of some large units for leasing to one-parent families should be required in any conversion program. However, government should also provide housing managers with incentives, in the form of special subsidies, to help management pay for the additional costs of maintaining, policing, and renovating these units -- costs which will result from the presence of these large families.

Building Size

Building size alone, that is separate from the effects of all the other independent variables, has a total effect on fear of .41 and a total effect on instability of .39. These are large and significant effects. The variable building size is made up of two highly correlated physical design characteristics: the number of units sharing a common entry and building type.

A cursory review of these findings may prove to be at variance with our personal experience: each of us knows of one or two moderate-income, high-rise buildings, lived in by friends, which appear to be comparatively stable and free of fear. How then does one reconcile this knowledge with the findings from this study? This difference is perhaps best explained by the fact that all the projects examined in this study were occupied predominantly by families with children. All projects with more than 60% elderly were intentionally excluded from the sample. High-rises occupied primarily by retired elderly families have a history both of high stability and of low fear. To a lesser degree the same can be said of high-rises occupied primarily by working-singles and couples, given that there are sufficient funds available to pay for round-the-clock doormen.

For high-rises occupied primarily by families with children the story is different. The level of fear found in the high-rise buildings in this study was significantly higher than that found in row houses or in walk-ups. The same is true for the level of instability.

The marked differences in instability that are attributable to building size alone are perhaps best explained by parents' dissatisfaction with raising children in large-sized buildings. Residents of the 63 projects in this study were shown illustrations of six different building types and asked to identify their building from among them (see Figure 10.1).

Residents were then asked the following: "Which type of building do you think is the best place to raise kids?" The response, broken down by the percentage of residents preferring each type, appears below:

Elevator buildings	1%
Walk-up (long interior corridor with many families sharing a common entry and circulation system)	1%
Galleria (outside corridor with many families sharing common circulation system)	3%
Walk-up (subdivided, few families sharing an entry)	7%
Garden apartments (piggy-back type row houses)	34%
Row Houses (individual houses in a row)	54%

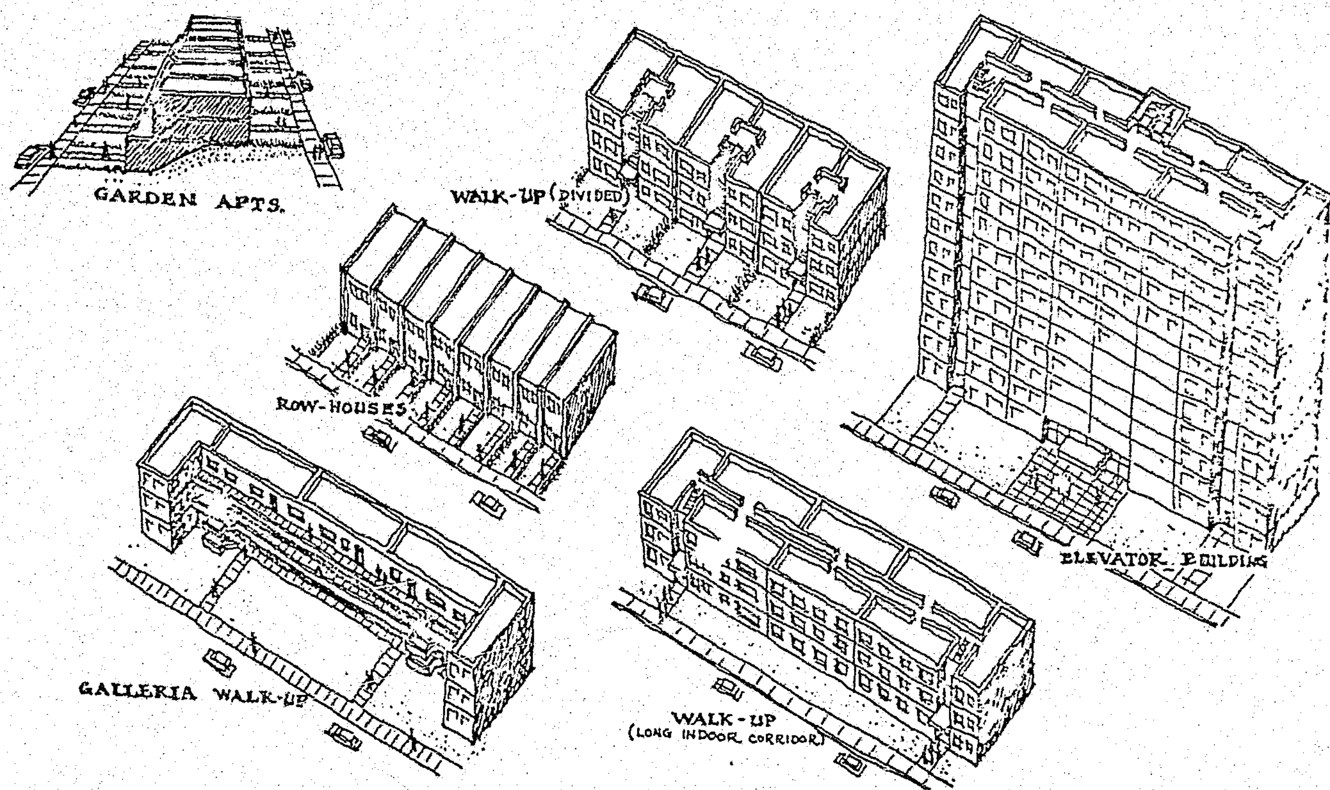


Figure 10.1 - The Six Building Types Typical of All the Developments in the Study

The descending order of desirability, from row houses to elevator buildings, is consistent and unmistakable. Fully 88% of all respondents found the row house and garden apartment (piggy-back row houses) the most desirable housing types in which to raise children. Even the differences between the subdivided walk-up (in which a small number of families share an entry), the galleria walk-up, and the walk-up with the long interior corridor are apparent: preferred by 7% versus 3% versus 1%.

In order to determine how the building the respondents were currently occupying affected their choice, residents were asked: "How good or bad is the type of building you're living in now as a place to raise children?" The response, broken down by the three basic classifications of building types residents were living in, appears below:

	High-rises	Walk-ups	Row houses
Very bad	20%	9%	4%
Bad	29%	21%	14%
In between	45%	33%	29%
Good	5%	30%	38%
Very good	1%	7%	16%

What is remarkable is that even for residents living in high-rises 49% found it either "bad" or "very bad" while only 6% found it "good" or "very good." Preference studies normally show that people tend to favor the type of environments they are surrently living in as justification for an earlier made decision: high-rise residents' evaluations of the inadequacies of their own environment for raising children therefore constitute an important rejection of a living environment they chose to live in with some expectation that it would prove suitable.

Implementing Policy on Building Size

The implementation of change in building size is complicated by many factors. If a housing developer or agency is starting a new project from scratch, he obviously has many more options open to him than a developer or agency who is managing completed and occupied units. For the developers of a low and moderate-income family project starting from scratch, the construction of a row house project is recommended over a walk-up, and a walk-up is recommended over a high-rise, if the developer desires to keep fear and instability to a minimum in his development. In studies undertaken of the comparative cost of different building types (independent of land costs) it was found that walk-ups, which can be built at densities up to 50 units per acre, cost less to build than either high-rises or row houses. They are also the least costly to maintain.[1] A developer, therefore, should not select or pay more for a piece of property than a density of more than 50 units per acre would justify. Fifty units per acre is the effective maximum density at which three-story walk-ups can be built.

However, the developer who has already purchased an expensive site is forced to consider how the cost of the land may be divided up between units. The land he purchased may have been so costly that he can now only afford to build on it at a density of over 50 units to the acre. In that case he has no option but to construct a high-rise building. However, if his site is an acre or larger in size he should consider a compromise: that is, the construction of a high-rise for exclusive occupancy by elderly at a very high density (150-250 units/acre) so that the remaining portion of the site can be built as walk-ups, or even row houses, for families with children at 50 units or less per acre. On smaller sites the high-rise for the elderly might well be built on top of three story walk-ups for families with children.[2] Experience has shown that high-rises constructed for occupancy exclusively by the elderly are safe and desirable buildings even at very high densities.

We come now to the central policy question: what can a housing agency do that has high-rise buildings currently occupied by families with children? There is no simple, inexpensive, and effective solution to this problem. If the building has a high vacancy rate, the possibility of moving the remaining families out and into new, or existing, walk-ups and row houses may be explored. But the conversion of an existing high-rise designed for families with children to one designed for elderly is very costly. The large units (three to five bedrooms) are expensive to convert to small, one-bedroom units (60% to 85% of the cost of a new unit).

There are two other options available: securing the building by reducing its accessibility to outsiders (see accessibility recommendations in Appendix G); and changing the type of families with children who occupy the building. Both of the above should be adopted simultaneously for maximum effect. A high-rise building occupied by families with children which is experiencing high fear and instability may also be found to have a high percentage of low-income and AFDC families and a high ratio of teenagers to adults. The percentage of low-income/AFDC families and the ratio of teenagers to adults both affect fear significantly. Low-income/AFDC also affects the personal crime rate and the level of instability, and teen-adult ratio also affects the burglary and personal crime rates.

The overall fear and instability of a high-rise occupied by large, low-income families with children can therefore be reduced by changing the occupancy to a higher percentage of smaller, higher-income, two-parent families. This may take a major policy change and commitment by the housing agency to achieve: if the high-rise building already has a reputation for fear and instability, it will be difficult to attract higher-income families with fewer children to it because they have more options available to them in the housing market. To accomplish such a change will necessitate a long-term commitment on the part of management to seek out a new tenant body. This will mean a period during which management will have to bear the burden of a large number of vacant units. Once the project is properly leased up, however, the rate of instability should decrease and the losses incurred during the changeover can be expected to be made up over time. In order to attract new tenants, management will have to publicize its new leasing policies, and it will need the backing and commitment of the government agency providing it with subsidies in order to achieve the changeover: management will need a period of grace on mortgage payments while some of the units go vacant during the search for new tenants. Management will also need understanding and support from the subsidizing agency in turning away some large, low-income, and AFDC families while trying to achieve a more stable mix of residents.

Earlier in this section it was mentioned that an investment in reducing accessibility of high-rise buildings was more cost-efficient than a similar investment in row houses and walk-ups. However, there was the cautionary note that this assumed that crimes were being committed by individuals who lived outside the development. However, the study's findings show that crime, fear, and instability are affected by the characteristics of the residents within the development: the percentage of low-income and AFDC families and the ratio of teenagers to adults. A substantial investment in reducing the accessibility of a high-rise building, therefore, should, for maximum effectiveness, be undertaken in tandem with a program to reduce the percentage of low-income and AFDC families and the ratio of teenagers to adults. In this way high-rises can remain occupied by families with children. They will, however, be of predominantly moderate rather than low-income; and they will be primarily two-parent rather than one-parent families.

It should be pointed out here, as a further caution, that the New York City Housing Authority's investment in reducing accessibility through the installation of intercoms in its high-rises has been without success except in buildings occupied predominantly by the elderly or by two-parent families with few children. Children have a history of disabling the intercoms and the automatic door closing and opening hardware. If they cannot have their way with the main entry doors they will dismantle the emergency exit doors so as to gain undisrupted access to the interior of the building. The number of units sharing an entry and the teen-adult ratio are the two factors which most influence the failure of intercom installations in subsidized low-income housing.

In discussing the mechanisms and procedures required to implement a program for stabilizing high-rise developments, it was suggested that this would require a policy change along with a concerted and long-term commitment by both the manager/owner of the development and the government agency providing the subsidy. To date, there are few instances of this happening. The far more common solution adopted for the family-occupied high-rises suffering crime, fear, and instability is to provide them with additional rental subsidies to allow management to fill up the vacant units with a higher percentage of low-income residents. In management's and government's anxiety to keep the development from defaulting, a short-sighted, short-term solution is adopted which, our findings suggest, can only have negative long-term consequences. It is true that in the short-term, the increased subsidies will fill the vacant units and provide the mechanism by which government can assist a housing management firm in meeting its monthly mortgage payments. But such a policy will also increase the percentage of low-income and AFDC families and, most likely, the ratio of teenagers to adults. Such a change in the social characteristics will, with time, only increase the crime, fear, and instability in the development and nullify the effects of an investment in reducing the accessibility of buildings (assuming that such a program for physical modifications was also introduced when the development received an additional subsidy).

Development managers and the local area offices of HUD are not the only ones who must bear the blame for adopting such short-sighted policies; they are, after all, encouraged to do so by HUD Central. It is from the Central Offices of

HUD that directives are issued to the region and local area offices to reduce vacancy rates, turnover rates, and defaults in government assisted housing -- quickly and by whatever means available. This inevitably leads to the adoption of short-term strategies which only provide temporary, patch-up relief. These policies are adopted and implemented even though the problems of crime and fear will only worsen with time -- producing higher instability and requiring still more subsidies. The managers of limited dividend developments will, at this juncture, begin to take profits out of their buildings as quickly as they can -- even though they might actually be receiving more subsidies and higher overall rents. The project, following the national trend, will then go into default and, if a private owner cannot be found for it, be sold to the local public housing authority, if they will accept it (which they are normally willing to do for still more subsidies). The useful life of such projects then becomes very short; the cost to government is far in excess of what was ever anticipated. The total cost in government subsidies for such developments over a twenty to thirty year period (the length of the mortgage, assuming the project can survive that long) can be well over twice what legislators thought they were committing themselves to.

Footnotes for Chapter 10

[1]The National Commission on Urban Problems prepared an exhaustive comparison of the cost of different housing types across the nation built under various government assistance programs.[a] Two of their concluding tables are presented here (Tables A.1 and A.2).

Table A.1: Development Cost by Type of Building[b]

FHA 207 – 231 Multi-Unit Programs	Development Cost Per Unit		
	High	Median	Low
1966 HUD study, 196 projects	$36,001	$16,524	$ 7,702
1962-66 medians, 87 projects	41,269	15,110	8,102
Elevator	41,269	20,826	12,464
Walk-up	20,954	13,388	8,102
Row	19,767	13,227	8,111

Table A.2: Construction Cost per Square Foot by Type of Building[c]

FHA 207 – 231 Multi-Unit Programs	Dollars/Sq. Ft.		
	High	Median	Low
1966 HUD study, 196 projects	$20.88	$12.49	$ 7.74
1962-66 medians, 87 projects	$21.66	$10.16	$ 6.70
Elevator	$21.66	$14.35	$10.16
Walk-up	$12.90	$ 9.61	$ 6.70
Row	$13.63	$ 9.66	$ 8.25

Both tables show, first, that the range in costs within any building type, including elevator buildings, walk-ups, and row houses, is sufficiently large as to make a low-priced elevator building less expensive than a high-priced row house or walk-up. Nevertheless, Table A.1 shows that in a comparison of over-all development costs per unit, row houses cost slightly less than walk-ups, and walk-ups, in turn, cost significantly less than elevator buildings. Table A.2, comparing construction costs per square foot, shows that walk-up units are less costly than row house units, and row house units less costly than elevator buildings.

The Housing Development Administration of the City of New York recently undertook a comparative study of both the development and maintenance costs of different housing types.[d] Their study, based on 1973 construction experience, does not appear to be either so comprehensive or so rigorous as the study by the National Commission on Urban Problems. Their conclusions are quoted here for information purposes only.

The HDA study compared three-story, three-family homes with Mitchell-Lama (state subsidized) high-rise buildings, and determined that the three-story buildings, selling at approximately $100,000, were "among the best housing buys available." Development costs for the walk-ups and the high-rises were calculated on the basis of land costs at 20% to 25% of the total development costs. Furthermore,

1. Development costs for a conventionally built three-family home are approximately $6,900 per room as compared with current estimates of $11,900 per room in a high-rise Mitchell-Lama building.
2. Maintenance and operation costs of three-family homes are approximately $135 per room per year, compared with high-rise Mitchell-Lama, which costs substantially in excess of $200 per room per year. The saving to three-family homes is the result of several factors, among them:
   - the willingness and ability of homeowners to make small repairs;
   - the absence of common spaces that require maintenance;
   - the absence of elevators and other complex systems;
   - the small-scale nature of the housing, which encourages individual concern for proper maintenance.

Both of the above studies appear to share similar conclusions: that the three-story, multifamily walk-ups are the least costly means of providing medium-density housing.

Walk-ups are less expensive to build and to maintain than both row houses and high-rises. Costwise, the three-story walk-up manages to achieve an excellent compromise between the two-story row house and the high-rise apartment, in that it does not require the elevators or elaborate fireproofing of the high-rise, nor the extensive foundations, roofing, and exterior walls of the row house.

Sources

a. Elsie Eaves, How the Many Costs of Housing Fit Together. Research Report No. 16, prepared for the consideration of the National Commission on Urban Problems. Washington, D.C.: U. S. Government Printing Office, 1969.
b. Ibid., Table 30, p. 56
c. Ibid., Table 42, p. 64.
d. Mayor's Policy Committee, Housing Development and Rehabilitation in New York City. November 1974.

[2]The Congressional Budget Office, in its March 1979 paper entitled "The Long-Term Costs of Lower-Income Housing Assistance Programs," claimed that long term costs of Section 8 and public housing assistance are likely to exceed the budget authority reserved by as much as three times. The paper suggests that rent ceilings be raised in moderate income housing (Section 8) and that heavily subsidized residents in public housing and in leased apartments in moderate and middle income developments be asked to pay a greater portion of their rents. The paper also suggests increasing the proportion of higher income tenants in moderate income and public housing developments.

[3]Housing Affairs Letter, "Can You Grow to Love $710,300 for a 40-year Subsidy on One Unit?" Community Development Services, Washington, D. C., March 23, 1979.

APPENDIX A

REASONS FOR INCLUDING SAN FRANCISCO PUBLIC HOUSING PROJECTS IN THE STUDY

As described in Chapter 2, 35 moderate-income housing developments in the three cities were included in the study. Ten of these 35 developments consist of two building types. Each group of buildings of the same type within a development is considered in this study to be a separate site, so the number of moderate-income sites in the study is 45.

During the early stages of designing the sampling plan for selecting respondents in these sites two problems became apparent. First, interviewing 3300 households in these 45 sites would produce an excessively high sampling ratio. And second, among these 45 sites there were not enough cases of high-rise, low-income sites. In order to alleviate both of these problems, San Francisco public housing sites were added to the study. Each of these problems and the eventual solution are described in more detail below.

The 45 moderate-income sites consisted of 6400 occupied dwelling units. Funds allocated to the study allowed for the interviewing of residents from 3300 households. Had we interviewed 3300 residents in the 6400 households, our sample size would have been about 50% of these households. This was found to be unnecessarily extensive by our survey consultants and was also thought likely to result in possible biasing effects from residents conversing with each other about their interviews during the weeks the interviews would be conducted.

Another problem became apparent when the sites were subdivided into strata relating to two key independent variables: physical design and the socioeconomic characteristics of residents. It was found that, of the 45 moderate-income sites, only two fell into the stratum "low-income, high-rise," and both of these developments were found to be located within the same city: Newark (see Table A1).

Table A1

Allocation of Sites to Strata
Determined by Building Type and
Percent Rent Subsidized Units
(Moderate-Income Sites in Three Cities)

City	Percent rent supplement	Building type: Row house	Walk-up	High-rise
Newark	< 30%	0 sites	3 sites	5 sites
	≥ 30%	0	1	2
St. Louis	< 30%	3	6	1
	≥ 30%	1	3	0
San Francisco	< 30%	2	4	1
	≥ 30%	5	8	0
Total number of sites = 45		11	25	9

Our survey consultants advised us that we would require more cases of low-income, high-rise developments, particularly as this sociophysical combination was central to many of our hypotheses. We were further advised that the relative precision of our estimates of victimization rates and other dependent variables would be improved if the 3300 interviews were spread over a larger mumber of sites.

It was concluded therefore that we could answer both deficiencies in the sample by including the public housing projects in all three cities in our study. This would allow us first to increase the total number of sites and second to increase the number of high-rise sites with a high percentage of rent-supplement residents.

In examining the public housing developments in the three cities we found that there was a total of 40 developments, many of them of rather large size (1000 units). If we sampled residents in all of the developments (moderate-income and public) proportionally, over 75% of our interviews would be in public housing. Since it was the intent of the study to concentrate on examining conditions in moderate-income developments, this new sampling plan would run contrary to the original purpose. In addition, we found that in two cities, Newark and St. Louis, there was a concentration of welfare and broken families in the high-rise buildings. If we were to find, as we did in the test case of Newark, that crime rate was related to building type, we would be unable, because the two variables "percent welfare" and "percent broken families" were also so strongly related to building type, to attribute this finding to the action either of building type or of the socioeconomic characteristics of residents (see Tables A2 and A3 following).

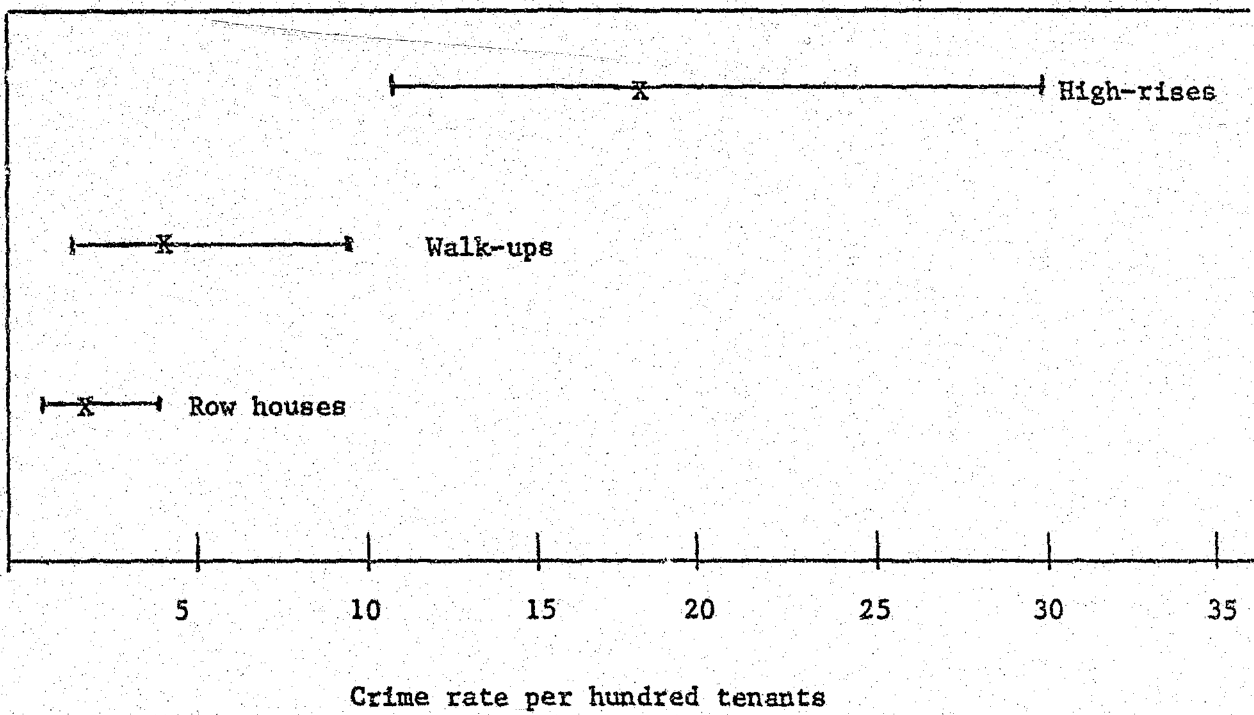
Table A2

Pearson Correlations between Key Variables for all Newark Public Housing Projects

	Crime rate (police)	Vacancy rate	% one-parent families	% male teenagers	% welfare families
Vacancy rate	.78				
% one-parent	.80	.62			
% male teens	.77	.54	.91		
% welfare	.78	.69	.93	.93	
Building height	.88	.70	.82	.80	.82

Table A3

Crime Rate per Hundred Tenants by Building Type:
Minimum, Maximum, & Average for Years 1973, 1974, 1975
For 12 Newark Public Housing Projects



X = Average

Project Distribution: Row House - 1
Walk-up - 7
High-rise - 4
Total - 12

Total Police-Reported Incidents: 3787 (murder, rape, robbery, assault, burglary)

In examining public housing projects in San Francisco, however, we found: that there was a more even distribution of building types; and that there was not a concentration of welfare and one-parent families in any one building type. (See Table A4 following.)

Table A4

Social and Physical Characteristics
of San Francisco Public Housing Sites

Socio-economic characteristics		Building type: Row House	Walk-up	High-rise	Totals
% welfare	< 60%	6 sites	7 sites	1 site	14 sites
	≥ 60%	4	6	3	13
% one-parent	< 57%	6	6	3	15
	≥ 57%	4	7	1	12

The addition of the 27 public housing sites[1] in San Francisco to the 45 moderate-income sites in Newark, St. Louis, and San Francisco succeeded in providing a better distribution of sites across the strata and still allowed the study to concentrate primarily on conditions in moderate-income housing. (See Table A5 following.)

[1] Note that the public housing developments of mixed building types, just as the moderate-income developments, are here considered as two separate sites, each defined by building type. All public housing projects are categorized as ≥ 30% rent supplement.

Table A5

Allocation of Developments to Strata
Determined by Building Type and
Percent Subsidized Units

	Original Selection (45 Moderate-income sites in three cities)				New Selection (45 Moderate-income sites plus 27 public housing sites in San Francisco)			
Percent Rent Supplement	Building type				Building type			
	Row	Walk-up	High-rise	Totals	Row	Walk-up	High-Rise	Totals
$<30\%$	5	13	7	25	5	13	7	25
$\geq 30\%$	6	12	2	20	15	25	7	47
Totals	11	25	9	45	20	38	14	72

APPENDIX B:

SAMPLING DESIGN FOR HOUSEHOLD SURVEY

Residents interviewed in all study sites were selected in accordance with the sampling design described below. Three kinds of considerations guided the design of the sample of residents: (1) whether to use a stratified sample and, if so, how to define the strata; (2) how to allocate the number of interviews to be sought within each stratum; (3) what kinds of probability sampling procedure to use.

Defining the Sample Strata

The decision was made that the study's purposes could best be served if a stratified sample were used, and if the strata were defined in terms of categories that would have to be compared in testing the principal hypotheses. Therefore six stratification variables were used: the city where a site was located and five additional variables judged to be most central to the defensible space theoretical framework. The six stratification variables are:

1) City where site is located (3 categories)

2) Building type -- high-rise, walk-up, or row house (3 categories)

3) Size of development -- 150 or fewer units, 151 to 600 units, or 601 or more units (3 categories)[1]

1. The categories within the stratification variables 3, 4, and 5 were determined empirically: for example, the cut-off points determining the three sizes of developments were determined so as to produce approximately an equal number of developments in each category.

4) Percent low-income residents -- more than 30% of the residents on rent supplement, or less than 30% on rent supplement (2 categories)

5) Percent one-parent families -- 44% or less, 45% or more (2 categories)

6) Proximity to public housing -- whether or not the development is within one block of a public housing project; or in the case of a public housing development, whether or not the development is within one block of another public housing development (2 categories).

All of the above variables, except building type, represent features of an entire housing development. In the case of building type, if a development were composed of two building types, then each section of the development consisting of only one building type was to be considered a separate entity, called a study "site."

The six stratification variables were combined to form a cross-classification matrix containing 216 strata (3 cities x 3 building types x 2 classes of % low income x 2 classes of % one-parent x 2 classes of proximity to public housing x 3 sizes of development). Only 45 of all these possible strata were actually represented by the study sites produced in the three cities. Table B.1, below, presents the characteristics of each stratum and the number of study sites within each stratum.

Six of the original 45 strata do not appear in Table B.1 This is because, prior to data analysis, five of these strata were dropped and two strata were combined into one. The five strata were dropped because they possessed two attributes: 1) they contained sites in which very few interviews had been obtained; and 2) they contained no <u>other</u> sites with acceptable response rates. Two strata were combined as a result of site visits which revealed that the only difference between the strata, a difference in building type, had been incorrectly designated initially.

Allocating Number of Interviews to Each Stratum

The method adopted for allocating the number of interviews to be obtained within each stratum was proportional allocation, such that the number of interviews obtained in any stratum would be proportionate to that stratum's share of the total number of occupied units. (This method was perhaps the best for ensuring the sample's "representativeness." Additionally, it offers certain advantages in calculating sample estimates of population values.)

The study's resources allowed for a sample size of 3,300 obtained interviews. A number of eligibility criteria, which are described in Chapter 2, were expected to result in a rate of interview completion of approximately 71 percent, with ineligible households and non-responding households together totalling about 29 percent. Therefore, the number of interviews initially allocated to each stratum was inflated by a factor of ($1.00 \div .71 =$) 1.408, for a <u>designated</u> total sample of 4,646. (The designated sample actually selected came to 4,621.)

Table B.1

Characteristics of Strata in the Sample Design; Study Sites in Each Stratum

Stratum Number	City	Percent low-income resi-dents [1]	Size of develop-ment [2]	Building type	Proximity to public housing [3]	Percent one-parent families [4]	Occupied units [5]	Interviews obtained	Names of develop-ments [6]
1	Newark	Medium	Small	Walk-up	No	High	72	24	Timstill
2	Newark	Medium	Small	High-rise	No	Low	208	62	Mt. Calvary 1 Mt. Calvary 2
3	Newark	Low	Medium	Walk-up	No	Low	268	84	University Courts
4	Newark	Low	Medium	High-rise	No	Low	650	192	St. James Carmel Zion
5	Newark	Low	Medium	High-rise	Yes	High	371	95	Hill Manor
6	Newark	Low	Small	Walk-up	No	High	174	64	Amity 1 Urban Housing (walk-up)
7	Newark	Low	Small	High-rise	No	High	32	12	Urban Housing (high-rise)
8	St. Louis	Medium	Medium	Row house	No	High	203	65	Primm
9	St. Louis	Medium	Medium	Walk-up	No	High	251	69	Westside Community Gardens
10	St. Louis	Medium	Small	Walk-up	Yes	High	190	58	Boaz Kinloch Manor
11	St. Louis	Low	Medium	Row house	No	Low	194	51	Jefferson (row house)

(continued)

Table B.1 (Continued)

Stratum Number	City	Percent low-income residents [1]	Size of development [2]	Building type	Proximity to public housing [3]	Percent one-parent families [4]	Occupied units [5]	Interviews obtained	Names of developments [6]
12	St. Louis	Low	Medium	Walk-up	No	Low	108	27	Jefferson (walk-up)
13	St. Louis	Low	Small	Row house	No	Low	56	17	University Terrace (row house)
14	St. Louis	Low	Small	Row house	No	High	213	71	Alpha Gardens Aritha Spotts
15	St. Louis	Low	Small	Walk-up	No	Low	151	52	Alpha Village Leawood
16	St. Louis	Low	Small	Walk-up	No	High	145	46	Hillvale
18	San Francisco	Medium	Medium	Walk-up	No	Low	154	47	Friendship
19	San Francisco	Medium	Small	Row house	No	High	103	24	Loren Miller
20	San Francisco	Medium	Small	Row house	Yes	Low	72	26	Paine (row house) Garvey (row house)
21	San Francisco	Medium	Small	Row house	Yes	High	117	43	Ridgeview (row hous M.L. King(row house
22	San Francisco	Medium	Small	Walk-up	No	High	106	34	Banneker
23	San Francisco	Medium	Small	Walk-up	Yes	Low	112	40	Paine (walk-up) Garvey(walk-up)

(continued)

Table B.1 (Continued)

Stratum Number	City	Percent low-income residents [1]	Size of development [2]	Building type	Proximity to public housing [3]	Percent one-parent families [4]	Occupied units [5]	Interviews obtained	Names of developments [6]
24	San Francisco	Medium	Small	Walk-up	Yes	High	256	79	M.L. King (walk-up) F.D. Haynes Prince Hall Ridgeview (walk-up)
25	San Francisco	Low	Medium	Row house	No	Low	218	51	Glenridge (row house)
26	San Francisco	Low	Medium	Row house	No	High	68	21	Freedom West (row house)
27	San Francisco	Low	Medium	Walk-up	No	Low	347	90	St. Francis Glenridge(walk-up)
28	San Francisco	Low	Medium	Walk-up	No	High	310	90	Freedom West (walk-up)
29	San Francisco	Low	Medium	High-rise	No	Low	452	68	Geneva Towers
31	San Francisco	Low	Small	Walk-up	No	High	100	25	Vista Del Monte
32	San Francisco	High	Large	Row house	No	--	736	150	Sunnydale (row house)
33	San Francisco	High	Medium	High-rise	Yes	--	596	61	Ping Yuen Ping Yuen North Yerba Buena Annex
34	San Francisco	High	Small	Row house	No	--	115	27	Holly Courts
35	San Francisco	High	Small	Walk-up	No	--	133	49	Westside Courts

(continued)

Table B.1 (Continued)

Stratum Number	City	Percent low-income residents [1]	Size of development [2]	Building type	Proximity to public housing [3]	Percent one-parent families [4]	Occupied units [5]	Interviews obtained	Names of developments [6]
36	San Francisco	High	Large	Walk-up	Yes	--	136	45	Yerba Buena Plaza (walk-up)
37	San Francisco	High	Large	High-rise	Yes	--	395	96	Yerba Buena Plaza (high-rise)
38	San Francisco	High	Medium	Row house	No	--	399	109	Alice Griffith (row) Alemany (row)
39	San Francisco	High	Medium	Row house	Yes	--	1056	281	Harbor Slope Potrero Annex Potrero Terrace Hunters'View(row) Hunters' Pt.A(row)
40	San Francisco	High	Medium	Walk-up	No	--	936	210	Valencia North Beach Hayes Valley Bernal (walk-up) Griffith (walk-up)
42	San Francisco	High	Medium	High-rise	No	--	54	16	Bernal (high-rise)

1 The percent of low-income residents was estimated using the percent of rent supplement units for moderate-income housing. Moderate-income developments with less than 30% of the units on rent supplement were estimated to have a low percent of low-income residents. Those with 30% or more of the units on rent supplement were estimated to have a medium percent of low-income residents. Because of strict income guidelines for eligibility, all public housing developments were assumed to have a high percent of low-income residents.

(continued)

Table B.1 (continued)

2 Size of development: small indicates developments with 150 or fewer units; medium developments are those with from 151 to 600 units; large developments are those with 601 or more units.

3 Proximity to public housing: yes=within one block of a public housing project (or, another public housing project in the case of public housing developments); no=not within one block of a public housing project.

4 Percent one-parent families: high = 45% or more of the households are one-parent; low = 44% or less are one-parent households. These were estimates based on a random sample of households drawn from the Institute's files on the demographic characteristics of all households. Such data were not available for San Francisco public housing developments.

5 This is the number of units in the stratum from which the sample was drawn. It represents the total number of units minus the vacant units, the units inhabited by management personnel, units opened within the past nine months through renovation, and any units converted to uses other than residential.

6 Names of developments in the stratum. When only some of the units in a development are included in the stratum, the type of included unit (row house, walk-up, high-rise) is indicated in parentheses following the name of the development. If no such designation follows, all of the units of that development may be assumed to have been included in that stratum.

Sampling Within Strata

It was decided to use, within each stratum, systematic sub-samples selected with random starts, rather than to use simple proportional random sampling. The "systematic sampling" technique was a means of enhancing the precision of within-sample estimates, over the degree of precision that could have been expected with simple random sampling.

Thus within each stratum the appropriate number of systematic samples of five households were generated to produce that stratum's inflated allocation of sample households.

In each selected household, either of the two adult heads, if there were two, could be interviewed. Therefore, as part of the selection of the sample, the sex of the household head to be interviewed in each household was determined randomly. Interviewers were instructed to ignore the sex designation in any household which had a single head of household.

APPENDIX C:

SOURCES OF DATA

Six sources of data were used in this study: (1) interviews with residents; (2) interviews with housing managers; (3) interviews with police personnel; (4) records kept by managers of housing developments; (5) records kept by housing agencies; and (6) site visits by research staff to all housing developments.

Interviews with Residents

The major source of data in this study was the household survey of residents. A total of 2,655 residents were interviewed in the 63 sites retained for analysis.

Each designated respondent in the sample was sent an introductory letter which described the study mentioned the payment of $5.00, and requested his or her participation. Each interviewer was assigned a number of designated respondents. The interviewer visited each assigned household. If the designated respondent agreed to be interviewed, the interviewer determined eligibility, and either conducted the interview at that time or made an appointment to return. Calling cards were left if the interviewer found no one at home; up to 10 repeated visits were made to make contact with the designated respondent, and follow-up letters were sent if repeated attempts to make contact failed.

Every effort was made to conduct each interview in private: that is, without another adult present. The interviewer read the questions, which included both fixed-choice and open-ended items. The respondent was given a set of answer cards to aid him or her in choosing answers to some fixed-choice questions. Most interviews were completed within one and one-half hours, although some lasted as long as two hours. At the end of the interview, each respondent was paid $5.00 and was asked to sign a receipt.

Interviewers for the household survey were hired and trained by field supervisors of the Research Triangle Institute. A detailed field interviewer manual was prepared by the staff at our Institute jointly with RTI staff. Intensive two-day interviewer training sessions were held in each of the three cities and were conducted jointly by members of our Institute and RTI. The progress of each interviewer was closely monitored by the RTI field supervisor in each city. A careful review of the first questionnaires completed by each interviewer was made and retraining was given when necessary. Completed questionnaires were edited by field staff and clarifications and corrections were made by interviewers when necessary. Between ten and fifteen percent of the interviews were verified by RTI staff in each city.

After field editing, completed questionnaires were sent to RTI where they were edited and prepared for key punching. Then the responses to all precoded questions were entered on tape through a direct entry process. Five percent of the sample of questionnaires were rekeyed and verified: the results of this verification indicated a .41% error rate.

The interviewing of residents in moderate-income developments in all three cities began in mid-November, 1976, and was completed by late January, 1977. The interviewing in public housing in San Francisco began in mid-January, 1977, and extended to late March, 1977.

Interviews with Managers

The preferred respondent for the housing manager interview was the on-site manager. In some cases, however, a managing agent or assistant manager had to be substituted. In two cases, the manager refused to grant an interview. In one of these developments, the manager referred the interviewer to a tenant leader who was able to answer some of the questions; in the other case, no management interview was possible.

Interviews with housing managers were conducted by Institute staff in Newark and St. Louis, and in San Francisco by Institute staff and two trained interviewers under Institute staff supervision.

Introductory letters were sent to each manager describing the study and requesting an interview. Most managers, however, had previous knowledge of the study. Appointments for the interviews were then arranged by telephone. Once an appointment had been arranged, the manager was sent a list of interview topics for which reference to management files might be necessary. As in the household survey, the interviewer read the questions, and a set of response cards was used to guide the respondent's selection of answers to fixed-choice questions.

In cases where one manager had responsibility for two or more developments in the study, designated questions were asked separately for each development. If a manager handled three or more developments, an assistant accompanied the interviewer to help record answers. Depending on the number of developments the respondent managed, interviews lasted from one and one-half hours to over three hours. Of the total of 53 developments where a manager interview was obtained, 32 are managed by one manager each, and 21 share a manager with at least one other development. Of those developments in the study that share a manager with another development, four share a manager with one other development, nine share a manager with two other developments, and eight share a manager with three other developments. A total of 37 managers were interviewed: 32 of these managers were responsible for managing only one of the developments in the study and 5 of these managers were responsible for more than

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3 OF 4

one development. When a development consisted of two study sites, the manager's responses for that development were applied to each of the two sites.

Interviews with City Police

The developments in the three cities were located in a total of six different police jurisdictions. At least one police representative in each police jurisdiction was interviewed, with one exception, Kinloch, Missouri. Three separate attempts were made to interview the chief, or his deputy, in Kinloch, without success. In San Francisco, the largest jurisdiction in the study, an interview was conducted in each of the four police districts where most of the developments in the study are located. The interview was designed to be used with patrol officers or with the sergeants who assign patrol duties. Frequently, however, a higher ranking officer elected to answer the questions.

Introductory letters and phone calls also preceded interviews with police department representatives in all police jurisdictions. Interviews were requested with patrol officers or sergeants. Interviews were conducted, however, with district captains and assistant chiefs, as well as with patrol officers, and sergeants. A total of nine police representatives were interviewed. Only five developments were located in districts or jurisdictions where interviews could not be arranged. Open-ended interviews were also conducted with representatives of the housing authority police in Newark and San Francisco.

For some questions in the interview, response cards were used, as were lists of the developments under study and maps showing their location.

Tenant Files

The Department of Housing and Urban Development requires that moderate-income, federally-assisted housing developments maintain records on the socioeconomic and family characteristics of each household in residence. The only exceptions are those households which pay full market rent for apartments because the household income is too high to qualify them for any subsidy.

A different federal application form is completed and kept on each resident household depending on which subsidy program is being used to provide aid to the household. The Department of Housing and Urban Development forms are: Form 2501 for rent supplement tenants; Forms 3131 or 3132 for Section 236 tenants; Form 1705 for tenants in developments under the Section 221(d)(3) program; and Form 52659 for tenants under the Section 8 housing assistance program. Records for tenants under the Section 23(c) leased housing program are kept on housing authority forms by the public housing authority which leases the units. Each of these forms includes the following information: the age and sex of each household member and their relationship to the head of household; the annual income of household; the source of income; the date of initial occupancy; and the size of the apartment. The only exceptions to this information content are: HUD Form 1705, which does not show source of income other than employment; and HUD Form 52659, which lacks the date of initial occupancy.

Before the sampling design was constructed, information was collected from the tenant files at each development on every family in residence for which records were available. This information was then used to characterize each development with respect to the percentage of low-income residents and the percentage of one-parent families so as to allow us to place each development in a stratum of our sampling matrix.

Coders were instructed to collect all of the information required, as listed above, using supplementary materials in the files if the application forms were not complete. Some developments had excellent files, but at others files had not been removed when tenants had moved out, or the files of a current tenant were missing (at the lawyer's office or pulled for recertification).

Because some developments had incomplete or unreliable records, the principal use that was made of these records was in creating the sampling matrix. The demographic profiles of developments used in the analysis of data were developed from the information on the characteristics of residents collected with the household survey.

Housing Agency Files

The HUD Regional offices of Newark, St. Louis, and San Francisco require their developments to file annual reports (Form 9801) on June 30 summarizing, among other things, the number of move-ins, move-outs, vacancies, and apartment units in unrentable condition. Both the San Francisco Housing Authority and the New Jersey Housing Finance Agency keep comparable monthly records for each development. Information was gathered for 1974 through 1976 on the number of occupied units, vacant units, and "abandoned" units as of June 30 or July 1 each year, and on the total turnover during the previous twelve months. 1976 was chosen as the year to be used in our analysis because the data was both most complete and most current for that year. Using this information we calculated the 1976 turnover rate and the 1976 vacancy and abandonment rate for each development in the study. Unfortunately, the records were incomplete for twelve moderate-income developments, because the developments had failed to file Form 9801 in 1976 with the HUD Regional Office. Eight of these twelve moderate-income developments had filed forms for 1975 but not for 1976. For those developments where records were complete for both 1975 and 1976, little difference was found between the two years for abandonment rate, vacancy rate, and turnover rate. Therefore, for the eight of the twelve developments for which 1975 records were available, 1975 figures were substituted for missing 1976 figures. In the four other developments in which neither 1975 nor 1976 records were available, the project managers' replies to relevant questions in the manager interview were used to provide information on abandonment, vacancy and turnover in 1976.

Site Visits

Each housing development in the study was visited at least once by Institute staff. Photographs and notes were taken, and maps or blueprints were consulted during those visits. The objective was to fully and carefully document the physical design characteristics of each development and to ensure that the correct building type designation had been made.

APPENDIX D

DEFINITION OF VARIABLES USED IN THE CAUSAL MODEL[1]

Building Size

1. This variable is called DESIGN on the computer tape.

2. It is a standard score composite, constructed at the site-level, of two variables: BLDGTYPE and UNENT.

3. BLDGTYPE was coded as follows:
   1 = Row house
   2 = Walk-up
   3 = Galleria type of walk-up
   4 = High rise

4. UNENT is the number of apartments sharing a building entry, or in the case of buildings with outdoor stairways the number of units sharing the stairway. When the number of units per entry differs across buildings within one site, the average number of units sharing an entry was used.

5. The value for building size was computed for each site separately.

6. The correlation between BLDGTYPE and UNENT is .67; the alpha coefficient for the index is .84 (N = 63 sites).

Accessibility

1. This variable is called DEFNS on the computer tape.

2. DEFNS is a rating of the defensibility or inaccessibility of buildings and apartment units: therefore on the computer tape for this study the lowest value equals low defensibility and high accessibility. In the report the variable was renamed "accessibility" and its direction reversed so that a high value on the variable "accessibility" means low defensibility.

3. Each site in the study was rated for its inaccessibility.

4. The original ratings were made on a three-point scale (0,1,2) for row houses and high-rises but on a four-point scale (0,1,2,3) for walk-up sites. To obtain a single scale with the same range for all building types, the ratings for walk-ups were divided by 1.33. Since 4 divided by 1.33 is 3, the ratings have the same maximum value for all building types.

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[1]These variables are contained in the data set called SITELEVL on the computer tape.

Low-income/AFDC

1. This variable is called ECON2 on the computer tape.

2. ECON2 is a site-level, standard-score composite composed of two variables: ESTRLINC AND AFDC.

3. ESTRLINC is the adjusted income of families. This index is derived from item R7 of the household questionnaire which elicits total family income within 13 categories, ranging from under \$3,000 to over \$35,000 a year. This item was first recoded so that the integer codes (1 to 13) of these categories were changed to the midpoint of the income range for each category (\$2,500 to \$37,500).

Next, counts were made of the number of persons in the household (the number listed as living in respondent's dwelling unit in answer to item R5) and of the number of friends in the household (based on responses to R5 specifying the person as a friend). The first count minus the second yields the number of persons in the respondent's family (N.INFAM).

Adjusted income is computed by adjusting total income for the size of the family, according to the formula:

ESTRLINC = INCOME - N.INFAM x 600

That is, \$600 per each family member, subtracted from total income, gives estimated real income. If the number is below zero, ESTRLINC = 0.

The mean value on ESTRLINC for each site was then used to form the ECON2 composite.

4. AFDC is the proportion of one-parent families whose major source of income is welfare. The number of such families in a site was derived from items R5 and R8 in the household survey. This figure was then divided by the number of respondents in that site. AFDC was reversed (by subtracting each value from the highest value in the range) so that both variables in the composite form a scale of _increasing_ economic status.

5. The correlation between ESTRLINC and AFDC is .73. The alpha coefficient for the index is .84 (N = 63 sites).

6. For the purposes of presenting and discussing the results, ECON2 was renamed "Low income/AFDC" and the direction of the variable was reversed (in the presentation of results, _not_ on the computer tape) so that in the report it is a scale of an increasing proportion of low income families.

7. The value for ECON2 was computed for each site separately.

Teen-adult ratio

1. This variable is called TNADL on the computer tape.

2. It is the ratio of teenagers, aged 10 to 20, to adults and was obtained from item R5 in the household survey which lists the ages of all persons living in the respondent's household. Early in the analysis this variable was reversed and so on the computer tape a high value equals a low ratio. For ease of comprehension the direction of the variable was reversed again in the presentation of results so in the report a high value for teen adult ratio equals a high ratio.

3. The ratio of teenagers to adults was computed for each site separately.

Cooperative ownership

1. This variable is called COOP on the tape.

2. COOP was coded as follows:
0 = not a cooperative
1 = cooperative

3. The value for COOP was determined for each development. If a development contained two sites, the value for that development was assigned to both sites.

Police service

1. This variable is called POLICE on the tape.

2. It is a standard score composite of 4 variables: POL1, POL3, POL4, and POL5.

3. POL1 is item 12 in the police interview:
Which type of routine patrolling is done: cruising while awaiting calls for assistance, systematic patrolling by car where the police regularly pass by or through particular places, or systematic patrolling on foot?
(1 =cruising; 2 = systematic patrolling by car; 3 = systematic patrolling on foot)

4. POL3, POL4, and POL5 are the following items from the police interview:
13. How many times during the daylight hours--8:00 a.m. to 5:00--is a development patrolled?

14. During the evening hours--5:00 p.m. to 1:00 a.m.--how many times is a development patrolled?

15. How about during the night and early morning--1:00 a.m. to 8:00 a.m.?

Each of these items was coded in the following way:

0 = no systematic patrols
1 = 1-3 patrols
2 = 4-7 patrols
3 = 9-15 patrols
4 =16-24 patrols

5. A value for police service was calculated for each development for which data were available. If a development contained two sites, the value for that development was assigned to both sites.

TABLE D1

Correlations between Items in Composite Measure of Police Service

	POL1	POL3	POL4	POL5
POL1	1.00			
POL3	.57	1.00		
POL4	.45	.88	1.00	
POL5	.62	.80	.54	1.00

Standardized alpha = .88

N of cases = 45 developments

Guard service

1. This variable is called MANAG1 on the tape.

2. It is a standard score composite of a single item from the household survey (P2) and a composite variable (SECGD) created at the manager-level.

3. P2 from the household survey is:
Overall, how would you rate the job they (security guards or housing police) do protecting people in (NAME OF DEVELOPMENT)?

(1=Very bad job to 5=Very good job)

This item was coded "99", or legitimate skip, if the respondent reported in answer to P1 that there are no security guards in the development. Therefore, values of 99 were recoded to zero for this item.

4. SECGD is a composite of 4 items from the manager's interview: G1A, G1B, G2, and G5.

5. Items G1A and G1B are the responses to the following item:

G 1. How many security guards (housing police) are on duty at one time?

G1A is the greatest number of guards on duty at any one time, and G1B the fewest number on duty at one time. Since the magnitude of these numbers depends on the size of the site, the variables were divided by the number of occupied units for that site and multiplied by 500, so that the variables represent the number of guards per 500 households.

6. G2 is the following item: What are their hours? This item was originally coded "1" if guards were present both day and night and "2" if they were present only at night. This item was therefore reversed to conform with the direction of the composite.

7. G5 is: Are they armed? This item was also reversed so that "1" indicates unarmed guards, and "2" indicates armed guards.

8. For each item in the SECGD composite if <u>no</u> guards are present in the site, the item was assigned the value of zero. Whether or not guards are present at all was determined from variable A10A11D. If this variable, after recoding, equalled 1, G1A, G1B, G2, and G5 were all assigned the value of zero.

9. The mean value on P2 was calculated for each site separately. The value for SECGD was calculated for each development for which data were available. If a development contained two sites, the value for that development was assigned to both sites.

10. The correlation between P2 from the household survey and the composite measure from the manager's interview is 67. The alpha coefficient for the overall index is .80 (N = 54 sites).

Table D2

Correlations between Items in Composite Measure of Security Guard Service from Manager's Interview

	G1A	G1B	G2	G5
G1A	1.00			
G1B	.67	1.00		
G2	.81	.70	1.00	
G5	.82	.62	.96	1.00

Standardized alpha = .93
N of cases = 42 developments

Rent Collection

1. This variable is called RENT on the computer tape.

2. It is a standard score composite formed at the site-level from 4 items in the manager questionnaire: C6, C10, C11, and C12.

3. The item C6 is:
After how many days from the due date do you consider a resident delinquent in rent payments?
(Actual number of days)

4. Items C10 and C11 are:
In an average month, how many households are delinquent in their rent?

Last month, on the last day of the month, how many residents were behind in their rent?

The responses to both of these items vary according to the size of the development. Therefore, these variables were divided by NOCC (the number of occupied units in a development) and then multiplied by 100 so that the final value is the number of rent-delinquent households per 100 occupied units.

5. Item C12 is:
If you add up all the back rents owed by all the households that are behind in rent now, how much money does that come to?

This item was recoded so that:
1 = 0 - $ 1500
2 =$150 - $ 3500
3 =$3501- $12,000
4 =$12,001-$134,426

6. All four items in the RENT composite were reversed to form a scale of increasing management firmness and success in rent collection.

7. The value for RENT was computed for each development for which data were available. If a development contained two sites, the value for that development was assigned to both sites.

Table D3

Correlations between Items in Composite Measure of Rent Collection

	C6	C10	C11	C12
C6	1.00			
C10	.22	1.00		
C11	.38	.37	1.00	
C12	.13	.36	.46	1.00

Standardized alpha = .65
N of cases = 41 developments

Use of space

1. This variable is called SPACE on the tape.

2. It is standard score composite composed of two subscales formed from items from the household survey.

3. The first subscale is composed of J7 and J8 a-f, which refer to the use of a private yard or patio.

> J 7. When the weather is nice, how often do you spend more than a few minutes out there? (1=almost never to 7=Almost everyday)
>
> J 8. People use a private yard or patio for different kinds of activities. Do you or members of your family use it for:
> a) Children's play?
> b) Sitting outside?
> c) Barbecuing or eating?
> d) Having friends over?
> e) Growing plants and flowers
> f) Storing things
> (1=yes and 2 = no for each of these activities)

If the respondent had no yard or patio, all the above items were recoded from "99" for legitimate skip to zero. Items J8 a-f were reversed so that a no response formed the lower scale point in line with the overall scale direction of increasing usage for this composite.

4. The corresponding items in the second subscale concern the use of shared outdoor areas.

> J 9. When the weather is nice, how often do you spend more than a few minutes in the area just outside this building? (EXCLUDING PRIVATE YARDS OR PATIOS) (1=Never to 7=almost everyday)
>
> J 10 and J 11. Do you ever use the area outside this building for:
> a) Sitting by yourself
> b) Sitting with other residents you know
> c) Sitting with members of your family or friends from outside the development
> d) Playing with children or watching them play
> e) Having a barbecue or picnic
> (J10: Yes or No for each activity; If Yes to J10, J11=Seldom, Sometimes, or Never)

The items J10 and J11 a-e required more elaborate recoding since information was gathered not only on whether an activity was practiced (J 10) but also on the frequency of that activity (J 11). The resulting variables were called JC1-5 and were created in the following manner: a negative response to J10a, for example, meant that J11a had been skipped and in that situation, the respondent received a score of zero on the new variable JC1. If the response to J10a was positive, the score on the new variable JC1 was equal to the score for J11a.

5. The index for use of space was constructed at the respondent-level. A mean value was then computed for each site.

Table D4

Correlations between Items in Subscale on Use of Private Yard or Patio

	J7	J8A	J8B	J8C	J8E	J8F
J7	1.00					
J8A	.75	1.00				
J8B	.88	.73	1.00			
J8C	.75	.64	.75	1.00		
J8D	.75	.64	.77	.75	1.00	
J8E	.71	.51	.63	.58	.56	1.00
J8F	.41	.30	.40	.42	.39	.42

Standardized alpha = .92

N of cases = 2650 respondents

Table D5

Correlations between Items in Subscale on Use of Shared Outdoor Space

	J9	J10A	J10B	J10C	J10D	J10E
J9	1.00					
J10A	.49	1.00				
J10B	.52	.55	1.00			
J10C	.46	.51	.56	1.00		
J10D	.50	.42	.49	.52	1.00	
J10E	.28	.28	.32	.37	.37	1.00

Standardized alpha = .83
N of cases = 2650 respondents

Social Interaction

1. This variable is called COHES on the tape.

2. COHES is a standard score composite formed at the respondent-level from 6 items in the household survey: A14, F1, F2, F3, F8, and F9.

3. Items A14, F1, and F2 were used in their original form:

A 14. How much of (NAME OF DEVELOPMENT) do you feel you are part of?
(1=None of it to 7=All of it)

F 1. In general, how often do you have casual conversations with other residents here at (NAME OF DEVELOPMENT)?
(1=Less frequently than once a month to 7=Several times a day)

F 2. How many families do you feel there are at (NAME OF DEVELOPMENT) whom you could count on in an emergency?
(1=None to 5=Very Many)

4. Answers to items F3 and F9 were collapsed into 10 categories to handle the large numerical range.

F 3. How many families are there at (NAME OF DEVELOPMENT) where you know at least one adult resident by name?

F 9. How many close adult friends and close adult relatives do you have who live here at (NAME OF DEVELOPMENT)?

Responses to these 2 items were recoded as follows:

0 = none	
1 = 1	5 = 5,6
2 = 2	6 = 7-10
3 = 3	7 =11-15
4 = 4	8 =16-30
	9 = 31+

5. Item F8 was:

How often do you get together with close adult friends and close adult relatives who live at (NAME OF DEVELOPMENT), for instance, to visit or to go out together?
(1=About once a year to 7=More than once a week)

6. Both F8 and F9 were recoded according to the respondent's answer to F7. If F7 indicated that the respondent had no close friends or relatives in the development, F8 and F9, which in that case had been scored "99", were recoded to zero.

7. The index for social interaction was constructed at the respondent-level. A mean value was then computed for each site.

Table D6

Correlations between Items in Composite Measure of Social Interaction

	A14	F1	F2	F3	F8	F9
A14	1.00					
F1	.25	1.00				
F2	.34	.31	1.00			
F3	.33	.35	.44	1.00		
F8	.18	.33	.29	.29	1.00	
F9	.26	.32	.41	.41	.66	1.00

Standardized alpha = .76
N of cases = 2650 respondents

Control of Space

1. This variable is called CTRL on the tape.

2. CTRL is a standard score composite formed at the respondent-level from 5 items in the household survey: L1, L2, L3, L7, and L8.

3. Items L1, L3, and L8 were used in their original form.

> L 1. Suppose three 13-year-old boys, who were strangers, were spray painting graffiti on the walk just in front of this building. How likely is it that a resident of this building who saw them would tell them not to do that? (1=Very unlikely to 5=Very likely.)
>
> L 3. If the kids kept on painting graffiti on the walk, how likely is it that the resident who saw them would call the police or management? (1=Very unlikely to 5=Very likely.)

L 8. If someone were attacked right outside this building and called out for help, how likely is it that a resident of this building would help in some way?
(1=Very unlikely to 5=Very likely.)

4. Item L2 was not asked of respondents who answered "Very unlikely" to L1, and for such respondents L2 was scored "99." These responses were recoded to "1" for L2; all other L2 responses remained the same.

L 2. How likely is it that the kids would stop painting graffiti?
(1=Very unlikely to 5=Very likely.)

5. Responses to L 7 were collapsed into four categories to form a more meaningful scale of intervention.

L 7. Suppose that two young men about 19 or 20 whom residents did not recognize were standing around near the front of this building. Suppose they looked suspicious. Which one of the things listed on this card do you think residents of this building would do?
1= Do nothing (Forget about it)
2= Watch the persons (Keep an eye on them)
3= Call authorities (Call the city police, call the security guard or housing police, call the management)
4= Direct intervention (Go out and ask them who they're looking for)

6. The index for control of space was constructed at the respondent-level. A mean value was then computed for each site.

Table D7

Correlations between Items in Composite Measure of Control of Space

	L1	L2	L3	L7	L8
L1	1.00				
L2	.61	1.00			
L3	.44	.34	1.00		
L7	.24	.21	.28	1.00	
L8	.36	.32	.33	.18	1.00

Standardized alpha = .71
N of cases = 2650 respondents

Fear of Crime

1. This variable is called FEAR on the computer tape.

2. It is a standard score composite formed at the respondent-level from 7 items from the household survey: NEW1, NEW2, NEW3, O4, B4, O2, O3.

3. The first three items in the scale refer to the safety of three types of areas in the development: the area right outside the apartment door; the public sidewalk; and the area right in back of the building. The wording of these three items differed slightly according to the type of building the respondent lived in. Three variables, NEW1, NEW2, and NEW3, were formed by selecting the item appropriate for each of the main building types.

NEW 1: N3 (high-rise), N12 (walk-up), N15 (row house)
NEW 2: N6 (high-rise), N11 (walk-up), N14 (row house)
NEW 3: N7 (high-rise), N13 (walk-up), N16 (row house)

The items used to form NEW 1 all had the same wording:

At night, how safe is the area right in back of the building?
(1=Safe to 5=Very unsafe)

The items used to form NEW 2 also had the same wording:

At night, how safe is the public sidewalk that is nearest your apartment?
(1=Safe to 5=Very unsafe)

The items forming NEW 3 took different forms for each building type:

N 7. (High rises) The corridor just outside your door?

N 13. (Walk-ups) The landing just outside your door?

N 16. (Row houses) How about the area right outside your front door?

4. Only one item in this scale required recoding so that a higher value would indicate higher fear and that was O 4:

How much crime do you think occurs in this development compared to the area just outside it -- more crime in the development than outside, about the same amount, or less crime in the development?
(Recoded: 1=less crime in development;2=about the same; 3=more crime in the development)

5. The three remaining items in the fear scale were B4, 02, and 03.

B 4. How safe or unsafe is (NAME OF DEVELOPMENT) as a place to live?
(1=Safe to 5=Very unsafe)

O 2. At night, how worried are you about being held up, threatened, beat up, or anything of that sort right outside this building?
(1=Not at all worried to 5=Very worried)

O 3. During the course of this next year, how likely is it that someone would break into your apartment when no one is home?
(1= Very unlikely to 5=Very likely)

6. The fear of crime index was constructed at the respondent-level. A mean value was then computed for each site.

Table D8

Correlations between Items in Composite measure of Fear of Crime

	B4	NEW1	NEW2	NEW3	O2	O3	O4	O5
B4	1.00							
NEW1	.42	1.00						
NEW2	.47	.54	1.00					
NEW3	.45	.55	.57	1.00				
O2	.36	.47	.44	.45	1.00			
O3	.32	.27	.32	.28	.35	1.00		
O4	.40	.25	.32	.32	.22	.24	1.00	
O5	.30	.23	.25	.24	.20	.16	.37	1.00

Standardized alpha = .81
N of cases = 2650 respondents

Personal Crime

1. The variable is called VPERS on the computer tape.

2. It is an index composed of two items from the household survey:

Q 8. During the past 12 months did anyone try to take something from you, such as a wallet or purse, by using force or threat of force?
(Number of times occurred within development)

Q 9. Other than during such a robbery or attempted robbery, were you or any member of your household threatened or injured with any weapon or tool, beaten up, or attacked?
(Number of times occurred within development)

3. The procedure for estimating the rate of personal crime was to divide the total number of such experiences in a site as indicated by the answers to Q8 and Q9, by the number of respondents interviewed in that site and to multiply that figure by 1,000 to obtain the rate per 1,000 residents.

4. The rate of personal crime was determined for each site separately.

Burglary

1. This variable is called VBURG on the computer tape.

2. It is an index composed of two items from the household survey:

Q 1. During the past 12 months did anyone enter your apartment without your permission and then steal something?
(Number of times occurred within development)

Q 2. (Other than that) Did you find any sign that someone tried to break into your apartment but did not succeed, such as a forced window or lock, or a jimmied door?
(Number of times occurred within development)

3. The procedure for estimating the rate of burglary was the same one that was used for estimating the rate of personal crime.

Instability

1. This variable is called INSTAB on the computer tape.

2. It is a standard score composite formed at the site-level and consists of three items of information: turnover rate, vacancy and abandonment rate, and residents' desire to move.

3. The turnover rate is the number of households who moved out of a development during a one-year period divided by the total number of occupied units in that development at the end of that one-year period.

4. The rate of vacancy and abandonment is the number of apartment units that are vacant, plus the number of apartment units that are no longer rentable at the end of a one-year period, divided by the total number of apartment units in the development.

5. The primary source of vacancy, abandonment, and turnover data was housing agency records for the year July 1, 1975 to July 1, 1976. For 12 developments records for that year were not available so data for the previous year were used instead. And in four cases records for neither year were available so the data were obtained from interviews with managers.

6. Residents' desire to move was measured with the following item from the household survey:

> C 5. Right now, if you could have your way about it, how likely is it that you would move out of this development?
> (1=Very unlikely to 5=Very likely)

7. The mean value for C5 was computed for each site separately. The values for turnover rate and vacancy/abandonment rate were computed for each development. If a development contained two sites, the values for that development were assigned to both sites.

Table D9

Correlations between Items in Composite Measure of Community Instability

	Turnover rate	Vacancy & abandonment rate	Residents' desire to move
Turnover rate	1.00		
Vacancy and abandonment rate	.53	1.00	
Residents' desire to move	.42	.41	1.00

Standardized alpha = .76

N of cases = 63 sites

APPENDIX E:

RATIONALE FOR SELECTION OF ALPHA LEVEL FOR POWER OF .18

<u>Summary for Nonexpert Reader</u>

The major reason most research projects are undertaken is to test a hypothesis about the relationship between two variables. The researcher collects a sample of data which will help him or her decide if a relationship really exists in the population from which the sample was selected. For example, in this study we had to decide if the design of urban housing was related to crime rate. The decision about whether a relationship exists in the population is made on the basis of measures of relationship (e.g., correlation and regression coefficients) computed from the sample data. Since random events in selecting a sample will almost always mean that the estimate of the degree of relationship from the sample does not equal exactly the corresponding value in the population, investigators make errors in deciding whether a relationship exists in the population on the basis of sample results. There are two types of errors of inference that can be made. First, assume that the relationship <u>does not</u> exist in the population. If we decide on the basis of sample data that the relationship <u>does</u> exist, a Type I error has been made. Second, assume that in the population the relationship <u>does</u> exist. Then if we erroneously conclude from the sample observations that the relationship <u>does not</u> exist, we have committed a Type II error. Theories of probability, sampling and statistics provide us the means for determining the likelihood of making these two kinds of errors. As one might guess, the probability of making one type of error is a function of the probability of making the other type of error, the size of the sample, and the magnitude of the relationship in the population.

Conventional wisdom holds that Type I errors have more disastrous consequences and should be controlled at a rate of .05 (or less); that is, over replications of the study one would be expected to make an inferential error of the first kind once in every twenty studies. In order to make the probability of Type II error sufficiently low, investigators are urged to use information about the possible magnitude of the relation in the population to determine the sample size needed to make the probability of a Type II error about .20. In our study sample size was constrained by budgetary limitations. After an exhaustive evaluation of the potential consequences of Type I and Type II errors we determined that the relative seriousness of the two kinds of error were about equal. Mathematical calculations led us to set the probability of Type I error at .15, which for a sample size of 63 and small to moderate degrees of relationship, would control the Type II error rate at .2 to .3. In this way we tried to balance the relative costs that would be incurred by making the different kinds of errors of inference.

Determining the Probability of Type I Errors

In the classical theory of statistics two kinds of errors of inference are distinguished. The first is called Type I error and refers to the probability of rejecting a true null hypothesis of no effect under the stated model conditions. Errors of the second kind are defined as the probability of failing to reject a false null hypothesis. Nominal Type I error rates are known as "alpha levels." In order to avoid a possible terminological confusion with Cronbach's alpha, which was described above as an index of the reliability of a multi-item scale, in this section we will refer to the nominal alpha level of tests of significance of the path coefficients as PEI (Probability of Error of Type I).

In performing a statistical analysis of a set of data, researchers must decide a priori what probability of error of inference can be tolerated. If all of the assumptions of the statistical model are satisfied by the data, e.g., the variables are normally distributed, then the investigators can be certain that, over replications of the study, they will make incorrect conclusions about a hypothesis at exactly the rates specified for Types I and II errors. Traditionally, behavioral scientists have considered the consequences of Type I errors to be the more serious. This has led to the convention of setting PEI at .05. By selecting PEI = .05

investigators are setting their risks of incorrectly rejecting a true null hypothesis (of "no effect") at 5 of 100 repetitions of the study on average. That is to say, when the null is true the researchers will <u>falsely</u> infer that the independent variable had an effect (when it did not). In many ways this convention has served the social sciences well. However, in recent years some statisticians have urged researchers to evaluate carefully the costs of making an error of this type and to choose rationally the PEI in relation to the consequences (social, economic, psychological) of making a Type I error. In many circumstances a higher level of PEI can be tolerated.

Type II errors designate those incorrect decisions that an independent variable does not affect a dependent variable (when it does). We shall symbolize the probability of a Type II error as PEII and note that it is intimately related to the the concept of statistical power. The power of a statistical test is defined as the probability of rejecting a false null hypothesis in favor of a true alternative. Loosely speaking, power refers to the ability of a statistical test to identify those factors which affect the dependent variables, i.e., to find in favor of a true alternative hypothesis. Thus, power represents an extremely important concept in hypothesis testing. Since researchers typically either do not believe or do not want the null hypothesis to be true, there should be considerable interest in the probability that a statistical test will identify true alternative hypotheses. In much social research the consequences of making a Type II error are more costly than those of making a Type I error. Obviously in the best of all worlds we would want a statistical test which maintained very low PEI and low PEII (or, correspondingly, high power).

It turns out, however, that researchers are rarely able to keep both kinds of error rates very low simultaneously. This results from the fact that there is a precise mathematical relationship between PEI, PEII, sample size (N, the number of units of analysis, e.g., families or sites), and the magnitude of the effect of the independent variable (ES, Effect Size). For constant N and ES there is an inverse relation between PEI and PEII; that is, as PEI decreases, PEII increases. Thus, for constrained sample size and effect size, as we decrease the probability of making one kind of error of inference, we increase the probability of making the other kind of inferential mistake. Under these circumstances, a trade off has to be made between PEI and PEII. Adherence to the convention of PEI = .05 in the social sciences -- where sample sizes are usually modest and effect sizes almost always small -- has produced huge quantities of research with low power and, we assume, subject to very high rates of Type II errors. For example, reviews of the literature in psychology, education, and communication have found that the statistical power of tests of hypotheses averages between .2 and .4. The average probability for erroneously inferring that a real effect is not different from 0 ranges between .6 and .8. Obviously the efficacy of carrying out a particular investigation should be seriously questioned if the power of the test is so low that the researcher is likely to decide that a variable does not have the expected effect even when it does have that effect. Cohen (1965, 1977) has strongly advocated the position that power considerations should be an integral part of the research planning process. Specifically, since power increases with sample size (for fixed PEI and ES), a "power analysis" carefully done prior to data collection can indicate the N the investigator must have in order to test a given hypothesis at prespecified PEI with predetermined power. Cohen & Cohen (1975) recommend that power of .80 be adopted as a convention comparable to the long-standing PEI = .05. Unfortunately, there are many instances in which achieving power of .80 (with PEI = .05) would require a prohibitively large N. (See Cohen, 1977, pp. 16-17.) Thus in most circumstances researchers must balance or "trade off" Type I and Type II error rates. Cohen suggests that many times the advancement of knowledge would be better served if investigators accepted higher PEI (say, .10 or .15) in order to increase power. Having made these general comments about errors and power in hypothesis testing, we now describe the power analysis we made for this study.

Our objective was to test the hypotheses set out in Chapter 1 such that we minimized our risk of Type I errors and maximized our chances of finding any real effects which existed. In devising our strategy to accomplish this goal, a series of decisions confronted us. These centered around those factors which jointly determine error rates and power: properties of estimators of effects, PEI, PEII, N, and ES. First, we had to choose a method for estimating the parameters of our model, e.g., the beta weights and variance of the residual from regression. A natural choice was Ordinary Least Squares (OLS) regression. OLS estimators have the smallest sampling variance (or standard error) among the class of unbiased estimators of the regression weights (path coefficients). These estimators are, therefore, efficient and hypothesis tests based on them, most powerful (Seber, 1977).

The second concern was with sample size. The number of housing developments (and the number of cities) to be sampled was primarily determined by the project's budget. Even though the original proposal called for sampling of sites in eight cities, the approved budget enabled us to conduct our research in three cities with a total of 63 sites. Obviously this very small sample greatly limits our ability to achieve high power. In an effort to increase sample size we considered the possibility of using the respondent as the unit of analysis, thereby increasing our N to more than 2,500. However, as described earlier in this chapter, the site is the only appropriate unit of analysis for testing the hypotheses we wished to test in this study.

The third factor we considered was effect size (ES). There are two estimators which we could reasonably use as measures of effect size, the standardized partial regression weight (path coefficient) or the squared multiple semipartial correlation. The tests for the hypotheses that each of these estimators is zero are the same (Cohen & Cohen, 1975). We chose to base our power analysis on the squared multiple semipartial correlation since it is easier to manipulate mathematically and to understand intuitively. The squared multiple semipartial correlation (sR^2) simply refers to that proportion of dependent-variable variance accounted for or explained by a given independent variable. In a nonexperimental study like this one the value of sR^2 lies completely beyond the control of the investigator. It is a property of the causal system which is being studied; its value is determined within the system of causal relations. Thus, for our power analysis we could only try to anticipate the likely sR^2 values for the independent and intervening variables in our model. Previous research in this area (Newman, 1972, 1973) suggested that the dependent variables in our system were determined by many factors, most of which exert rather small effects. Indeed, we expected that any factor affecting the dependent variables of fear, personal crime, burglary, and instability individually would explain only between 1% and 10% of criterion variability. In Cohen's (1977) terminology, we anticipated "small" to "moderate" effects for the independent variables. Although we could not artificially increase these effect sizes, we could and did use them in our power calculations. As will be shown below, we estimated the potential power of our tests for a set of effect sizes in the range of 1% to 15% of criterion variance explained. To summarize to this point: We wanted to maximize the power of tests of significance of the OLS regression coefficients based on 63 observations where the effect sizes were likely to be less than 15% of dependent-variable variance explained while minimizing the risks of Type I errors of inference.

The final step in the power analysis involved consideration of PEI and PEII. The two kinds of error rates (or, alternatively, PEI and power) have to be decided simultaneously, since they are perfectly (negatively) correlated for fixed N and ES. That is, once PEI is chosen, then PEII (or power) is automatically set as well. In order to determine the effects of various choices of PEI on power, we calculated the power of statistical tests for combinations of values of ES (2%, 5%, 10%, and 15%) and PEI (.01, .05, .10, and .15) under the assumption of N = 63. It should be pointed out that power for sR^2 also depends upon the definition of Mean Square Error (MSE) of regression. We decided that Model II error (Cohen & Cohen, 1975) was appropriate for our tests, i.e., the error variance was calculated with all of the independent variables for that equation included in the regression. Since MSE defined in this way varies inversely with the squared multiple correlation for the total equation (i.e., with all explanatory variables included), we computed power for each of the preceding combinations of ES and PEI assuming squared multiple correlations of .3, .5, and .7. It turned out that all seven of the equations in our model had squared multiple correlations in this range. (See Chapter 8.) The results of the power analysis are presented in Table E.1.

A quick inspection of the tabled values indicates that most of the tests of causal coefficients that we wished to make in this study would be conducted with unacceptably low power (high probability of Type II errors) if we adopted either of the conventional criteria for significance, .01 or .05. Most of the power values for PEI = .01 and PEI = .05 are less than .50. This means that our chances of identifying _real_ effects would average less than 50%. Only for the largest of the anticipated effects ($sR^2 = .15$) contained in those equations possessing relatively great explanatory capability ($R^2 = .7$) would power of .80 be found for the conventional PEI criteria. Examination of the power values for PEI = .10 and PEI = .15 shows improved power as they necessarily must. However, even with PEI = .15, an almost unheard

Table E.1

Statistical Power for Test of Null Hypothesis that Path (Regression) Coefficient Equals Zero

Squared Multiple Correlation for Full Equation	PEI	Magnitude of Effect to be Detected .02	.05	.10	.15
.3	.01	.04	.05	.15	.26
	.05	.15	.23	.34	.49
	.10	.25	.29	.46	.62
	.15	.33	.35	.55	.70
.5	.01	.03	.09	.26	.43
	.05	.11	.24	.49	.67
	.10	.19	.35	.62	.78
	.15	.27	.42	.70	.80
.7	.01	.05	.18	.55	.82
	.05	.15	.39	.75	.93
	.10	.25	.52	.85	.97
	.15	.33	.60	.92	.99

Note -- Tabled entries are statistical power, i.e., the probability of rejecting a false null hypothesis. Values in rows for nominal PEI = .01, .05, and .10 are taken from Tables 9.31, 9.32, and 9.33 in Cohen, 1977, pp. 416-418. Powers for PEI = .15 are approximate values derived by a consultant for this study.

of nominal Type I error rate in social research, Cohen's convention for power of .80 is reached only in those instances where the effects are moderate to large in size and most of the criterion variance is accounted for by the set of explanatory variables.

We were thus confronted with something of a dilemma. In order to detect even moderate sized effects in the seven equations constituting our causal model we would have to adopt a significance criterion that exceeded the traditional standard. This forced upon us an in depth analysis of the relative consequences of Type I and Type II errors. For all of the effects to be tested we first considered the costs of false positive errors, i.e., concluding that an effect was real when in the population it was actually zero. Then we evaluated the costs of false negative errors, i.e., concluding that an effect was zero when in the population it was really nonzero. Space does not permit us to recount all of the circumstances, issues, potential outcomes, and consequences that we considered. However, our conclusion is easily summarized: The consequences of Type II errors seemed to us to be almost as deleterious as those of Type I errors; thus, it was incumbent upon us to balance these two error rates to a greater degree than the conventional PEI levels allowed. We, therefore, adopted PEI = .15 as the criterion for statistical significance in this investigation. In supporting our decision, we note two of the main factors which influenced our judgment. First, defensible space is a relatively new and untested theory. Drawing an incorrect conclusion that a particular variable, e.g., building size, has no effect on residents' fear when there are no other research results available which bear on this question may prematurely stop a promising line of inquiry. Such outcomes are much less likely to occur for theories which have been extensively investigated. Second, this was not an experiment or quasi-experiment (Cook & Campbell, 1979), the purpose of which was to evaluate several models of physical environment which were purposely constructed to reduce crime, fear, and instability. Instead, this was a survey study of uncontrolled variables (Bock, 1975) from which we hoped to draw inferences about the causal structure of the system. Certainly our findings would have implications for policy. However, the results would not dictate policy. Stricter control of Type I error rates needs to be maintained in those experimental studies where the effectiveness of various "treatments" is evaluated. Since our study was not of this character, a higher PEI could be tolerated. In conclusion, for these and other reasons we felt justified in relaxing our criteria for statistical significance. Although our choice of PEI = .15 does not afford us with as much power as we would ideally like to have, it does represent a great improvement over that produced by the conventional PEI levels.

Table F.1

Correlation Matrix
of All Independent, Intervening, and Dependent Variables
(Lower triangle: correlation coefficients)
(Upper triangle: N of cases for correlation)

	Building size	Accessibility	Low-income/AFDC	Teen-adult ratio	Cooperative	Police service	Guard service	Rent collection	Use of space	Social interaction	Control of space	Burglary rate	Personal crime rate	Fear
Building size	1.00	63	63	63	63	57	54	51	63	63	63	63	63	63
Accessibility	-.13	1.00	63	63	63	57	54	51	63	63	63	63	63	63
Low-income/AFDC	.02	.49	1.00	63	63	57	54	51	63	63	63	63	63	63
Teen-adult ratio	-.18	.26	.46	1.00	63	57	54	51	63	63	63	63	63	63
Cooperative	-.17	-.27	-.30	-.11	1.00	57	54	51	63	63	63	63	63	63
Police service	-.23	-.07	-.09	-.28	.01	1.00	49	47	57	57	57	57	57	57
Guard service	.18	-.29	-.12	-.07	.09	-.39	1.00	47	54	54	54	54	54	54
Rent collection	-.14	-.28	-.70	-.32	.07	-.01	.01	1.00	51	51	51	51	51	51
Use of space	-.56	-.12	-.25	.21	.27	.08	.06	.13	1.00	63	63	63	63	63
Social interaction	-.29	-.33	-.21	.24	.39	-.34	.24	.02	.45	1.00	63	63	63	63
Control of space	-.22	-.45	-.71	-.32	.32	-.16	.18	.50	.29	.49	1.00	63	63	63
Burglary rate	-.13	.49	.29	.28	-.17	-.06	-.18	-.16	.01	-.11	-.33	1.00	63	63
Personal crime rate	-.05	.02	.24	.16	.18	.27	-.06	-.48	0	.12	-.32	.11	1.00	63
Fear	.35	.36	.69	.37	-.26	-.11	.14	-.51	-.43	-.27	-.71	.18	.26	1.00
Instability	.37	.40	.58	.25	-.39	-.11	.14	-.54	-.31	-.44	-.61	.34	.06	.50

Table F.2

Standardized Partial Regression Coefficients for All Direct Paths in Burglary Model (Standard Errors in Parentheses)

	Rent collection	Use of space	Social interaction	Control of space	Burglary rate	Fear of crime	Instability
Building size	−.20[c] (.12)	−.52[a] (.13)	−.31[b] (.15)	−.30[b] (.13)	−.12 (.22)	.22[d] (.15)	.25[d] (.16)
Accessibility	−.02 (.13)	−.03 (.15)	−.32[b] (.13)	−.12 (.12)	.39[b] (.19)	.04 (.14)	−.05 (.14)
Low-income/AFDC	−.73[a] (.03)	−.44[b] (.20)	−.27 (.19)	−.57[a] (.17)	−.18 (.30)	.32[d] (.20)	.10 (.22)
Teen-adult ratio	−.10 (.17)	.30[b] (.14)	.16 (.14)	−.22[c] (.12)	.09 (.20)	.16 (.13)	.06 (.14)
Cooperative	−.19[d] (.07)	.07 (.13)	.17 (.12)	−.03 (.10)	−.05 (.17)	.03 (.11)	−.13 (.12)
Police service	−.19[d] (.09)	.05 (.15)	−.43[a] (.14)	−.28[b] (.13)	−.10 (.21)	−.03 (.14)	−.25[d] (.15)
Security guard service	−.11 (.12)	.13 (.14)	−.01 (.13)	−.04 (.11)	−.06 (.17)	−.10 (.11)	−.15 (.12)
Rent collection		−.16 (.18)	−.28[c] (.17)	−.04 (.14)	−.01 (.24)	.01 (.14)	−.40[b] (.16)
Use of space			.16 (.14)	−.06 (.13)	.01 (.25)	−.19 (.13)	.10 (.15)
Social interaction				.25[c] (.14)	.06 (.22)	.11 (.15)	−.35[b] (.16)
Control of space					−.29 (.26)	−.39[b] (.18)	−.15 (.20)
Burglary						−.07 (.11)	.16 (.12)
Fear of crime							−.13 (.18)
	df=1,55	df=1,54	df=1,53	df=1,52	df=1,51	df=1,50	df=1,49

[a] $p < .01$
[b] $p < .05$
[c] $p < .10$
[d] $p < .15$

Table F.3

Standardized Partial Regression Coefficients for All Direct Paths in Personal Crime Model (Standard Errors in Parentheses)

	Rent collection	Use of space	Social interaction	Control of space	Personal crime rate	Fear of crime	Instability
Building size	$-.20^{c}$	$-.52^{a}$	$-.31^{b}$	$-.30^{b}$	$-.12$	$.23^{d}$	$.22$
	(.12)	(.13)	(.15)	(.13)	(.19)	(.15)	(.16)
Accessibility	$-.02$	$-.03$	$-.32^{b}$	$-.12$	$-.02$	$.01$	$.01$
	(.13)	(.15)	(.13)	(.12)	(.16)	(.13)	(.14)
Low-income/AFDC	$-.73^{a}$	$-.44^{b}$	$-.27$	$-.57^{a}$	$-.32$	$.35^{c}$	$.05$
	(.03)	(.20)	(.19)	(.17)	(.27)	(.21)	(.23)
Teen-adult ratio	$-.10$	$.30^{b}$	$.16$	$-.22^{c}$	$.05$	$.15$	$.08$
	(.17)	(.14)	(.14)	(.12)	(.05)	(.13)	(.14)
Cooperative	$-.19^{d}$	$.07$	$.17$	$-.03$	$.15$	$.02$	$-.12$
	(.07)	(.13)	(.12)	(.10)	(.14)	(.11)	(.12)
Police service	$-.19^{d}$	$.05$	$-.43^{a}$	$-.28^{b}$	$.30^{d}$	$-.05$	$-.24^{d}$
	(.09)	(.15)	[illegible]	(.13)	(.19)	(.15)	(.16)
Security guard service	$-.11$	$.13$	$-.01$	$-.04$	$.04$	$-.09$	$-.16$
	(.12)	(.14)	(.13)	(.11)	(.15)	(.11)	(.12)
Rent collection		$-.16$	$-.28^{c}$	$-.04$	$-.48^{b}$	$.05$	$-.44$
		(.18)	(.17)	(.14)	(.20)	(.16)	(.18)
Use of space			$.16$	$-.06$	$-.19$	$-.18$	$.08$
			(.14)	(.13)	(.18)	(.14)	(.15)
Social interaction				$.25^{c}$	$-.33^{d}$	$.08$	$-.31^{c}$
				(.14)	(.20)	(.16)	(.17)
Control of space					$-.44^{c}$	$-.34^{c}$	$-.24$
					(.23)	(.19)	(.21)
Personal crime						$.07$	$-.08$
						(.13)	(.14)
Fear of crime							$-.15$
							(.19)
	df=1,55	df=1,54	df=1,53	df=1,52	df=1,51	df=1,50	df=1,49

$^{a}p < .01$

$^{b}p < .05$

$^{c}p < .10$

$^{d}p < .15$

Table F.4

Standardized Partial Regression Coefficients
for all Total Effects of Independent Variables
(Standard Errors in Parentheses)

	Rent collection	Use of space	Social interaction	Control of space	Burglary rate	Personal crime rate	Fear of crime	Instability
Building size	-.20[c] (.12)	-.49[a] (.13)	-.33[a] (.12)	-.34[a] (.10)	-.05 (.15)	.11 (.15)	.41[a] (.11)	.39[a] (.12)
Accessibility	-.02 (.13)	-.03 (.15)	-.32[b] (.14)	-.20[c] (.11)	.43[b] (.17)	-.03 (.17)	.06 (.12)	.16 (.14)
Low-income/AFDC	-.73[a] (.03)	-.32[b] (.15)	-.11 (.14)	-.55[a] (.12)	-.02 (.18)	.29[d] (.18)	.57[a] (.13)	.40[a] (.14)
Teen-adult ratio	-.10 (.17)	.31[b] (.14)	.24[c] (.14)	-.18[d] (.11)	.16 (.17)	.21 (.17)	.18[d] (.12)	.07 (.14)
Cooperative	-.19[d] (.07)	.10 (.13)	.24[c] (.12)	.03 (.10)	-.04 (.15)	.29[c] (.15)	.03 (.10)	-.14 (.12)
Police service	-.19[d] (.09)	.08 (.14)	-.36[a] (.14)	-.37[a] (.11)	-.01 (.17)	.42[b] (.17)	.05 (.12)	.01 (.13)
Security guard service	-.11 (.12)	.15 (.14)	.04 (.14)	-.04 (.11)	-.04 (.16)	.10 (.16)	-.10 (.11)	-.10 (.13)

[a] $p < .01$

[b] $p < .05$

[c] $p < .10$

[d] $p < .15$

df = 1,55

APPENDIX G:

MEASURES FOR REDUCING ACCESSIBILITY IN DIFFERENT BUILDING TYPES

Just as the accessibility of each building type was rated differently, so the measures that can be adopted to reduce accessibility are different for each type of building.

Row Houses

Access to the interior of row house units is usually gained through windows. This is because the doors to the units, front and back, are usually solid, well-installed, and equipped with a reasonable lock. However, if the doors are not sound, one must begin to reduce accessibility in row houses with the installation of new doors, frames and locks.

All doors to the unit that are directly accessible from the public street should be of solid wood, sturdy hollow metal or metal-covered wood. No windows should be located within the door but the door should be equipped with a peep-hole containing a wide-angled lens. Peep-holes without lenses should be avoided as they can be dangerous for the resident to use. If there is an existing small window in the door (± one square-foot maximum), it can be made resistant to break-ins by protecting it with a security screen or bars or by replacing the single-weight glass with double-weight glass. The glass should be installed and firmly secured (screwed) in the door from inside the unit.

Door frames play as important a part in the security of a door as the door and its lock. Every outside door should fit snugly in its frame. The frame, whether of solid wood or heavy guage hollow metal, should be securely anchored with metal rods into the surrounding wall. If the frame is of hollow metal, the area around the lock should be packed solid with cement grout. This is because locks of doors are often sprung open by pusing the frame away from the door in the area of the lock.

All locks should be of the mortise type and equipped with one inch long dead-bolts. Key-in-the-knob locks should be avoided -- they are easily defeated. Mortise locks that are equipped with "stop-work" buttons for freezing the latch should be avoided; they cost more and produce a false sense of security. The cylinder of the lock should have at least six pins. Avoid a master-key system; it defeats the utility of high quality locks, effectively reducing a six pin lock to three pins. For a more detailed discussion (with illustrations) of the mechanisms for securing doors and choosing locks see pages 167 through 206 of the publication our Institute prepared for LEAA and HUD: Design Guidelines for Creating Defensible Space (D.G.C.D.S.) (G.P.O. stock # 027-000-00395-8).

The accessibility of windows in row house units may be reduced in one of two ways: by securing the window itself, or by securing the grounds that give access to the windows. In most cases it is cheaper to secure the windows than the grounds around them, however there are additional advantages that accrue with the securing of the grounds.

Windows can be secured through the installation of a security screen window guard. This is most easily installed when the windows slide up and down (double-hung) or open inwards. The screen or guard can then be installed on the outside wall. Security can also be achieved through the installation of a new outside layer of horizontal louvered windows of small dimension and set within sturdy metal frames (see P. 197 of D.G.C.D.S.). The latter, although more costly than security screens or guards, look better and also provide additional insulation -- helping to pay for themselves in a few years of use through savings in heat loss.

Although the securing of windows in the front of row house units is cheaper than securing the grounds giving access to these windows, this may not be the case with windows at the rear of units. In a row house grouping it is often cheaper to secure the rear windows by cutting off access to the rear of units from the street entirely -- through the use of fencing. Depending on the layout of the existing project it is often possible to place a small run of seven-foot high fencing between the end walls of row house units and so cut off all access to the interior grounds except from the interior of the units themselves. If this is possible, it will prove to be appreciably less costly than securing each ground floor window with security screening, window guards, or additional metal-framed horizontal windows.

Such fencing will also serve to make the rear yard areas themselves more secure, and will result in their more intensive use by residents. The fencing-off of rear yards also helps to secure access to rear doors and to rear second floor windows. If fencing is not used, then rear doors must be made secure in their own right and consideration should be given to the vulnerability of second floor rear windows -- a frequent form of entry by burglars. Second floor windows in the front of units -- which face onto public streets -- are seldom broken into because of their high degree of conspicuousness.

In securing the rear windows and doors to row house units with the use of fencing it should be remembered that the fewer the number of units in the rear enclaves so created, the more effective the security. If the rear walls of a large number of units are grouped together within such an enclave (say, in excess of forty), then access to rear windows and doors is still available from all the other units sharing the enclave. The greater the number of units in the enclave the less the recognition, the greater the social pressure, and the greater the deterrence. If the units are all occupied by families with large numbers of children, the vulnerability of large groupings to break-ins through rear windows may be too great to warrant this type of solution. This vulnerability can be reduced by subdividing the number grouped together with additional fencing.

High-Rises

Access to most of the units in a high-rise building is available to intruders only via the interior of the building. This is because the windows of the ground floor units are the only windows that are easily accessible from the ground outside. There are some second story windows that are accessible from the canopies over entries and other windows that are accessible from the roof or from windows in public circulation areas. Such windows should be treated the same as ground floor windows. In some high-rise buildings in which units are located on the ground floor the bottom sill of the windows is designed to be over six feet above the ground. These are usually inaccessible enough and need no special security. In high-rise buildings which have windows that are accessible from ground level these windows should be secured in the same manner as ground floor windows in row houses.

The major investment in securing the accessibility to apartment units in high-rise buildings should be made by securing common entry and exit doors at ground level. At minimum all these doors should be heavy and solid, have reinforced frames, be equipped with good quality locks, be hung with three to four strong hinges, and be equipped with automatic door-closing hardware. All code-required secondary means of egress (fire-doors) should be equipped with sturdy panic hardware which requires a strong push to open the door.

Emergency exit doors should not be designed with windows or knobs -- inside or outside. Only a keyhole should appear on the outside surface of these doors and one should only be able to open these emergency exit doors from the outside with a key.

The front or main common entry door should be equipped with an intercom and accompanying, apartment-activated electric door-opening device. This allows residents to open the front door from their apartments. However, it must be said that intercoms have not had much success in high-rise buildings that are heavily occupied by low-income families with children. Intercoms work best in buildings occupied by predominantly elderly families or families with few children. In multi-family buildings occupied by low-income families with children intercoms have been shown to remain operational when there are no more than about twenty families sharing a common entry -- six families sharing a common entry is better still.

Control of access to apartment units in a high-rise building occupied by families with children is best achieved with the use of a doorman in combination with the intercom system described above. The emergency exit doors which are not in view of the doorman at the entry should then be equipped with alarms to alert the doormen to their unauthorized use. The fencing of the grounds around such a building so as to enable the doormen positioned at the main entry door to control access to the grounds as well as to the building makes him especially effective. A doorman positioned at the main entry door and able to control access to fenced-off grounds, parking, and to the emergency exit doors is the most effective way to control access to units in high-rise buildings.

A doorman placed in a fixed position which allows him to control access to a building and its grounds is much preferred over a security system which employs roaming guards. It is as difficult to monitor the activities of roaming guards as it is for roaming guards to control access to their buildings. Roaming guards who do not want a stationary post claim to be able to apprehend criminals better within their building and complex if they are allowed to roam rather than remain stationary. But it is preferable to position the guard at a fixed point at the main entry so as to keep criminals from getting into the building in the first place rather than to be able to apprehend one or two occasionally after they have entered the building.

Walk-ups

As our accessibility rating system indicated, walk-up buildings suffer the disadvantages of both row houses and high-rises. Depending on the height of the walk-up (two to four stories) 25% to 50% of the apartment units will be located on the ground floor and will have their windows directly accessible from the outside grounds -- front and back. Access to apartment units in walk-ups can also be gained via the entry door to the apartment which may be located on an interior corridor or stair, or on an outside, open gallery. The accessibility to units via the common entry and exit doors to the walk-up building therefore must also be considered. Finally, if the apartment unit is part of a galleria walk-up building there are likely to be windows from each apartment that are accessible from these outside corridors (or galleries). Reducing the accessibility of apartment units in walk-ups is thus a more complex procedure than it is in row house or high-rise buildings. Each type of walk-up building must be discussed separately.

<u>Type A: Walk-ups with enclosed interior stairs and corridors.</u> Ground floor windows should be secured with heavy-duty screens, window guards or horizontal louvered windows, as discussed under row houses. If the existing walk-up buildings are grouped in such a way as to allow a small run of fencing to secure a rear yard area common to a few buildings, then this might prove less expensive than securing the rear windows of each ground-floor unit. Again, savings in cost by this collective action may be offset by reduced effectiveness resulting from the large number of units sharing the enclosed common rear yard area.

The front, common entry door to a walk-up building should be secured by an intercom and buzzer-reply system. When units are occupied by families with children, the intercoms in walk-ups will be more effective and remain operable longer than they will in high-rise buildings because fewer families share each intercom. The secondary exit doors in walk-ups should be secured as recommended for high-rise buildings. If a fence is employed to secure the rear yards, then the secondary exit doors should lead out to these enclosed, common rear yard areas. There is a problem with this recommendation however, as most municipal fire-codes require that the emergency exit doors lead to the street. A variance may be obtained if it can be shown that residents escaping from the emergency exit doors have sufficient rear grounds available to them to be able to get clear of the flames and debris of the building were it to be on fire.

The doors to the individual apartment units that are located on interior corridors should be secured in the same way as the doors to apartment units in high-rise buildings.

<u>Type B: Walk-ups with Open (Gallery) Corridors</u>. Galleria walk-ups commonly have two characteristics which distinguish them from other walk-ups (Type A): they are seldom provided with a common entry door (or doors); some of the windows from each unit face onto the open, access corridor (gallery). They have been designed, in effect, like piggy-back row house units. This similarity to row house units is not in their favor. Where the ground floor, street-facing windows in row house units are usually visible from the street, the second and third floor windows of galleria units are often hidden

from view from the street by the gallery itself. To restrict accessibility, the windows of galleria units which face onto the access corridors should therefore be treated in the same way as the front, ground floor windows of row house units.

If it is possible to easily add ground floor, common entry and exit doors to galleria buildings, this is recommended. The front doors should be secured with intercoms and the emergency exit doors with panic hardware as discussed under high-rises.

From the above it can be seen that walk-up buildings, and gallerias in particular, are the most costly building type, on a per unit basis, to retrofit to reduce accessibility. A policy of leasing these units to two-parent, working-class families with few children, or to youthful elderly may be less costly and more effective as a long-term investment. With such a resident population an investment in fencing to enclose and restrict access to communally defined grounds would be comparatively inexpensive and as effective as securing all common doors and each window which faces onto an access gallery.

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