ABSTRACT

BEHAVIORAL CORRELATES OF PERCEIVED STRESS
IN THE URBAN ENVIRONMENT:
SPATIAL RESTRICTION IN METROPOLITAN DETROIT

by

Robert M. Pierce

The aims of this study are threefold: 1) to determine if there is a relationship between a characteristic of the environment, spatial restriction, and behavior indicative of social well-being, 2) to indicate where in the urban environment that relationship is manifested and 3) to explain why the relationship is found in certain parts of the city and not in others.

Behavioral scientists, primarily psychologists and sociologists, have in recent years increasingly focused their research interests upon various forms of density as stimuli which influence behavior detrimentally. Results of animal research are consistent with this conclusion, but aggregate as well as laboratory findings on human behavior are far more inconclusive. At present it cannot be definitively stated that density does or does not affect human behavior. It is the initial task of this research, then, to continue seeking answers to questions previously asked regarding the hypothesized relationship between place and behavior.

This research makes three major contributions to density-related behavioral research. First, it expands the concept density by including several forms of concentration under the guise of spatial

restriction. This broadens the focus of the problem, which has previously been analyzed in terms of population or room density only. Previous analyses have been carried out at the macro level of an entire city, or the micro level of the laboratory. Both forms of research help to determine if density is related to behavior, but neither provides an indication of where in the city we will find high levels of spatial restriction and related behavior. The second major contribution of this research is an intra-city, spatial approach to the problem. This spatial approach is particularly important because it indicates where in the city high restriction abounds and to what degree certain forms of behavior co-occur with this environmental characteristic.

The third major contribution of this study is the development of an environment-perception-behavior framework which attempts to explain the spatial patterns of restriction-related behavior. By analyzing the environmental perceptions of individuals occupying high restriction locations, it is possible to determine how the individual evaluates such surroundings. It is hypothesized that restrictive environments are perceived as stressful by their occupants, and that those perceiving their environment in this threatening manner will engage in behavior that is potentially harmful to themselves and others as a response to this cognition of stress. By gathering evidence in the field of perception of the environment, it is believed that this research makes a significant contribution to density-related behavioral research. This study not only indicates if and where density is associated with behavior, but offers perception of environmental stress as an

explanation of why the elements present in a location may or may not affect behavior.

Two levels of analysis, aggregate and individual, were used to test the hypothesized associations between spatial restriction, stress and behavior. Detroit was selected as the study site for this analysis. Census tract data measuring room, household, and structural densities were correlated with selected behavioral indicators of social well-being. Among these social indicators were family abandonment by parents, marital unrest, children running away from home, and failing to complete high school. Various forms of density, particularly population and structural concentrations, proved to be significantly associated with the behavior -- but primarily in the inner-city and among the black segment of Detroit's population. Results of the aggregate analysis suggested that the physical environment in the form of spatial restriction does co-occur with behavior. It is a behavioral problem to be reckoned with, but is secondary to the difficulty of being black and poor.

Analysis of individual perceptions of the environment does much to explain the aggregate findings. Spatial restriction, more than any other element in the person's residential location, is the major contributor to perceptions of environmental stress. Where restriction and frequencies of behavioral social indicators are high, perceptions of stress are equally great. Populations residing in restrictive environments perceive their surroundings in significantly stressful terms. These results suggest that perception may indeed have a role in responses to the environment.

The results of the individual analysis also confirm that in the final assessment, the question of stress and social well-being cannot

be considered solely in terms of the physical environment. It is equally if not more stressful to be black and poor. Any future attempts to implement programs designed to reduce stress and such behavior must address this fact.

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Five of the most important years of my life have been spent at Michigan State University. They have been important not only because they have helped me advance towards a career goal, but also because they have provided me an immeasurable degree of personal growth. This brief statement cannot adequately indicate the thanks I owe my department, advisor and many others, but it is hoped that they will more fully realize the keen sense of gratitude I feel.

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to my advisor Dr. Stanley Brunn. Dr. Brunn has provided me invaluable guidance in my program development and the completion of the dissertation. I shall not forget the many challenging sessions with him in which I was forced to think, reevaluate and improve. All students need some degree of encouragement and Dr. Brunn provided that stimulus.

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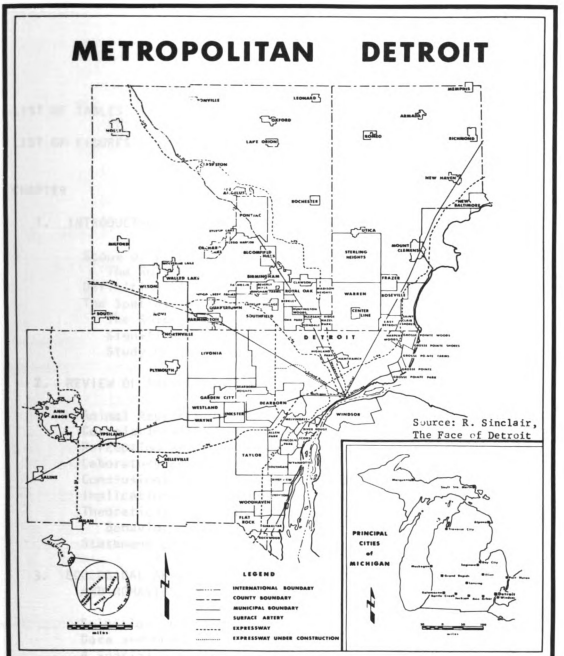
METROPOLITAN DETROIT
DETROIT
LEGEND
INTERNATIONAL BOUNDARY
COUNTY BOUNDARY
MUNICIPAL BOUNDARY
SURFACE ARTERY
EXPRESSWAY
EXPRESSWAY UNDER CONSTRUCTION
PRINCIPAL CITIES of MICHIGAN
Source: R. Sinclair, The Face of Detroit

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CHAPTER 1

INTRODUCTION

An "environmental" problem exists if we can detect a disruption between the designed environment and the system of behaviors which is to be accommodated by that environment. The most prominent of man's designed environments is the city and it is the city which may also be the cause of numerous physical and social maladies. While Western cities have overcome the majority of problems of santiation and hygiene which beset the first phase of urban growth, health problems of a different nature have arisen. These problems consist of an increasing number of disturbances in interpersonal relations and disruptions of social behavior which seem to stem from the process of living in the city itself.[1]

The link between the environment of the city and the incidence of diseases such as cholera and typhoid fever is rather clear: in the early twentieth century the quality of drinking water in many American cities was sufficiently poor to cause high rates of such illnesses. More recently it has been noted that urban air pollution is probably responsible for

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[1] Wirth, Louis, "Urbanism as a Way of Life," American Journal of Sociology, vol. 40 (1938), pp. 1-24; Simmel, Georg, "The Metropolis and Mental Life," in P.K. Hatt and A.J. Reiss, eds., Cities and Society, (Glencoe: Free Press, 1969), p. 100.

increasing rates of respiratory illness.[2] But determining whether the urban environment is responsible for the occurrence of such behavioral maladies as mental illness, high crime and family instability is much more difficult; hence the task of the behavioral scientist is far more demanding than that facing the physical etiologist. In attempting to account for the presence of a series of behavioral disorders, the scientist is presented with a myriad of possible explanations. For example, high rates of crime, suicide, mental illness and family discord may be explained as much by social and racial factors as the spatial character of the urban setting.

Scope of Problem

It has been asserted that many of the ills of the city are due to overpopulation. Apparently too many people occupying too little space leads to infringements upon basic needs for privacy. These avenues of research have led to the suggestion that population concentration is injurious to an individual's physical and mental stability. The population concentrations found in American cities have led some to doubt the possibility of a desirable quality of life for the inhabitants of densely settled urban settings.

The amount of space available to the urban resident is only one of many characteristics of his setting which could possibly affect his physical and social well-being. Air pollution, noise, crime and poor delivery of social services could all detrimentally affect the individual.

The scope of this dissertation is an environmental one, for its ultimate aim is to determine whether there is a link between place and

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[2] McDermott, Walsh, "Air Pollution and Public Health," Cities: Their Origin, Growth and Human Impact, readings from Scientific American, (San Francisco: W.H. Freeman and Co., 1973), pp. 132-140.

behavior. Are the disruptions in behavior among urban residents due to the nature of their location or can they be explained by other characteristics? In particular, can it be shown that the amount of space made available to the urban resident, compared with other elements in the city environment, contributes to the occurrence of behavior potentially detrimental to individuals and populations.

The Role of Perception - It is conceivable that the city directly influences behavior in the sense that the city as a stimulus elicits particular responses. However, it is more likely that the manner in which the individual mentally structures and evaluates his surroundings mediates the stimulus and response, i.e., environmental behavior. Geographers call this mediation process perception. To what extent perception in turn influences behavior has not yet been determined, but we do know that it is often misleading to view the problem in terms of direct environmental influence. A more realistic assessment of the possible relationship between the urban environment and human behavior should include an analysis of the intervening role of perception.

Few research efforts have attempted to analyze the process through which the population concentration dimension of the urban environment has become associated with behavioral disruptions. Those who have made such endeavors have invariably turned to the concept stress to link environment with behavior. But stress is an ambiguous concept; most etiological studies invoking stress as a causal factor in the incidence of such pathologies as mental illness have defined it differently. Definitions may be given in terms of stimuli, such as electric shock or the loss of a loved one, that lead to changes in the individual; or the definition may be

placed in terms of the outcome from such stimuli (hypersturcture, increased blood pressure or personality disintegration). In some cases stress has referred to the emotional state or experience, a changing personal or social situation. Accompanying such definitional difficulties are a number of questionable assumptions about stress: 1) all unpleasant environmental conditions are stressful; 2) what is stressful for one person will inevitably be stressful for others; 3) events stressful for an individual will lead to behavioral disorder.

While there appears to be no universally accepted criterion or definition of stress, there does appear to be some consensus in the social psychological literature that stress is closely related to perception. Lazarus has proposed that the distinguishing feature of psychological stress is the cognition of "threat-cues" by the individual.[3] Researchers have often concluded that certain elements in the environment are "stress-producing" or that given stimuli are "stressful" without realizing that there first must be evidence that someone finds them so.

If we can determine that individuals or populations perceive certain stimuli as stressful, i.e., that an environment with high population concentration means stress, then changing or removing such a stimulus conceivably will alter one's perception of his environment. Stress, then, can be defined within the context of one's perception of his urban environment and provides a useful construct for analyzing urban environments from the perspectives of their residents. It is defined in this study only in environmental and cognitive terms. It is fully realized that

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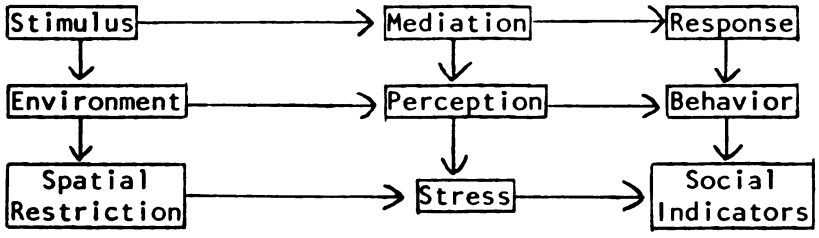
[3] Quoted in Glass, David C. and J.E. Singer, Urban Stress: Experiments on Noise and Social Stressors, (New York: Academic Press, 1972).

stress has physical connotations, but it is believed that environmental stress is a perceptual phenomenon that takes place through the mental evaluations of a location by its occupants.

In summary, the problem of this dissertation is one of place and behavior, and a concern for the mediating role of perception. Using terminology from geography and psychology, the problem can be stated graphically (Figure 1). The environment, in the form of spatial restriction,

FIGURE 1

Statement of Problem



is a stimulus which is mediated by the perception of the individual. If that perception of the environment is stressful, he is likely to respond in ways that are potentially harmful to himself and others.

Definition of Terms

In this analysis spatial restriction is regarded as the independent parameter and behavioral social indicators as the dependent parameter. Spatial restriction is defined as the density of people and structures which combine to affect the amount and quality of contact between individuals and populations. It is to be distinguished from population density or concentration, the number of inhabitants per unit of area, in that spatial restriction also takes into account the manner in which territory is occupied. It not only refers to the number of individuals occupying a

square mile of territory, but also the proportion of that mile used for residential purposes and the structural density of the area. Operationalizing the amount of space available to each individual in terms of simple population density ignores the effect of room size, structural density and building height. A group of 100,000 people living in a series of single-family homes is a much different environmental situation than if that same number was confined to a few high rise apartments. Twenty individuals living in a house surrounded by acres of open land are spatially restricted, but the density of inhabitants for the total area would actually be quite low. In essence, spatial restriction is a term used to refer to various forms of density, e.g., room, household, structural as well as population concentration. By using several forms of density, spatial restriction becomes a more encompassing parameter of population concentration.

The behavioral descriptor harmful or "pathological" appears repeatedly in the psychological literature. In some cases it refers to behavior suggesting a personal breakdown, a distuption of personality development, or behavior that is in some way "deviant" or "abnormal". In other cases it has referred to behaviors suggesting social disorganization.[4]

Normality, in its usual sense, is a statistical concept. When applied to behavior it has traditionally referred to patterns that fall within an acceptable range in a given context. Thus behavior can only be regarded as normal or abnormal when its cultural context is taken into account.[5] The disadvantage of this use of the term is readily apparent.

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[4] Michelson, William, Man and His Urban Environment: A Sociological Approach, (Reading, Mass.: Addison-Wesley, 1970), p. 56.

[5] Howard, A. and R.A. Scott, "A Proposed Framework for the Analysis of Stress in the Human Organism," Behavioral Science, vol. 10 (1965), p. 151.

It eliminates the possibility of a cross-cultural or universal measurement of what is "normal" behavior. Even within the United States there is a sufficient range of cultures and norms to eliminate the use of the term. What is abnormal in the suburbs may be well within the acceptable standards of behavior in the central city.

Behavioral norms, therefore, are not appropriate criteria in the selection of activities which can be considered as disruptions between the designed environment and its inhabitants. Physical breakdowns are more easily delimited, but the focus of this study cannot be exclusively confined to the narrow problem of body tissues. Pathologies in the city extend far beyond increased incidences of lead poisoning, emphysema and death and injury due to automobile traffic. Individuals respond to their surroundings in many ways and physical malfunction is only one.

In order to make comparisons by population and locale, behaviors must be selected so that they indicate in some way the "social well-being" of a population.[6] Social indicators, which are social, economic and behavioral statistics describing the conditions of major aspects of a society, define such activity. These behavioral social indicators are direct measures of welfare, and subject to the interpretation that, if they change in the "right" direction, while other things remain equal, things have gotten better or people are "better off."[7] Behaviors commonly used as social indicators include: crimes of violence, narcotics violations, divorce, children not residing with their parents, suicides, dropping out of high

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[6] Smith, Daivd M., The Geography of Social Well-Being in the United States, (New York: McGraw-Hill, 1973).

[7] Toward a Social Report, U.S. Department of Health, Education and Welfare, Washington, D.C., 1969, p. 97.

school and mental hospital admissions.[8] Social indicators form the parameter of behavior that this study focuses upon, and forms of spatial restriction will then be analyzed to determine to what degree they can account for and explain the variation of this behavior within a metropolitan area.

The Spatial and Interdisciplinary Perspective

One task of socio-medical research is to identify human tolerances for different physical and psychological strains imposed by the environment over various periods of time. Some environmental effects can be inferred from mortality statistics, but an overall hygienic assessment should also include health problems which cause temporary or chronic illness, prolong a period of convalescence or are felt as a malaise, and are generally imcompatible with otherwise rising material standards of living. Statistics reflecting the lingering and less dramatic strains of the environment are extremely limited, but if we are to have a healthier city, more detailed knowledge will be needed as a basis for dealing with the intricate effects of the city on the social health of its inhabitants.[9]

How should a study of this nature be approached? We know that population concentration varies spatially within a metropolitan location,[10] however, we do not know if there are behavioral influences of spatial restriction; or where they take place. Psychologists have attempted to measure behavioral influences of spatial restriction in laboratory tests,

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[8] Smith, op.cit., pp. 70, 94, 104.

[9] Charlestan, Gosta, "The Individual, The City and Stress." in L. Levi, ed., Society, Stress and Disease, (London: Oxford University Press, 1971), p. 143.

[10] Newling, Bruce E., "The Spatial Variation of Urban Population Densities," Geographical Review, vol. 59 (1969), pp. 242-252/

but concern must be maintained for the manner in which restriction and behavior vary from place to place in the city. Only through this spatial perspective can we fully determine where behavior due to restriction occurs. A spatial approach to the problem of behavior will tell us where it occurs but not tell us why it occurs. Answering the latter question requires the analysis of the individual's symbolic and affective view of his surroundings. Evaluation of the environment requires man to interpret the physical and social components of his stimulus field, an area of inquiry shared by the disciplines of geography and psychology.[11]

Geography has long dealt with the stimulus properties of the environment -- weather, topography, city form -- but has only recently considered the symbolic responses men make to those stimuli. Psychology has placed more emphasis on personal attributes arising out of functional and symbolic transactions between men and other stimuli, but those stimuli have been primarily confined to the laboratory or an artificial setting. However, the concerns of both disciplines are similar -- the environment as a stimulus, and man's response to it.

Both geographers and psychologists analyze subjective evaluations of the environment. In geography, man's evaluation of his surroundings is increasingly being linked to his behavior in various settings. The main focus is the individual's mental representation or image of the environment, which is developed on the basis of experience and which serves as his data source for decision making. An individual's attitudes, values, ways of structuring his experiences, and judgments of physical,

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[11] Beck, Robert, "Spatial Meaning and the Properties of the Environment," in Raymond Proshansky, et al., eds., Environmental Psychology: Man and His Physical Setting. (New York: Holt, 1970), pp. 134-135.

aesthetic, and symbolic objects all affect modes of adaptation to environmental elements. The manner in which knowledge of the environment is sorted and structured in the mind is termed perception.

From an environmental perceptual viewpoint, space or territory has meaning according to the purpose for which it is sought and the circumstances under which it is experienced. In the context of spatial restriction, it is clear that judgments of utility or acceptability are not based entirely on objective measures of open space or monetary value, but also include the potential of the space to provide for privacy, isolation, or freedom from whatever one finds distasteful in his environment.[12] That potential will vary as much according to the individual as it will to the physical nature of the space.

Linking place with behavior is a most demanding objective. It requires the philosophies and methodologies of disciplines other than geography, particularly psychology. Methodologies differ but these differences offer benefits to the researcher who utilizes the resources of both disciplines. Geography's research is organized by area, is carried out in the field, and is marked often by generality of vision at the expense of precision of insight. Psychology in the main has ignored the broader physical environment, even though it has studied intensively the perception and symbolization of discrete stimuli. Its carefully controlled laboratory research has often been marked by precision of insight obtained at the expense of the ability to extrapolate its findings to a different scale. Yet findings and principles drawn from psychology may

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[12] Sonnenfeld, Joseph, "Variable Values in Space Landscape: An Inquiry into the Nature of Environmental Necessity," Journal of Social Issues, vol. 22 (October 1966), p. 26.

be highly suggestive for studies relating man's behavior to the environment in which he lives.[13] The strong ties between the two disciplines, help to solve the problems of if, where, and why.

The study of environmental perception continues to be plagued with basic problems of definition and conceptualization. In one of the most recent statements on the status of research in environmental perception and behavior Lowenthal notes the current lack of commonly accepted definitions, objectives and mechanisms. Above all, studies in perception and behavior require a more systematically organized theoretical base.[14] One of the most important results stemming from research could be the development and application of a model that adds to the understanding of human behavior. Too little work has been conducted by behavioral geographers in the past which goes beyond the model building stage. As a result we have a series of frameworks which purport to explain human behavior, but little empirical evidence to support these theories. It is believed that through an empirical, nonlaboratory testing of the model such as that developed in this study, an environment-perception-behavior framework can be demonstrated that has general application in the study of perception and behavior. This would be a most important contribution to meeting one of the major needs of the field: a systematically organized based of theory.

In summary this research will provide an analysis of the roles played by perception and environment in the incidence of behavioral social

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[13] Kates, Robert W., "Stimulus and Symbol: The View from the Bridge," Journal of Social Issues, vol. 22 (October 1966), p. 26.

[14] Lowenthal, David, "Research in Environmental Perception and Behavior, Perspectives on Current Problems," Environment and Behavior vol. 4 (September 1972), pp. 333-342.

indicators as they vary from place to place in the urban setting. If it can be shown that spatial restriction is an important behavioral stimulus, this information can be used in designing new towns and cities, and in formulating urban renewal projects. Such a discovery would be highly significant to those behavioral sicentists and urban planners interested in improving the quality of life in our cities.

The Role of Geography - With its emphasis upon behavior, perception and interdisciplinary analysis, the question may be raised as to the geographical nature of the study. Numerous statements have attempted to delimit and define the discipline by its subject matter, but the spatial perspective of the geographer has remained a common theme. This interest in distribution and in spatial variation appears to be the common denominator that binds the discipline together.

The basic subject of this dissertation is human behavior. Two avenues of study will be taken in its analysis: The analysis of place as it influences behavior and the distributional analysis of behavior. The latter refers to the study of behavior as it varies from place to place, and falls within the traditional confines of geography. The study of behavioral influences of location has also long been of interest to geographers and developments in this branch of the field have been fundamental in its evolution. At the turn of the century American geographers were making deterministic statements regarding the environment's impact on human activity. Sauer was prominent among those leading the discipline away from such an interpretation, suggesting that geography cast off its adherence to determinism as other social sciences had already begun, and rely instead on historical and comparative methods without

recourse to causation.[15] Today, we see a return to the study of environmental influences as a new research tradition in the discipline.[16] The study of behavior in space aims to determine how physical and social elements of a particular location affect human activity, but necessarily considers the all-important function of the individual in its analysis. In this manner deterministic statements can be avoided. The distinction is very similar to the evolution of behavioralism in psychology. This is not to infer, however, that mankind is above the impress of his surroundings To what degree the urban American is affected by his environment is the problem of this study -- a subject that is traditionally geographical.

Significance of the Individual - During recent years many countries have been obliged to take stock of increasing rates of alcoholism, crimes of violence and attempted suicide. Sociological and social-psychological research has shown that clusters of these disturbances are found most commonly in overcrowded underprivileged sectors of the large cities.[17] Explanations for this phenomenon have taken various forms, including the suggestion that physical conditions in the city, particularly in the slum, act adversely upon the resident. Glass and Singer, in their analysis of stress in the city, have concluded that life in the city is an endless round of obstacles, conflicts, confrontations and inconveniences. The

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[15] Chappell, John E. Jr., "On the Causation in Geographical Theory," Proceedings, Association of American Geographers, vol. 1 (1969), p. 37.

[16] Kohn, Clyde, "The 1960's: A Decade of Progress in Geographical Research and Instruction," Annals, Association of American Geographers, vol. 60 (June 1970), pp. 211-219.

[17] Carstairs, George M., "Overcrowding and Human Aggression," Hugh D. Graham and T.R. Gurr, eds., The History of Violence in America, (New York: Bantam Books, 1969), p. 598.

urban dweller is confronted daily with noise, litter, air pollution and overcrowding. Some of these conditions are pervasive. Others occur only at home, or at work, or in transit. "Their incidence is profoundly disturbing...such conditions produce behavioral and physiological consequences inimical to the health and well-being of man."[18]

But an observed departure from the normal, while it may have a statistical connection with the city itself, does not necessarily have a causal connection. It is therefore difficult to determine whether a specific disturbance derives from the physical conditions of the city or is more attributable to the general pattern of urban society -- or has no connection with the city whatsoever. Observation of urban life cannot but lead to the conclusion that despite the unpleasantness of conditions, it does go on. Either the urban environment is not as potent as popularly believed or else man has the capacity to adapt or ward off the detrimental effects of his surroundings.

While it is correct that urban residence does not automatically inflict behavioral disorder, it nevertheless seems true that there is some connection between the two. A crucial factor in the case of spatial restriction may be the absolute number of individuals who are forced or required to interact with one another. When the amount of space per person interferes with any activity or causes too much or forced social interaction, one will be conscious of being spatially restricted. To the extent that this does not occur, spatial restriction will be less apparent.[19]

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[18] Glass, David E. and J.E. Singer, Urban Stress: Experiments on Noise and Social Stressors, (New York: Academic Press, 1972), p. 5.

[19] Freedman, Jonathon L., "Conceptualization of Crowding," Population Distribution and Policy, (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 507-508.

Whether speaking in terms of the general urban environment or the element of spatial restriction, it seems clear that the role of the individual may be significant in determining whether disruptions will occur in the environment-behavior relationship. In each of the posited explanations, variations in individual adaptation levels are the keys to the appearance of social indicators. This reemphasizes the need to consider the role of individual perception, and the importance of avoiding the use of a stimulus-response model.

Study Objectives - Spatial restriction has been defined in strictly objective terms; yet the above discussion intimates that it is the individual's subjective evaluation of his surroundings which is the basis for understanding variations in behavioral responses. Subjective indicators are needed to supplement objective measures of spatial restriction for the very reason that an individual's response to a set of circumstances is dependent, not only on those circumstances as viewed obejctively, but on a whole set of values, attitudes and expectations that he brings into the situation.[20] Thus being spatially restricted is not merely having so many inhabitants and residential structures per square mile. It is also very much a subjective experience. Just as objective indicators can be misleading and will remain so until measures of the human meaning attached to them are obtained, so are subjective indicators by themselves insufficient as guides to policy.[21] Therefore, this analysis of spatial restriction

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[20] Marans, Robert and Willard Rogers, Toward an Understanding of Community Satisfaction, Mimeo, Institute for Social Research, (Ann Arbor: University of Michigan, December 1972), p. 7.

[21] Ibid., p. 10.

will be conducted on two levels: objective and subjective. The objective analysis will examine behavioral correlations with measures of physical space, e.g., persons per room and persons per square mile, and the subjective analysis will inspect correlations between behaviors and the evaluation the individual attaches to his surroundings. By conducting the study from a dual perspective, we can determine 1) if physical measures of spatial restriction are perceived as confining; 2) what aspects of restriction, objective and subjective, are closely associated with selected forms of behavior; and 3) if behavioral correlations with objective measures of spatial restriction can be explained by evaluations of the environment by urban residents, or by other factors, such as race or poverty.

CHAPTER 2

REVIEW OF THE LITERATURE

In order to develop research hypotheses and determine appropriate methods for testing them, it is necessary to review previous research which has concentrated on behavioral responses to spatial restriction. A review of previous research serves as a reference point which can be used as a guideline for meeting the author's own research objectives. In addition to developing hypotheses and a methodology, a survey of research findings can help provide meaning to findings obtained in this study.

This chapter investigates how others have approached the problem of restriction and behavior and the present status of the hypothesized link between the two themes. From this review a series of research hypotheses will be developed for testing.

Three basic lines of research have been related to the issue of spatial restriction: aggregate level correlational studies, research on the human use of space, and laboratory studies concerning the effects of spatial restriction on human behavior. Each has produced varied results while treating important methodological and conceptual issues.

What are the physical and social consequences of a continued, massive concentration of human populations? As yet, the science of human behavior is not sufficiently developed to answer this question

with precision, or even with confidence.[1] However, it is possible to learn from studies of animals, both in their natural environment and under experimental conditions. Certain regularly occurring consequences of severe spatial restriction are reported in animal populations. This research warrants some attention.

Animal Research - In 1962 John Calhoun published his poineering study which detailed the ways in which extreme population density, defined as the number of Norway rats occupying a specified amount of territory, affected their behavior.[2] In his experiment he provided the rodents with sufficient food and water, but held constant the amount of space they occupied. A population increase meant the amount of space for each member decreased. Under these conditions Calhoun observed the effects of what he described as "pathological togetherness." As population density increased through natural reproduction, conflict cycles among males began to disrupt the social structure of the population and its spatial distribution. Dominant males horded females in inaccessible pens located adjacent to a large central pen. Subordinate males and other females crowded into the central area and it was this portion of the population that demonstrated pathological social patterns. In this "behavioral sink" females abandoned their litters, failed to make nests and failed to bring their pregnancies to full term. Cannibalism occurred and some males in the crowded central area demonstrated sexual deviance,

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[1] Carstairs, George M., "Overcrowding and Human Aggression," in Hugh D. Graham and T.R. Gurr, eds., The History of Violence in America, (New York: Bantam Books, 1969), p. 594.

[2] Calhoun, John, "Population Density and Social Pathology," Scientific American, vol. 206 (1962), pp. 139-148.

with some becoming homosexual or pansexual. Others demonstrated a behavior which Calhoun called "probing." Probing rats were sexually hyperactive males and often cannibalistic, forcing intercourse on females in their nests, something normal male Norway rats never do. Research dealing with other animals has indicated that rats are not alone in being adversely affected by a high density environment, but Calhoun's work has received the greatest attention and is representative of this form of spatial restriction research.

The applicability of data from animal research to the analysis of human spatial restriction is open to question. There is strong evidence against a direct association between rodent and humna behavior. Rodham cites many studies which support his view that rat behavior is predominantly stereotyped and reflexive, the result of stimulus-response, and not cognitive. He proposes that cognition allows man-made degrees of behavioral freedom and is a necessary ingredient for the development of culture.[3] Biologist Dubos sees little application of Calhoun's research to human situations.[4] Getis and Boots have concluded that little has been done in the study of rat behavior that has direct bearing on analysis of human spatial behavior. In part this is due to the fact that little attention has been paid to the spatial behavior of rats. With the exception of Calhoun, few psychologists have considered such factors as density and spacing. Thus the geographers do not reject the possibility of human

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[3] Rodham, C., "Cultures, Rats and Men," American Journal of Psychology, vol. 58 (1945), pp. 262-266.

[4] Dubos, Rene, "The Social Environment," In Environmental Psychology: Man and His Physical Setting, Raymond Proshansky, et al., eds., (New York: Holt, 1970), pp. 202-208.

implications from the spatial aspects of rat behavior. They do note, however, that enormous field work difficulties face researchers interested in making such ties.[5]

Stea, in a recent review of the geographical nature of this animal research, is much more positive. He has concluded that it has prominent implications for spatial learning by human beings. "While it is true that much more of rat behavior may be termed 'instinctive' considerable spatial learning does take place, and the parallels between the two organisms in this respect may be much closer than in others."[6] It would be misleading to suggest that evidence is primarily against behavioral associations between rodents and human beings. Others have drawn much broader implications than has Stea. Tolman was among the first to argue that an examination of rat behavior would exhibit basic laws and principles which underlie and therefore "explain" man's cultureized intelligence, motivation and instability.[7] Carey, in reaching the most sweeping conclusion, has surmised that Calhoun's research "conjures up the ghastly image of the turmoil-ridden core city surrounded by the relatively more placid suburbs."[8]

Although it is not the purpose of this chapter to debate the above issue, it is beneficial to examine non-human responses to spatial

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[5] Getis, Arthur, and Barry N. Boots, "Spatial Behavior: Rats and Man," Professional Geographer, vol. 23 (January 1971), pp. 11-14.

[6] Stea, David, "Rats, Men and Spatial Behavior, All Revisited or What Animal Geographers Have to Say to Human Geographers," Professional Geographer, vol. 25 (1973), pp. 106-112.

[7] Tolman, E.C., "A Stimulus-Expectancy Need- Cathexis Psychology," Science, vol. 101 (1946), pp. 160-166.

[8] Carey, George, "Density, Crowding, Stress and the Ghetto," American Behavioral Scientist, vol. 15 (March/April 1972), p. 502.

restriction because they suggest other aspects of human behavior that might be investigated. It would appear that direct human implications of such research are limited by problems of validity which arise whenever one generalizes from communities of rats to societies of men.

Correlational Studies

Until recently there were few studies relating the behavior of human beings to crowded environments, and these produced rather inconsistent results. Scientists interested in the epidemiology of mental health were only indirectly concerned with the affects of crowding on human behavior; they preferred to relate the distribution of a pathology to population characteristics. One value of such research is that it provides clues to the etiology of the disorder. When a high rate of occurrence is found to be associated with certain population characteristics, the implication is that these characteristics contribute to the production of the disorder; one such characteristic is high population density.

The classic epidemiological study of mental illness was conducted by Faris and Dunham.[9] Their analysis of the spatial distribution of schizophrenia and manic-depressive psychosis in Chicago indicated that the highest rates of mental disorder were found in those parts of the city that they characterized as socially "disorganized." A transect from the inner city to the urban fringe revealed decreasing rates of hospitalized schizophrenia. Highest rates of illness were found among those social and ethnic groups residing in the most densely populated

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[9] Faris, Robert E. and Warren Dunham, Mental Disorders in Urban Areas, (Chicago: University of Chicago Press, 1939).

areas of the city. The initial findings of Faris and Dunham have been replicated elsewhere. In each case the hypothesized inverse relationship between social class and the incidence of mental disorder and the positive association between pathology and high density were substantiated.[10] Other epidemiological studies of mental illness have dealt directly with its spatial distribution and relationship to high population concentration. Downs and Simon reported that various diseases and maladies, including psychoneuroses, cluster in those areas of Baltimore where population density is high.[11] Similar findings of spatial clustering are reported in St. Paul[12] and Boston.[13]

Mental illness has not been the only subject of epidemiological research related to spatial restriction. Schmitt computed five different measures of population density for the census tracts in Honolulu and

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[10] See : Hollingshead, A.B. and F.C. Redlich, Social Class and Mental Illness, (New York: John Wiley, 1958); Kaplan, Bert, Robert B. Reed, and W. Richardson, "A Comparison of the Incidence of Hospitalized and Non-Hospitalized Cases of Psychosis in Two Communities," American Sociological Review, vol. 27 (August 1962), pp. 472-479; Jaco, E.G., The Social Epidemiology of Mental Disorders, (New York: Russell Sage, 1960); Robins, L.N., et al., "The Interaction of Social Class and Deviant Behavior," American Sociological Review, vol. 27 (August 1962), pp. 480-492; Dunham, Warren, Community and Schizophrenia: An Epidemiological Analysis, (Detroit: Wayne State University Press, 1965); and Parker, Seymour, and Robert Kleiner, Mental Illness in the Urban Negro Community, (Glencoe, Illinois: Free Press, 1966).

[11] Downs, J. and K. Simon, "Characteristics of Psychoneurotic Patients and their Families as Revealed in a General Mortality Study," Milbank Memorial Fund Quarterly, vol. 22 (1954), pp. 42-46.

[12] Lemkau, Paul, "Position Paper on Mental Health and Housing," Mimeo, prepared for Environmental Control Administration of the Department of Health, Education and Welfare, and the American Public Health Association, 1970.

[13] Loring, William C., "Residential Environment: Nexus of Personal Interaction and Healthful Development," Journal of Health and Human Behavior, vol. 5 (Winter 1964), pp. 166-169.

correlated these with the rates of juvenile delinquency, adult crimes, suicide, mental hospital admissions and other measures. In two studies, separated by approximately ten years, he found strong positive correlations between population per net acre and almost all dependent measures: .30 infant mortality, .70 tuberculosis, .83 veneral disease, .74 mental hospital admissions, .50 illegimate births, .63 juvenile delinquency, .55 imprisonment. The single exception was a .04 for suicides.[14]

These studies of mental illness and other pathologies suggest the possibility of an association between measures of population concentration and behavioral disorders. But is there meaning in this relationship? Or is it merely the result of the clustering of the ill in areas of the city left to them by others, locations which just happen to have large numbers of those people most likely to experience pathologies? Work on mental illness conducted by epidemiologists further suggests the strong possibility that social class, rather than location or spatial restriction is the primary explanatory variable. Members of the lower end of the social spectrum suffer in greater numbers from varying degrees of mental illness. They also tend to be concentrated in those portions of American cities where restriction is greatest. The social geography of urban America tends to indicate that race and poverty covary with spatial restriction, and, in turn, pathology. If the poverty were eliminated, would the difficulties of living in a spatially restrictive environment also disappear?

The correlational studies of Schmitt, Chombart de Lauwe, Winsborough, and more recently Mitchell, and Galle, Gove and McPherson approach these

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[14] Schmitt, R.S., "Density, Delinquency and Crime in Honolulu," Sociology and Social Research, vol. 41 (March/April 1957), pp. 274-276.

issues through aggregate analysis. The most frequent approach is to correlate various census measures of population density, such as number of persons per acre or per dwelling unit with indices of social and medical pathology, rates of crime, tuberculosis and suicide. To account for the potential influence of non-density variables, the effects of characteristics such as income level, education and race have usually been controlled through the technique of partial correlation.

The results of such research have been mixed. Schorr concluded in his analysis of social pathology that poor housing and crowded conditions leads to pessimism, passivity and a general state of dissatisfaction as well as sexual deviancy among residents of urban environments.[15] Winsborough, however, has demonstrated that the positive correlation between density and pathology disappears when certain measures of social status are used as control variables.[16]

Culture appears to be a mediating influence in spatially restrictive environments. Measures of spatial restriction in parts of Hong Kong reach levels far beyond any found in cities of the United States, yet two researchers have concluded that such conditions in Hong Kong do not necessarily lead to behavioral social indicators. Mitchell saw little association between variations in restriction and certain forms of behavior. The only element of social organization that appeared to be affected by restriction pressure was parental control of children. Where room densities were higher, parents found it more

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[15] Schorr, A., Slums and Social Insecurity, (Washington, D.C., 1963).

[16] Winsborough, H., "The Social Consequences of High Population Density," Law and Contemporary Problems, vol. 30 (1965), pp. 120-126.

difficult to maintain household decorum.[17] Schmitt, in an earlier study, concluded that population density per acre is not associated with behavioral anomalies. Other factors, such as cultural traditions and the nature of residential land use, seem to mediate the relationship between population density and human behavior.[18] Conversely, in another cultural setting Chombart de Lauwe found measures of room density to be significantly associated with family disorganization among Parisians.[19]

Two of the most recent aggregate level studies of human behavior in spatially restrictive environments indicate that no definitive answer to the question of environmental influence has been obtained. Like previous studies, they reach opposite conclusions. However, their recency as well as their thorough evaluation of important conceptual and methodological issues central to this study, suggests a detailed analysis.

Galle, Gove and McPherson carried out ecological analyses of human behavior under spatially restrictive conditions.[20] Basing their study upon the findings of Calhoun, the authors were interested in solving two problems: obtaining a means of comparing human with rat behavior and determining what effect population density has upon

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[17] Mitchell, Robert, "Some Social Implications of High Density Housing," American Sociological Review, vol. 36 (February 1971), pp. 18-29.

[18] Schmitt, R.C., "Implications of Density in Hong Kong," Journal of the American Institute of Planners, vol. 29 (1963), pp. 210-219.

[19] Chombart de Lauwe, P., Famille et Habitation, (Paris: Editions du Centre National de la Recherche Scientifique, 1959).

[20] Galle, Omer, Walter Gove and J. Miller McPherson, "Population Density and Pathology: What are the Relationships for Man," Science, vol. 175 (1972), pp. 23-30.

human behavior. Using the seventy-five community areas of Chicago as their units of analysis, Galle et al. selected five human alternatives for the rat behaviors that were judged to be "pathological": 1) fertility, 2) mortality, 3) number of welfare recipients under eighteen years of age in each community, 4) rate of juvenile delinquency, and 5) admission rates to mental hospitals. Selection of mortality and fertility rates affords a direct comparison between human and rat populations, but the other variables are, according to the authors, human surrogates for animal behaviors. Calhoun observed that females congregating in the densely populated central pens failed to make nests for their young and often abandoned their litters. Families receiving public assistance are typically disrupted, having only one parent in residence, and the family is unable to provide for the children in a socially acceptable manner. Because of the similarity in behaviors, welfare rates were used as a human surrogate for the observed rat pathology. As an analog for asocial, aggressive behavior among rat populations, juvenile delinquency rates were used in each Chicago community. As a substitute for withdrawal and psychotic behavior among Calhoun's Norway rats, age-adjusted rates of admissions to mental hospitals were used.

Addressing themselves to the question of intercorrelation between density and socio-economic status and race, Galle, Gove and McPherson statistically controlled for both parameters in their analysis. Their regression analysis of density, defined as population per acre, and pathological behavior led them to a reevaluation of the concept density, as applied to human activity. Initial results of their analysis indicated that socio-economic status and race were more associated with pathological behavior than density. However, given the ability of an individual

to find privacy in his own room, despite living in a high population density location, the authors concluded that mere population density may not be an adequate measure of "density" when analyzing human behavior in spatially restrictive locations. Density could be viewed as a measure of a person's ability to attain privacy as well as the actual amount of space theoretically available to him. Galle, Gove and McPherson refer to the inability to find privacy because of continuous contact with others as "interpersonal press," a form of density. Density, then, was broadened in its interpretation, and was composed of four variables: 1) the number of persons per room, 2) the number of rooms per housing unit, 3) the number of housing units per structure, and 4) the number of residential structures per acre.

As a consequence of their reinterpretation of the concept density, the authors conducted a second analysis of the relationship between the environmental characteristic, socio-economic status and pathological behavior. They found that the measure of density was related to each of the pathological behaviors and in each case a significant relationship remained between the density components and the pathologies when social class and race were used as controls. The number of persons per room proved to be the most highly related to pathological behavior. In conclusion the components of density vis-a-vis the number of people per unit area of analysis, form an important intervening variable that significantly affects the relationship between social class, race and pathology.

Freedman, employing basically the same methodology in his analysis of population density, juvenile delinquency and mental illness

in New York City, reaches the opposite conclusion.[21] "Density" is operationalized through two measures: the number of people per residential acre and the number of people per room in each residence. For each of his New York City Health Areas, Freedman obtained measures of median income, median years of education, percentage substandard housing, unemployment, change of residence and percentage non-white; these were used as control variables.

Three major types of analyses were conducted. Simple correlations between density and the control variables were initially computed followed by the relationships between density and rates of youth crime and admissions to mental hospitals. Partial correlations between density and both crime and mental illness were then calculated removing the effect of median income and percentage non-white. Finally, a stepwise regression analysis that included all the independent variables was performed This gave an indication of the relative importance of each variable in explaining variation in juvenile crime and mental illness.

It is clear from Table 1 that simple correlations between the dependent and independent variables are significant. These findings are consistent with general intuition and observation of the most densely settled areas of the city. There tends to be more juvenile delinquency and mental disturbance in the more densely settled neighborhoods.[22] But Freedman also noted that higher correlations between the dependent variables and income and race. This initial analysis led him to suspect

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[21] Freedman, Jonathon L., "Population Density, Juvenile Delinquency and Mental Illness in New York City," Population Dsitribution and Policy, (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 510-523.

[22] Ibid., p. 519.

that social class and race might be more important or more basic factors than density. High density neighborhoods in New York also tend to be low income and to have a relatively high percentage of non-white residents.

TABLE 1

Correlations of Density, Income and Percent Nonwhite with Juvenile Delinquency and Mental Illness

	Juvenile Delinquency	Mental Illness
Density per Acre	.36	.56
Density per Room	.43	.53
Median Income	.67	.60
Percent Nonwhite	.75	.69

Source: Freedman, Jonathon L., "Population Density, Juvenile Delinquency and Mental Illness in New York City," Population Distribution and Policy, (Washington, D.C.: U.S. Government Printing Office, 1970), p. 519.

This suspicion was confirmed through a stepwise multiple regression analysis, the results of which are shown in Table 2. Once income and

TABLE 2

Stepwise Multiple Regressions of Income, Percent Nonwhite, and Density on Delinquency and Mental Illness

	Juvenile Delinquency	Mental Illness
	Increase in Percent Variance Explained	Increase in Percent Variance Explained
Income	45.00	36.00
Percent Non-white	15.00	14.00
Density Per Acre[a]	.39	5.00
Density Per Room[a]	.28	2.00

[a] Separate analyses for the two measures of density

Source: Freedman, Jonathon L., "Population Density, Juvenile Delinquency and Mental Illness in New York City," Population Distribution and Policy, (Washington, D.C.: U.S. Government Printing Office, 1970), p. 520.

race have been entered into the regression formula, neither density per acre nor density per room explained much additional variance. Density accounted for virtually none of the variance in juvenile delinquency and only a relatively small proportion of the variation in mental hospital admissions. When the other independent variables were entered into the analysis, the results remained substantially the same.

From this analysis, Freedman concluded:

> . . .those who blame all of the ills of the cities on population density are greatly overstating the case. At the extreme we might argue that high density has virtually no effect, but a more conservative statement would be that density is vastly less important than income level and ethnic backgrounds . . .. Therefore, the glib statement that population density is 'killing the cities' and causing a breakdown in our social, mental, and moral fiber seems highly implausible and certainly unproven.[23]

Who is correct? As with most correlational statements, the relationship or lack thereof, is difficult to interpret. The question of how spatial restriction affects human behavior is extremely important, but remains largely unanswered by these researchers. Correlational studies of the type discussed do not ordinarily allow one to draw definitive conclusions about causation. Galle, Gove and McPherson turn to a discussion of individual behavior in explaining their aggregate findings. Aggregate correlational studies serve the purpose of suggesting relationships and help to answer the question of environmental influence; but to be fully effective investigations need to include an examination of the individual's relationship with his surroundings. In this manner aggregate findings are better understood and become more meaningful.

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[23] Ibid., p. 522.

Perception and Territoriality

The work of Hall and Sommer on proxemics and human territoriality reflect the individual scale of analysis. While they do not focus directly upon the behavioral effects of restriction, their inquiry into the perception and use of space is closely related to a consideration of problems arising from spatial restriction.

Research into personal space has shown that human beings carry with them portable space "bubbles" which affect interpersonal communications and regulate spacing and density within residential and work settings. Hall was among the first to study this dimension of personal space. He used the term "proxemics" to refer to the study of man's perception and use of space as a component of culture.[24] The main implication from his work on proxemics is that people differ in their habits, attitudes and values concerning the use of space and interpersonal distance, and that differences along these dimensions are largely culture-bound. The size of an individual's space "bubble", the minimum amount of space which he must maintain between himself and other objects and beings in order not to feel threatened, varies according to the situation and personal characteristics. It is ultimately determined by the person's cultural background. Thus, the spatial distance considered comfortable for conversation is much less in Latin America than it is in the United States.[25]

Robert Sommer has also defined personal space in territorial terms. Personal space is "an area with invisible boundaries surrounding a person's

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[24] Hall, Edward T., The Hidden Dimension (Garden City, N.Y.: Doubleday and Co., 1966).

[25] Hall, Edward T., The Silent Language, (Garden City, N.Y.: Doubleday and Co., 1959).

body into which intruders may not come."[26] It involves an emotionally charged zone around individuals which may regulate spacing and it also concerns the process of delimiting and personalizing territory. Perception of spatial relations among objects is significantly influenced by the type of activity which occurs in a given area.

One of the newest research directions in geography rephrases the Man-Environment tradition of the discipline in behavioral terms. This is particularly true of urban geography, where increased attention is being focused upon the spatial and physical characteristics of the city as they are related to the behavior of the metropolitan inhabitant.[27] Recent work by urban and behavioral geographers has not dealt with the subject of spatial restriction, but the interest in man's perception of his surroundings and how his behavior is associated with the image of his environment is couched within the stimulus-perception-response framework of this study.

Wolpert regards perceived differences in the urban environment as the vehicle which motivates decisions to migrate on the part of a certain proportion of the urban population.[28] Migration is viewed as an adaptive response to perceived differences in environmental quality. Other things being equal, one will move to another location if it appears more promising as a place where he can realize a more satisfying life-sytle.

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[26] Sommer, Robert, Personal Space - The Behavioral Basis of Design, (Englewood Cliffs, N.J.: Prentice Hall, 1969).

[27] Taafe, Edward J., Geography, (Englewood Cliffs, N.J.: Prentice Hall, 1970), p. 87.

[28] Wolpert, Julian, "Migration as an Adjustment to Environmental Stress," Journal of Social Issues, vol. 22 (October 1966), pp. 92-102.

Perceived differences in place utility evolve from cognition and evaluation of stimuli. The individual's "action space" represents the spatial parameter of the mover-stayer decision process. Through daily travel experience, the person gains direct knowledge of various locations within his urban area. This knowledge is transformed through evaluation, primarily influenced by what desires the person has regarding a satisfactory living environment. If one beleives that his residential surroundings are deteriorating in quality relative to other locations in his city, he is likely to move. Perceptions of other areas as more enticing -- and within the individual's ability to reside there -- may also prompt a decision to change residence. Thus spatial aspects of intra-urban migration, according to Wolpert, are measures of the utility of one place relative to perceived values of other locations.

Other geographers have been interested in the role of perception as it relates to behavior. Mental map studies have been used in the design process as a basis for the reconsideration of urban aesthetics, and as a means of analyzing the underlying dynamics of human behavior. In the latter context, Porteous has noted that the individual's perception and cognitive structuring of the city has been used as a partial explanation for shopping behavior and choice of travel paths.[29] Sonnenfeld has described differences in the ability to adapt to the Arctic environment among native and non-native population by measuring expressed levels of contentment with that environment.[30]

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[29] Porteous, J. Douglas, "Design with People: The Quality of the Urban Environment," Environment and Behavior, vol. 3 (June 1971), pp. 161-164.

[30] Sonnenfeld, Joseph, "Environmental Perception and Adaptation Level in the Arctic," Environmental Perception and Behavior, David Lowenthal ed., Department of Geography Research Paper No. 109, (Chicago: University of Chicago Press, 1966), pp. 42-59.

Within geography, the research area with the greatest concentration of perception studies deals with the perception of natural hazards.[31] This research has been concerned with the persistence of settlement in hazardous areas and the ways in which man has attempted to adapt to the hazards. The types of hazards investigated have included floods, coastal storms, drought, snow, hail, landslides, and tsunamis. More recently, the effects on the physical setting due to man's actions, such as air or water pollution or weather modification, have been added to this list. White, Burton and Kates have been the major investigators and they have outlined five major avenues of geographical study:

> Minimal understanding of conditions upon which social policy might be based would involve research helping to, 1) assess the extent of human occupance by hazard zones, 2) identify the full range of possible human adjustments to the hazard, 3) study how man perceives and estimates the occurrence of hazard, 4) describe the process of adoption of damage-reducing adjustments in their social context, and, 5) estimate the optimal set of adjustments in terms of anticipated social consequences.[32]

The individual's view of the hazard has been sought in answering these questions. Variations in perception of hazards are considered to be a major factor in the decision-making process. If a resource manager perceives a risk or hazard-threat, he is likely to be more receptive to an innovation which might help minimize the risk. Variations in perception among hazard zone occupants have been explained in terms of

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[31] Saarinen, Thomas F., Perception of Environment, Commission on College Geography Resource Paper No. 5, (Washington, D.C.: Association of American Geographers, 1969), p. 19.

[32] Burton, Ian, Robert Kates, and Gilbert F. White, "The Human Ecology of Extreme Geophysical Events," Natural Hazard Research Working Paper No. 1, (Toronto: Department of Geography, University of Toronto, 1968), p. 36.

three main factors: the relation of the hazard to the dominant resource use, the frequency of occurrence of the hazard, and variations in degree of personal experience.[33] The emphasis, direct or implied, by geographers in studying human perception of hazards has been upon behavioral adjustments which occur as a result of the perceived hazard or the lack of it. Golant and Burton have analyzed avoidance behavior as a response to environmental risk and to perceived risk and have used a semantic differential to explore preconceived ideas people have about potential natural hazards; the implication is that the perceived meaning a person attaches to the stimulus will be associated with the way he responds to it.[34]

Beck, Tuan and Kates each note the considerable importance that perception, or the subjective interpretation of one's surroundings, has for behavioral responses to environmental stimuli. Tuan has stated that it is not enough to examine the environment as a series of discrete stimuli if we wish to understand its impact on man in the course of his day-to-day living. Changing the physical setting alone will not revolutionize people's lives.[35] However, if we can determine that individuals or populations perceive certain stimuli as threatening, then changing or removing such a stimulus conceivably will alter one's interpretation of his environment and his response to it.

Kates suggests that "the central task of the behavioral and social sciences in the study of environment is to relate the stimulus

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[33] Saarinen, op.cit., p. 20.

[34] Golant, Stephen and Ian Burton, "Avoidance-Response to the Risk Environment," Natural Hazards Research Paper No. 6 (Toronto: Department of Geography, University of Toronto, 1968).

[35] Tuan, Yi-Fu, "Environmental Psychology: A Review," Geographical Review, vol. 62 (April 1972), pp. 245-256.

properties of the environment to their symbolic human manifestations and in turn to define the stimulus properties of the symbolic environments that man creates."[36] For the social scientist to understand the variance in behavioral responses to environmental stimuli, he must ascertain what meaning those stimuli have for the individual. Beck points out that interpretations of stimuli vary within and between cultures. Meaning is derived from a satisfaction of needs and needs have spatial qualities. Meaning "clothes the perceptual world" so that the individual comes to structure his environment according to his understanding of experienced stimuli.[37] It is through the perceived meaning of a spatially restrictive environment that such surroundings could affect one's behavior.

Laboratory Research

Experimental investigations directly concerned with the effects of spatial restriction on human behavior reflect the most recent approach to the study of spatial restriction phenomena. Such studies have generally been of two types: those which define restriction in terms of group size and those which manipulate it in terms of room size. The research of Ittelson, Proshansky and Rivlin, Hutt and Vaizey, and Griffit and Veitch represents the first type of investigation, while those of Freedman, and Freedman, Klevansky and Ehrlich represent the

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[36] Kates, Robert W. "Stimulus and Symbol: The View from the Bridge," Journal of Social Issues, vol. 22 (October 1966), p. 23.

[37] Beck, Robert, "Spatial Meaning and the Properties of the Environment," Environmental Perception and Behavior, David Lowenthal, ed., Department of Geography Research Paper No. 109 (Chicago: University of Chicago Press, 1966).

second.[38] Results from the first set of studies indicate that members of larger groups are more aggressive and asocial than those of smaller ones, regardless of whether the setting is a psychiatric ward, a playground, or a psychological experiment. The second set of experiments, however, demonstrates that when group size is kept constant but room size is varied, the task performance of subjects in the small room is not adversely affected. Freedman did observe in the small room condition, however, that interpersonal relations within female groups were more intimate and friendly than in male groups.[39]

In the most recent experimental study of spatial restriction, Stokols et al. observed that variances in room size do affect task performance and the quality of social interaction.[40] An additional finding was a marked difference in the impact of room size upon the sexes; this verified the conclusions of Freedman. Men reported higher feelings of aggressiveness and restriction when density was increased

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[38] Ittelson, W., H. Proshansky, and L. Rivlin, "The Environmental Psychology of the Psychiatric Ward," in Environmental Psychology, H. Proshansky, W. Ittelson and L. Rivlin, eds., (New York: Holt, 1970); Hutt, C., and M. Vaizey, "Differential Effects of Group Density on Social Behavior," Nature, vol. 209 (March 26, 1966), pp. 1371-1372; Griffit, W. and R. Veitch, "Hot and Crowded: Influences of Population Density and Temperature on Interpersonal Affective Behavior," Journal of Personality and Social Psychology, vol. 17 (1971), pp. 92-98; Freedman, Jonathon, "The Effects of Crowding on Human Behavior," unpublished manuscript, Department of Psychology, Columbia University; Freedman, Jonathon, S. Klevansky, and P. Ehrlich, "The Effect of Crowdin on Human Task Performance," Journal of Applied Social Psychology, vol. 1 (1971), pp. 7-25.

[39] Stokols, Daniel, "A Social-Psychological Model of Human Crowding Phenomena," Journal of American Institute of Planners, vol. 38 (1972), p. 74.

[40] Stokols, Daniel, et al., "Physical, Social, and Personal Determinants of the Perception of Crowding," Environment and Behavior, vol. 5 (March 1973), pp. 87-115.

by reducing room size. Women reported an opposite reaction. The authors concluded from their experiments that perceptions of "stress" vary between individuals, and that personal and cultural variables can mediate these perceptions as well as their behavioral ramifications.

Perceptions of limited physical space are not always translated into identical feelings of restriction. Rather, the impact of reduced space for the individual appears to be determined through the interaction of the physical and social setting and the characteristics of the individual. It remains to be determined what these personal social and cultural factors are. In order to understand more fully the relationship between spatial restriction, perception and behavior, the authors suggest two directions for future research: "...explore more fully the dimensions of stress which overlap with the experience of crowding and...specify more clearly the mechanisms by which perceived spatial restriction and its related symptoms of stress arise. Second, it would be useful to delineate specific behavioral indices of crowding stress, and to state more precisely the conditions under which behavioral responses to the experience will occur."[41]

Conclusions from the Literature Review

From the stages of research outlined above, a preliminary picture of spatial restriction phenomena begins to emerge. The animal studies portray restriction as a situation which develops over time. The physical condition of spatial limitation, which places constraints upon certain social acitvities (e.g., allocation of food and sexual behavior), represents the necessary condition for these phenomena. As

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[41] Ibid., p. 113.

population density increases, spatial constraints become more acute until they lead to social disorganization and physiological pathology. Situations of restriction among non-humans, then, are characterized both by the element of spatial restriction and by the manifestation of its deleterious effects on organisms over time.

The research on human populations, however, indicates that spatial restriction is not inevitably associated with behavior. The correlational studies suggest that in Asian societies cultural traditions offset the supposedly detrimental effects of high population density. Other aggregate analyses of United States populations reach opposite conclusions examining restrictive conditions in the same cultural environments. Studies examining the perception of spatial adequacy and the delimitation and use of personal space provide further evidence that cultural norms mediate the perception and adjustments of interpersonal space. Such research also suggests that the type of activity in a given area largely determines whether the amount of available space is perceived as adequate. The laboratory investigations of human restriction demonstrate that when group size is held constant and the physical consequences of spatial restriction are controlled (e.g., high temperature, stuffiness, limited movement), high density exerts virtually no ill effects on human task performance.

At present, it cannot be stated that there is a definitive conclusion regarding work analyzing the behavioral influences of spatial restriction. With the exception of non-human research, inconsistent results have been obtained. Similar methodologies have produced different results in both correlational and laboratory studies. The salient question in this study is does spatial restriction adversely affect

human behavior? Results of studies of human groups and individuals are inconclusive.

Implications of Previous Research for this Study

Although previous studies provide some insight into the nature of human restriction phenomena, interpretations from various lines of inquiry are made difficult by methodological and conceptual inadequacies.

The findings of aggregate studies are plagued by the causal ambiguities of correlational research. Emphasis upon aggregate analysis severely limits the scope and applicability of such "behavioral" research. Findings can be discussed only in terms of a population, or a segment thereof. Aggregate data tangentially deal with the question of restriction-produced behavior, but we are not able to discern the indivdual who is, or is not detrimentally affected by a spatially restrictive environment, only the characteristics of his population. Clearly an analysis of individual behavior is needed if we are to better understand how one reacts to certain environmental conditions.

Aggregate studies have also failed to develop conceptual and operational definitions of spatial restriction and behavior that facilitate comparisons of findings. Every analysis of crowding or density and behavior has used different meanings for the the terms. This has resulted in a lack of consistency in their use, further hindering a testing of research reliability and validity. As Stokols notes, we have yet to determine specifically what are the behavioral reactions to a restrictive environment -- in part because in each case different behaviors are examined under different conditions.[42]

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[42] Stokols, op. cit., (1972), p. 74.

The inherent nature of laboratory studies leads to considerable deficiency in this method of research. Conclusions based upon studies of students in controlled laboratory settings limit the inferences one can draw from such work about the average individual or population. By controlling the physical consequences of spatial restriction, e.g., higher temperature, stuffiness and limited movement, the psychologists engaged in this form of spatial restriction research have virtually negated the possibility of extrapolating their findings to more realistically restrictive environments. What is needed is not only a movement away from aggregate analysis, but also one that avoids the confines of the laboratory and offers the potential of describing "real-world" situations where crowding does or does not detrimentally affect human behavior.

With few exceptions most analysts of spatial restriction have failed to direct their attention to the temporal or spatial aspects of the problem. The analysis of aggregate or individual data is usually based upon behavior observed at one point in time. We know little about the temporal or developmental aspects of spatial restriction and the ways people respond to it over time. The temporal aspect of this research may be particularly important in determining whether such conditions as length of exposure may influence certain behavioral responses to the experience of restriction.

Social scientists have arrived at fairly broad agreement that a single pattern of urban population density is repeated in a large number of Western cities: population density declines with distance from the city center.[43] This finding provides us with a referent which can

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[43] Clark, Colin, "Urban Population Densities," Journal of the Royal Statistical Society, Series A, vol. 114 (1951), pp. 490-496; idem, Population Growth and Land Use, (London: MacMillan and Co., 1967);

serve as an indicator of where we are likely to find restriction-related behavior. If a major need of restriction analysis is to state more precisely the conditions under which behavioral responses to the experience will occur, then one important aspect of this need is to determine where we will find these conditions.

Galle et al. have done much to unravel the use of the term density as it applies to human behavior and argue that it involves far more than the number of people per square mile. The work of geographers studying the perception of the environment and the laboratory study of Stokols have also reaffirmed the notion that spatial restriction is much more than an objective characteristic. By operationalizing restriction as a cognitive rather than a physical characteristic, the authors have demonstrated the important role perception has in the occurrence of behavioral responses to such conditions. The individual will not respond directly to an environment that physically provides him little space unless he finds that situation restrictive. Variations in response are due as much to the perceiver as they are to his surroundings. An

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Stewart, John Q. and William Warntz, "The Physics of Population Distribution," Journal of Regional Science, vol. 1 (Summer 1958, pp. 99-123; Winsborough, Halliman H., "A Comparative Study of Urban Population Densities," (Ph.D. dissertation, University of Chicago, 1961); Muth, Richard, "The Spatial Structure of the Housing Market," Papers and Proceedings of the Regional Science Association, vol. 7 (1961), pp. 207-220; idem, "The Variation of Population Density and its Components in South Chicago," Papers and Proceedings of the Regional Science Association, vol. 15 (1965), pp. 173-183; Berry, Brian J.L., James W. Simmons and Robert J. Tennant, "Urban Population Densities: Structure and Change," Geographical Review, vol. 53 (July 1963), pp. 389-205; Berry, Brian J.L., "The Internal Structure of the City," Law and Contemporary Problems, vol. 30 (Winter 1965), pp. 111-119; Newling, Bruce E., "Urban Growth and Spatial Structure: Mathematical Models and Empirical Evidence," Geographical Review, vol. 56 (April 1960), pp. 213-225; Berry, Brian J.L. and Frank E. Horton, Geographic Perspectives on Urban Systems, (Englewood Cliffs, N.J.: Prentice Hall, Inc., 1970), p. 276.

objective and subjective approach to the problem appears needed and potentially beneficial.

It is also clear that in both aggregate and individual levels of analysis, steps must be taken to statistically control for the influences of social class, race and ethnicity. From studies of personal space and aggregate analyses of Hong Kong and Paris, it is apparent that cross-cultural studies of spatial restriction and behavior suffer in the comparison, especially from a perceptual point of view. There is a definite need to maintain a cultural constant in a study of behavioral responses to spatial confinement.

Theoretical Ties Between Spatial Restriction and Behavior

There are further ramifications of Hall's research for this study. If an individual's personal space is breached, how will he respond to the invader? If he feels threatened, how will he defend himself? Hall has not been directly concerned with extending his studies of individual proxemics to the group level, but he has speculated on the possible implications of individual proxemic relations for urban planning and architecture and for the problems of spatial restriction in cities. It is clear from his research that responses would vary cross-culturally, but it seems equally clear that any investigation of behavioral responses to spatial restriction should include consideration of individual variations in personal spatial adequacy.

On the question of personal space invasion, Sommer suggests that knowledge of personal space and another mode of social organization, dominance behavior, combine to limit aggression. Dominance behavior refers to a hierarchy of dominant-subordinant relationships, as exemplified by social ranking. Territoriality and dominance behavior are

viewed as interdependent and complementary. Both processes limit aggression because an individual either refrains from going where he is likely to be involved in a dispute or, based on his knowledge of who is above or below him, engages in dominant-subordinant behavior rather than in actual combat.[44] However, Sommer's research still does not completely answer the question, what will happen if and when personal territory is knowingly or unknowingly violated?

Carstairs, in his description of violence in America, suggests that human aggression is predominant in those cities where spatial restriction is greatest.[45] In these parts of urban America it is difficult to avoid infringing on another's personal space on an individual or group basis. Sommer also notes in his own research that in modern Western society there appears to be an aura of instability where particularly important societal boundaries remain fuzzy and undefined. The study of proxemics thus suggests a potential deleterious response to high spatial restriction due to the invasion of personal space.

Conflict and behavioral instability in restrictive environments may also arise because of the invasion of another form of territoriality in the residential environment. Goffman, in his analysis of face-to-face interaction, has referred to various regions of interaction which affect the degree of formality on the part of the "performers."[46] Front stage is the location where a particular performance is or may be in progress. When one's activity occurs in the presence of others, some aspects of the

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[44] Sommers, op.cit., p. 12.

[45] Carstairs, op.cit., p. 594.

[46] Goffman, Erving, The Presentation of Self in Everyday Life, (Garden City, N.Y.: Doubleday and Co., 1959).

activity are expressively accentuated, and other aspects, which might discredit the image of the performer, are suppressed. Back stage is the location where those suppressed facts make an appearance. Back stage, relative to front, is the location where the performer can relax, where he can drop the image he portrays, forgo speaking his lines and step out of "character." Basic to the existence of this behavioral region is the element of privacy. Commonly it is cut off from the remainder of the residential environment by a partition and guarded passageway. The back region is the one location where the performer can reliably expect that no member of his "audience" will intrude.[47] Without this element of privacy and, therefore, the presence of a back stage, the individual is unable to adequately prepare himself for interaction with his peers as well as strangers. Removal of back stage not only deprives the performer of an opportunity to act in a relatively informal, familiar way, but reduces the ability of the individual to develop the guarded image necessary for him to perform adequately on front stage. A poorer quality of interaction develops because the person is unable to find a place of privacy in which to prepare himself for interaction with others.

Reduction of the quantity of space, therefore, affects the quality of space. Most American homes, regardless of class, make some attempt at partitioning the living room front stage from that of the rear portions of the home. When this physical separation is absent, or fails to prevent others from entering the back stage, disillusionment and torment can result. When individuals witness actions that are not meant for them, their impressions of the performer, and consequently their

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[47] Ibid., p. 113.

relationship with that person, may change radically. From the performer's perspective, inability to maintain control over his back stage leaves him in a position of not knowing what character he will have to project from one moment to the next, making it difficult for him to be successful in any role he plays.

By properly scheduling performances, it is not only possible to separate one's audiences (thus avoiding different and inconsistent fronts before the same people), but also allow a few moments in between performances so as to extricate oneself psychologically and physcially from one personal front, while taking on another.[48]

Goffman writes in an allegorical fashion, but his concept of back stage has real life application to spatially restricted environments. Gerald Suttles demonstrates the utility of Goffman's concept in his description of domestic congestion in the Addams Area of Chicago and the consequences of the inability to carry on certain acitivites in privacy:

> Even where there is the strongest desire for privacy girls must often dress, make themselves up, run around in their slips, and sometimes use the bathroom in someone else's presence. Boys sleep in the same room as their older and more worldly brothers, wear each other's clothing, and perform bodily functions in the same enclosures. Husbands and wives cannot keep their intimaceis or arguments a private matter that otners can at least pretend didn't happen. At time everyone may use the same towel, eat off the same plate, or indulge in a common obscenity. Fathers are seen in their underwear, mothers while in labor, sisters during their period....Sometimes there are disclosures that could lead to various consequences: abortions, incest, illegitimacy, adultery, and narcotics scars. More common,

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[48] Ibid., p. 139.

> however, are those skeletons for which every family is supposed to have a closet: defecation, intercourse, parental arguments and dressing.[49]

From a theoretical as well as a real-life persepctive, it appears that restriction of living space can and does have a marked affect on inter-personal relationships particularly in family settings. Sharing the same bathroom and bedroom congests relationships so that parental affection and authority lose meaning to children who have observed the back stage behavior of their parents. Relations become quite blunt since they cannot be ordered according to who has priority in a given space. Inevitably, conflict over spatial usage results in a definition of personal power rather than situational rights.[50]

Statement of Hypotheses

As has been noted, the various avenues of spatial restriction research have produced rather inconsistent results. In part, this inconsistency can be explained by poor conceptualization of the environmental element. Given the theoretical work of Goffman, Hall and Sommer, and the observations of Suttles, the key issue appears to be the degree to which individuals and populations are forced into contact with one another by the density and spatial arrangement of their environment. High population density alone may not affect the degree of contact between individuals, especially if they are able to retreat to the back stage portions of their dwellings. But if retreat into the home does not provide the privacy essential to stable social interaction, serious

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[49] Suttles, Gerald, The Social Order of the Slum, (Chicago: University of Chicago Press, 1971), p. 91.

[50] Ibid., p. 91.

consequences may result. This is not to suggest that density may not in some way be related to behavior; only that density in and of itself may not be a sufficient etiological factor. High population density is likely to have a considerable influence on the other elements of spatial restriction; e.g., structural density, room density and density of residential space. Thus while others have suggested that pathological behavior is a function of density, this writer has broadened the hypothesis by suggesting that behavioral pathology is a function of spatial restriction:

Hypothesis One

> Populations residing in spatially restricitve locations will exhibit greater frequencies of social indicators behavior than those which do not.

A series of additional questions, or sub-hypotheses emanates from the initial premise. Having suggested that population density is only one of a number of elements of spatial restriction, the initial hypothesis can also be used to test the degree to which these place characteristics are interrelated. Do those areas which are high in population density also demonstrate greater degrees of spatial restriction? To what extent do the other spatial restriction elements, such as room density and structural density, form similar spatial patterns? A geographical analysis of the characteristics of place should provide answers to these questions.

Social indicators cannot be merely the result of variations in spatial restriction. If it were, individuals provided with the same amount of space would all exhibit similar degrees of behavior. Responses to external stimuli can be affected by the individual's interpretation of them. Unless the person views a situation or object as threatening,

he is unlikely to be detrimentally affected psychologically and, in turn, behaviorally. Thus explanations for responses to spatial restriction can also be obtained through analysis of cognitive interpretations of external stimuli. Until the recent research of Stokols, this psychological element of restrictive stimuli was virtually ignored. Behavior was discussed as primarily a function of room or population density. This first hypothesis has broadened that interpretation; the second introduces the role of perception as an intervening variable in the spatial restriction-behavior relationship.

Hypothesis Two

> Spatially restrictive environments will be perceived as stressful.

When the amount of space available to an individual or population is reduced to the point where infringement upon personal space or back stage is probable, the residents of such an environment are likely to feel threatened. Lazarus has described an individual in a state of stress as one who perceives threat cues in his environment. Stress usually envolves the self-concept of some cognitive level: either that some part of the person's body is suffering or being attacked, or his self-identity is being threatened, attacked or involved in some hazardous and potentially harmful situation or circumstance. Hence, stress is usually "felt" by the individual, an emotional state is aroused and his defenses and coping mechanisms are mobilized, even though he may not be aware of the source of such threat other than a vague feeling that "something is wrong" and that his guard must be up if he is to survive what he perceives is an impending attack.

Stress, then, is both external and internal in relation to the individual. External stimuli, when perceived as threatening, become

stressful. Through their simultaneous and continuous demands these stimuli can eventually overwhelm the individual and lead to some forms of behavior that are indicators of low social well-being. Stress forms the link that ties environment to behavior. A spatially restrictive environment is potentially stressful, but unless that stress is realized, behavior due to restriction is unlikely to occur. This thesis is expressed in hypothesis three.

Hypothesis Three

> Individuals who perceive their environment as stressful will exhibit greater frequencies of behavioral social indicators than those who do not.

Each person structures and evaluates his surroundings within his own mind. If he perceives his surroundings as stressful, and is unable to avoid them, he will have to cope with the situation. People expend energy and commit resources to coping with perceptions of personal threat, and usually they successfully adapt. In most cases the successful adaptation permits stable behavior to be maintained during exposure to stressfully perceived stimuli. However, there is evidence that a cost is paid in the adaptation. Irrespective of whether adaptation was successful, the greater the commitment to coping with feelings of stress, the greater the adverse aftereffects. Time becomes an important factor, for if the perception of stress is continuous, the individual will have to commit dwindling mental and physical resources just to maintain stability.

All persons possess varying abilities to adapt, but eventually those abilities are overcome. If a threat to an individual's self-image cannot be overcome, self-defensive measures are necessary to make the threat tolerable. The degree to which a person must invest in

such defense measures is the degree to which his energy and resources are being used beyond what would be demanded had mastery been achieved.[51] Success or failure in coping with stress can lead to behavioral difficulties. The greater the degree of perceived threat, the fewer resources the individual has available to him to effectively interact with others and face additional demanding situations.

Behavior, if it is associated with spatial restriction, is also a function of stress. But restrictive stimuli are not the only elements in the individual's physical and social environment which can be perceived as stressful. Hypotheses two and three focus on a single element in one's surroundings and suggest a series of additional questions and sub-hypotheses which relate to stress and behavior.

To what extent is the stress felt in a community the result of poverty, racial discrimination and crime? It is highly possible, even likely, that the stresses of racial discrimination and poverty are more immediate than lack of residential space.

Given the adjustment abilities of human beings, can we expect that recent arrivals in restrictive locations will be more susceptible to perceptions of stress than long-time residents who conceivably have adjusted to their surroundings? Or will the opposite be the case -- that longer periods of residence in a stressful environment are associated with dwindling coping resources and, consequently, behavior?

Also seemingly associated with perceptions of stress and incidences of behavior would be a radical change in one's residential

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[51] Howard, A. and R.A. Scott, "A Proposed Framework for the Analysis of Stress in the Human Organism," Behavioral Science, vol. 10 (1965), p. 150.

environment. Are residents more able to cope with spatial restriction if they have been raised in such an environment? Are individuals more affected by a restrictive environment if they have recently left surroundings which provided them more open space and greater privacy?

Time, residential background, race and poverty are but a few of an infinite number of elements which can conceivably affect the manner in which a person views his surroundings and responds to them. The need for a spatial analysis of the problem of spatial restriction and behavior necessitates a testing framework that lies beyond the controlled environment of the laboratory. We cannot expect to isolate a single causal variable in the incidence of selected behaviors, but we can expect an increased understanding of the role spatial restriction and perception have in mediating behavior.

CHAPTER 3

ECOLOGICAL ANALYSIS OF SPATIAL RESTRICTION AND BEHAVIOR

The purpose of this research is to relate the nature of places to human behavior by means of an intervening variable, environmental perception. Chapter Three describes the characteristics of "place," in this case census tracts, and indicates the degree to which a set of attributes of that place, forms of density, co-occurs with a particular set of behaviors designated as indicators of social well-being.

Ecological, or aggregate, data are particularly useful in describing areal and group properties but behavioral scientists have often made the mistake of inferring individual behavior from these properties. Robinson has described this error as the "ecological fallacy."[1] Because of this limitation of aggregate data, individual characteristics assume particular importance in a behavioral study. In this chapter aggregate data will be used to measure the spatial association between levels of restriction and forms of behavior at the census tract level. Individual data evaluating the meaning residents of selected tracts attach to their environment will be analyzed in chapter four. These data on perceived meanings add to the understanding of association on an aggregate level while avoiding the ecological fallacy.

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[1] Robinson, W.S., "Ecological Correlations and the Behavior of Individuals," American Sociological Review, vol. 15 (1950), pp. 351-357.

Aggregate or ecological analysis of spatial restriction and behavior replicates research reported in the review of the literature. However, the inconsistency of findings and previous approaches suggests that further work, focusing especially on the spatial dimension, is needed. This will provide the added benefit of an intra-urban description of a spatial restriction and behavior, rather than a discussion of the city as a whole. In this manner it will be possible to determine how characteristics of place vary from location to location within a metropolitan area. Knowing the location of those parts of the city which are highly restrictive will in turn provide the spatial rationale for the selection of survey sites for the analysis of individual perception and behavior.

Selection of a Study Site

As one of the largest urban concentrations in North America, Detroit displays significant differences in population concentrations within its confines. In addition as the fifth largest Urbanized Area in the United States, Detroit is representative of those types of urban areas that are the focus of growth on the continent. Primarily for these reasons, it was selected as the study site. Significant differences in spatial restriction are needed if we are to determine any behavioral influences of this characteristic of place. By including the central city and its contiguous suburbs in the analysis, Detroit should prove an excellent study site that represents metropolitan North America.

Data and Methods of Analysis

In order to determine the nature of place as it varies within the Detroit Urbanized Area, several variables were selected to measure

various forms of spatial restriction. Others were selected as additional locational characteristics which might account for the spatial variation of behavior. The place characteristics presented in Table 3 are regarded as physical, social and temporal stimuli in the environment which may account for the presence of certain forms of behavior at various locations within the urbanized area.

TABLE 3

Variables Used in Aggregate Analysis

	Race and Social Class
X_1	Percentage Negro
X_2	Median Income
X_3	Median Number of School Years Completed
X_4	Percentage of Male Population Unemployed
X_5	Percent of Families below Poverty Income Level
	Forms of Spatial Restriction
X_6	Number of Persons per household
X_7	Percent of housing units having 1.01 or more persons/room - Percent Overcrowded
X_8	Number of persons per square mile - Population Density*
X_9	Median number of Persons per room*
X_{10}	Number of Rooms per housing unit
X_{11}	Percentage of total area in Residential land use*
X_{12}	Number of Housing units per square mile*
X_{13}	Number of Housing units per square mile of residential area*
	Others
X_{14}	Percentage of all residential structures constructed in the previous five years - New Structures
X_{15}	Distance of Census Tract from Central Business District - CBD Distance*
	Behaviors
X_{16}	Normal Family Index - Percentage of children under 18 who are residing with parents
X_{17}	High School Dropouts - Percentage of 16 to 21 years olds who are not high school graduates and not enrolled in school
X_{18}	Matriarchy Index - Percentage of household heads that are female

TABLE 3 (cont'd.)

X_{19}	Marital Unrest Index - Ratio of divorced and separated persons to those now married*
X_{20}	Welfare - Percentage of all families receiving public assistance income or public welfare income
X_{21}	Fertility - Number of children born per 1000 women ever married.
X_{22}	Non-Migrant Index - Percentage of population living in the same house for at least the past five years
X_{23}	New Residents - Percentage of residents living at present location $2\frac{1}{4}$ years or less

Source: U.S. Population Census, 1970 for Detroit SMSA
* Calculated by author

The latter set of characteristics, $X_{16}...X_{22}$, are behavioral responses to environmental stimuli.

As in any project of this kind, choosing the appropriate spatial unit of analysis for dependent and independent data is a compromise between the ideal and reality. Given the behavioral focus of this study, it is particularly important to avoid units of analysis that are so large they incorporate a considerable degree of population and thus behavioral heterogeneity within their limits. All other things being equal, the larger the unit of observation, the greater the degree of aggregation and possible variations in the individuals engaging in those behaviors being studied. Locational conditions measured by averages and by the relations between averages also become less meaningful for similar reasons. Census data, in either block or tract form, reduce the problems of within variation because their relatively small areal size increases population homogeneity.

Census tracts from the 1970 census have been selected for this analysis because they are less numerous and avoid problems of mapping and computer analysis that the smaller block units present. There are nearly

1000 tracts in the study area, and several times that number of blocks. Figure 2 presents the census tracts of the study area. It should be noted that the Detroit Urbanized Area, as shown in Figure 2, is not the same as that officially delimited by the Bureau of the Census. Tracts 931 and 934.04, located beyond the western boundary of the study area in Northville and Plymouth Townships, have not been included for study because they contain several state mental hospitals and correctional institutions.

Ideally a selection of variables which may be affected by elements in the environment would include additional social indicators. Inclusion of other behavior, e.g., homocide, suicide and drug addiction, has been limited not only by lack of published resources, but also by the lack of a common spatial denominator.

One of the most difficult tasks facing a researcher, who must draw upon more than one source for his data, is the strong likelihood that the characteristics will come in various units of observation. For example, crime data for the study area are reported for precincts and squad car areas, while suicides and attempted suicides are recorded by zip code areas. With 934 census tracts in the study area, the task of converting non-census material to tract form or vice-versa becomes formidable. Even if the conversion is made, the accuracy of the data is highly questionable. A common spatial unit can be calculated for all phenomena, but the units of analysis do not necessarily describe the population engaged in these behaviors. The usual means of conversion is to calculate the areal proportion of each census.

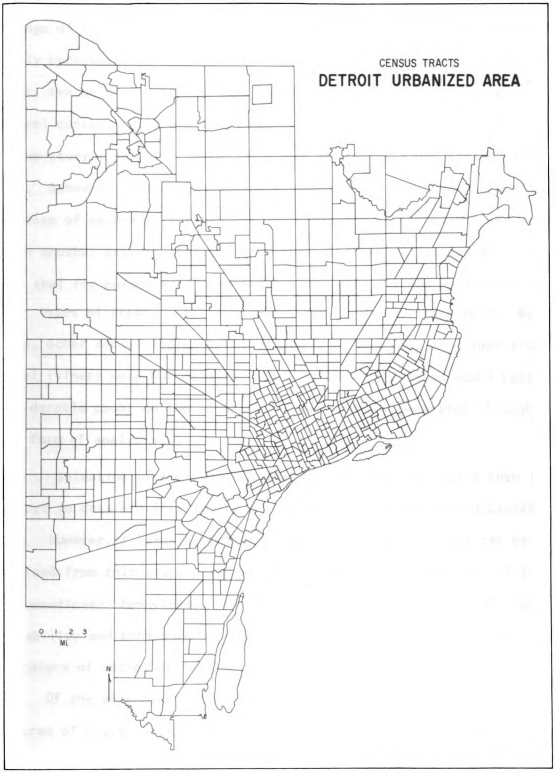

Figure 2

tract found in a precinct or zip code area and assign to it that percentage of the behavior in question. However, we have no guarantee that simply because ten percent of a police precinct is found in a census tract, ten percent of its crimes were committed in that tract or if several census tracts are found within a zip code area (as is the case in the study area), that an equal number of suicides was attempted in each. Behavior varies within each form of observation, and unless the location of each act is known, it is impossible to accurately describe it in another unit of analysis. Because of these difficulties, it was felt that for purposes of quantitative analysis, it was preferable to limit types of behavior to those available in census tract form. By so doing, other social indicators such as crime, suicide, drug addiction and mental illness were not studied; however, their inclusion would cast considerable coubt on the accuracy of any findings generated through this form of analysis.

Selection of both dependent and independent variables then is limited to data provided in the U.S. Census for the Detroit Urbanized Area. However, a large number of behavioral characteristics can be obtained from this source, and while they may not include many of the aforementioned behaviors,. they do contain several measures of family instability and behaviors which previous researchers have used as indicators of social well-being.

Of the dependent variables used in this level of analysis, only measures of migration might in and of themselves <u>not</u> be considered in some degree indicators of social well-being. However, the non-migrant index, which measures the degree of residential stability in a census tract, and the new residents figure, which describes population influx

into an area, may denote one of the most significant behavioral responses to spatially restrictive stimuli in the urban environment.

If the individual finds his environs spatially restrictive and in turn stressful, it would initially seem that he has two choices in responding to such a situation: remain and adapt to the circumstances, or avoid the stress by moving to a more satisfying and congenial locale. Wolpert has used this premise as the basis of a model which describes the decision-making process of the individual who migrates in response to a stressful environment.[2] In essence, he relates migration behavior simultaneously to variations in people and places. The migration question, however, raises an additional question regarding environment and behavior. It is reasonable to assume that if the individual is unable to cope with his surroundings he will eventually leave. But a considerable portion of the urban population is limited in its residential choice by numerous social and institutional barriers. What are the behavioral consequences of an individual's or population's inability to avoid the stress of offensive stimuli? High or low rates of migration, depending upon their location within the urbanized area, may provide strong indicators of at least one major response to stressfully perceived environmental stimuli.

In chapters One and Two some effort was made to distinguish between crowding and population density. To test the validity of this argument and to measure spatial restriction in as comprehensive a manner as possible, several structural and human density variables have been

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[2] Wolpert, Julian, "Migration as an Adjustment to Environmental Stress," Journal of Social Issues, vol. 22 (October 1966), pp. 91-102.

selected as environmental characteristics. Spatial restriction has a number of components among which is the number of persons per room within a dwelling unit. Where the number of persons per room exceeds one, this type of spatial restriction is referred to by the term "overcrowding." Overcrowding, or room density, is the form of spatial restriction which Galle, Gove and McPherson, and Carey,[3] found to be the most highly associated with "pathological" behavior. A second type of density is a direct function of housing type: how many people live under the same roof, whether it be a single family dwelling or an apartment complex. This is called structural or building density, and also can influence the degree of contact between individuals. Within the structure spatial restriction can be further refined so as to view the potential of the particular housing arrangement to bring people into desired or undesired contact with one another. Therefore, not only do the number of persons per household represent a form of potential spatial restriction, but the number of rooms available to that household population affects their degree of contact as well.

Another element of spatial restriction refers to the number of people living on a certain amount of territory -- population density. This can be further refined by considering the degree to which that land is in residential use. It is possible to have a low population density in any particular census tract, implying a low degree of spatial restriction; but if the residents of that tract are limited to only ten percent of that territory, this information paints a much different picture.

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[3] Carey, George W., "Density, Crowding, Stress and the Ghetto," American Behavioral Scientist, vol. 15 (March/April 1972), pp. 495-510.

Thus structural and human density in residential space also represent the degree of spatial restriction in the territory available for their occupation.

Therefore, it is not incorrect to argue that population density is a form of spatial restriction. It is misleading to argue that it is the only form. This argument applies to any other form of the parameter as well. By including the various components of spatial restriction, it will be possible to determine which, if any, are significantly associated with behavior.

The most recent available source that distinguishes residential from non-residential land use in Detroit was completed in 1965. This map of generalized land use for the Detroit S.M.S.A. is shown in Figure 3. While highly generalized, it provides the basic distinction that is needed to calculate the proportion of the total tract area which is used for residential purposes.[4] However, because considerable residential development has occurred on the northwestern fringe and much of the suburban periphery, a means of converting graphic data to census tract form and updating them to 1970 had to be found.

A base map and grid were simultaneously overlain on Figure 3 The base map depicted residential land use in each census tract, while

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[4] The U.S. Census provides data that can be used to calculate room densities, but not residential and total area of each tract. A planimiter was used to calculate total tract area, with an average of three measurements being used as a final figure in order to minimize error.

GENERALIZED LAND USE 1965

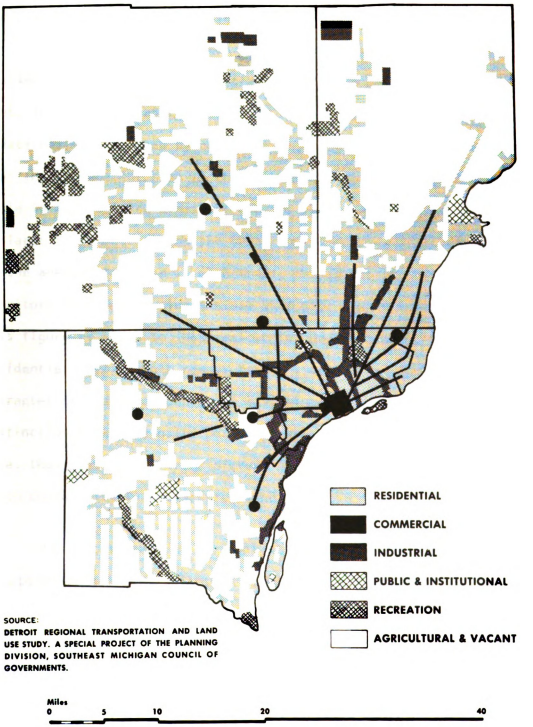

Figure 3

of each tract devoted to residential land use. From these percentages the number of square miles in each census tract given over to residential land use as of 1965 was calculated.

The U.S. Census provides information showing the percentage of residential structures in each tract which have been constructed since 1965. These data, when combined with lot size data, can be used to update residential area by census tract. Lansing and Hendricks report that the average lot size in the city of Detroit is only .12 of an acre, while in the outlying areas the average lot is nearly three times as large.[5] By multiplying the number of structures built since 1965 by the average lot size in each tract, the amount of new residential territory that has developed since that year can be determined. When this figure is added to 1965 residential area, an up-to-date measure of residential area in each census tract is achieved. Inclusion of this characteristic as a component of spatial restriction will allow the distinction between density per total area and density per residential area, thus providing a truer picture of business and agricultural areas which contain little residential land use.

The initial task in the analysis of the hypothesized environment-perception-behavior relationship is to determine the manner in which

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[5] Lansing, John B. and Gary Hendricks, Living Patterns and Attitudes in the Detroit Region, a report of TALUS, the Detroit Regional Transportation and Land Use Study, (January 1967), pp. 41-43.

the environment varies from location to location in the Detroit Urbanized Area. Given the complexities of the relationship, a means of analysis is needed which can simultaneously manage a large number of variables, compensate for random error and disentangle the complexities of the relationship into major and distinct patterns of regularities. Factor analysis is such a technique.[6]

Factor analysis is a mathematical tool which can be inherently spatial. As phenomena co-occur in space and in time, they form distinct independent patterns of interrelated characteristics. Factor analysis extracts those interrelationships and indicates their spatial patterns when the unit of analysis is locational. Thus a factor analysis of density and behavioral variables for census tracts will provide two essential pieces of information: 1) an indication of the extent that various behaviors and components of spatial restriction are interrelated, and 2) the spatial variation of these characteristics of place, the first element in our hypothesized relationship.

As noted in the review of literature, many of the components of spatial restriction are strongly associated with income levels and the distribution of non-whites in urban areas of the U.S. High population and structural density areas tend to be low in income and to have a relatively high percentage of non-whites. It is also possible that several other variables are associated with the dependent characteristics,

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[6] Rummel, R.J., "Understanding Factor Analysis," Journal of Conflict Resolution, vol. 11 (1967), p. 444.

but are interrelated with each other as well. Under these circumstances, a factor analysis which includes social class and racial characteristics may not provide meaningful patterns of spatial restriction and behavior which are independent of socio-economic status and race in the study area. To compensate for this likelihood, separate factor analyses will be run to test for the impact of race and social class have on the interrelationship of the other characteristics.

Factor analysis is basically descriptive and is seldom employed for purposes of statistical inference. While this method of analysis does provide an indication of which variables are interrelated and in what direction, tests of significance and hypothesis testing of this nature are usually reserved for other techniques. Under circumstances other than interrelated data, simple correlations would provide measurable degrees of interrelationship between spatial restriction and behavior.. But clearly it is impossible to know if areas of high spatial restriction might have more family instability because of less available space or because they are low income and have a higher percentage of non-whites. Given this ambiguity, it is necessary to turn to still other methods of statistical analysis where these control variables are held constant and the effect of spatial restriction assessed.

A convenient means of achieving this is a multiple correlation and regression analysis which will measure the association between a component of spatial restriction and a single behavioral characteristic, holding all other variables constant. Because the order in which an independent variable is entered into the multivariate correlation and regression equation determines the amount of variance it

explains, it is more desirable to perform an analysis in which no variables are forced into an equation. Rather all are allowed to enter at the points when they are the most important remaining characteristic, i.e., when they account for the greatest proportion of the variation in the dependent characteristic. This type of stepwise multiple regression adds variables one at a time in the order of the percentage of the total variance they explain. Through this form of analysis it is possible to see the relative importance of each variable according to the additional variance it explains.

A Spatial Analysis of Place Characteristics

Census data representing the density and behavioral characteristics were subjected to an R mode factor analysis employing an orthogonal rotation of axes. Additional independent variables describing income, education, employment and ethnic characteristics were used as controls to compare their potential for explaining behavior with that of population density.

It has been theorized that areas high in spatial restriction will be positively associated with high frequencies of social indicators. One means of empirically testing the hypothesized relationship between spatial restriction and behavior is through an analysis of factor loadings. Factor loadings can be interpreted like correlation coefficients, i.e., they measure which variables are interrelated in a pattern, or factor, and the degree and direction of that interrelationship. If the hypothesis is confirmed we would expect overall spatial restriction and its components to form a pattern of interrelatedness with the various forms of behavior.

Furthermore, we would expect that relationship to be positive.

Factor scores resulting from this analysis indicate the performance of a census tract on a factor of interrelated variables, and can be used for two purposes: 1) to describe the spatial distribution of related restriction and behavioral variables; and 2) to select census tracts that will serve as the study area for collection of individual data on perceived meanings of environmental stimuli.

A summary of the factor loadings of the rotated factor matrix is provided in Table 4. This first analysis seeks patterns among place characteristics and behaviors exclusive of the influence of social class and race. Six patterns of interrelationships were found among the characteristics, explaining over seventy-six percent of their variation in the study area. Factor One, entitled Low Density Behavior is of particular significance not only because it accounts for the greatest proportion of the total variance (twenty-eight percent), but also because it is the only factor which contains a substantial number of restriction components and behavioral pathologies. This is in essence a behavioral stability pattern. Measures of low social well-being all load negatively, indicating a population which does not behave in this fashion.

The strong negative association of population density and a measure of structural density, the number of housing units per square mile, with behavior provides initial evidence supporting the hypothesized relationship between spatial restriction and behavior.. These two components load most highly on this factor indicating that they are more interrelated with such behaviors as welfare recipiency, run-away children, high school drop-outs and forms of family instability. As hypothesized, this initial finding indicates that those areas which

TABLE 4

Spatial Restriction and Aggregate Behavioral Factors: Rotated Factor Loadings

Variable	Low Density Behavior	New Residents	Room Density	Apartment Dwellings	Divorce Environment	Spatial Restriction	Communality
Normfam	.8689	-.1058	.0349	-.1376	-.2376	.0654	.8471
Pers Hshld	.2697	-.0726	.6232	-.6246	-.1630	.0301	.8839
Hi Sc Drop	-.6757	.1857	.1395	.1005	.1245	.1050	.5472
New Struct.	.4655	.7320	.0573	-.0956	.0022	-.0074	.7651
Matriar ID	-.9278	.0265	-.0668	-.0034	.1676	-.0352	.8953
Mar Unrest	-.4214	.0186	-.1409	.0707	.5412	-.2667	.5667
Welfare	-.8657	.1062	.0938	-.0891	.2185	-.0898	.8333
Fertility	-.4181	-.0482	.2963	-.5724	.1362	-.1257	.6269
Non Migran	.1556	-.9213	.1145	-.0470	-.0387	.0217	.8903
Rms HsUnit	.2935	-.0725	-.1658	-.8173	-.2057	.0328	.8303
Per OvCrwd	-.3630	-.1372	.8537	-.0751	.1036	.0174	.8960
New Res	-.1885	.9017	-.0586	.1521	.0749	-.0206	.8813
Dist CBD	.7231	.1945	.2594	-.2301	.0603	-.0220	.6851
Pop Dens	-.7560	-.1420	-.0336	.1484	-.4376	-.0495	.8088
Pers Per Rm	.2839	-.0043	.9026	.1184	-.0108	-.0332	.9104
HU Per Sq Mi	-.6306	-.0349	-.1025	.3369	-.4077	-.1019	.6994
% Res LU	.0672	-.0495	-.0624	-.1221	-.6507	-.1742	.4795
HU per Res Area	-.2761	.0610	.0752	.4754	.0210	-.5415	.6052
Proportion of Variance	.2841	.1239	.1163	.1008	.0708	.0643	
Cumulative P.V.	.2841	.4079	.5242	.6250	.6958	.7601	

SOURCE: Calculated by author

are high in these components of spatial restriction will also exhibit greater frequencies of such behavior.

This conclusion, however, must be qualified. Other components of the parameter do not co-occur with the behaviors in question.

The only other factor containing measures of both spatial restriction and behavior is Divorce Environment. Marital Unrest, which is a ratio of divorced and separated vs. still married individuals, is associated with three forms of spatial restriction: population density, housing units per square mile and the proportion of tract area in residential land use. However, in each case the relationship is an inverse one. An examination of factor scores shows that this factor describes a population which resides in portions of the Detroit Urbanized Area where there is little residential land use, and therefore low population density. Yet the rate of marital unrest is among the highest in the study area. It should also be noted that less than fifty-seven percent of the variation of this characteristic has been explained by all of the variables entered into the factor analytic model. It is apparent that other characteristics might better explain variations in marital rest than those which have been used in this study.

Evidence both supporting and rejecting the hypothesized relationship between spatial restriction and certain behaviors appears in other factors extracted. Factor two, New Residents, contains characteristics describing a population which has recently moved into the new housing developments of the urbanized area. The high loading of structures built since 1965 indicates that this is primarily a suburban factor. Most recent residential construction has taken place in the outlying suburbs.

Factor three, Room Density, focuses upon the household density components of spatial restriction. With highloadings on such characteristics as persons per room, percentage of dwellings having more than one person per room, and the number of persons per household, factor three serves to illustrate two principles: 1) that "overcrowding," as a component of spatial restriction, is distinct from population and structural density; and 2) that while room density may or may not affect the degree of contact among household members, it does not appear to be associated with any of the behaviors considered in this study.

Many of the patterns that have been extracted from the data bear strong resemblences to the patterns discerned by Shevky, Bell and Williams in their social area analysis of Los Angeles and social pathology of American cities.[7] This is particularly true of New Residents, Room Density and factor four, Apartment Dwellings, all associated with some facet of Shevky-Bell's Stage of the Family Cycle. Households vary in size and in space requirements according to their stage of development, and Stage of the Family Cycle describes their differentiation in

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[7] See: Shevky, E. and W. Bell, and M. Williams, The Social Areas of Los Angeles: Analysis and Typology, (Berkeley: University of California Press, 1949); E. Shevky and W. Bell, Social Area Analysis, Stanford Sociological Series, No. 1, (Stanford: Stanford University Press, 1955)

location by those requirements. Families in the developing stage are childless and tend to locate in the most accessible portions of the metropolitan area. These are primarily inner-city locations which provide little residential space, usually of a multiple-family dwelling nature. With the arrival of children, the need for more space, and greater income levels, most families turn to suburban locations to meet their needs. The departure of the children, as they grow older, means an attrition of the family and the facilitating of movement back to the inner-city.

The New Residents factor, with its emphasis on migration into areas of new housing construction, can be applied to families in the child rearing stage who are seeking more space in the form of new housing. The Room Density factor can have a similar application, for household populations and room densities will vary according to whether the family is in the development, child rearing, or attrition stage.

Factor four, Apartment Dwellings, is so labeled because it loads heavily on characteristics describing multi-family dwellings as well as families which are not in the child rearing stage. The number of persons in the household is low, as is the fertility rate. The inner-city nature of the factor is indicated by the positive loading of various measures of structural density and the very negative presence of the number of rooms in the housing units occupied by this population. These structural characteristics describe an area where the predominant residential dwelling is a small apartment, with few single-family dwellings.

The factor also describes an area of the city where the structural density is fairly high, and thus spatially restrictive. It is worth noting that the behavioral characteristic loading prominently on this

factor, fertility, is described as a pathological response to density among occupants of Chicago because of the high rates of fertility found in spatially restricted locations. "...because overcrowding appears to make it difficult to step back, look at one's situation, and plan ahead, it may be that persons in overcrowded situations are less likely to perceive the long-range consequences of having more children and are thus less likely to want to use birth control techniques."[8] The data reveal an opposite response to structural density in Detroit, for fertility loads negatively on a factor containing positive measures of spatial restriction.

The similarity in factors extracted by this multivariate analysis and the family cycle characteristics of Shevky and Bell raises further questions regarding the supposed relationship between components of spatial restriction and behavior. It appears that variations in the components may be explained more by associations with family and age characteristics that often bear little relationship to the behaviors in question. An analysis of factor scores which measure variations of groupings throughout the study area will help to provide an answer regarding existence of the hypothesized association. It will also provide vital information describing where spatial restriction is greatest in Detroit and locations where low measures of social well-being are most pervasive.

Variations in Spatial Restriction

Factors three, four, and six measure forms of spatial restriction, and their distribution in the study area demonstrates the

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[8] Galle, Omer, Walter Gove and J. Miller McPherson, "Population Density and Pathology: What are the Relationships for Man," Science, vol. 176 (1972), p. 29.

utility of making a broad interpretation of the parameter, rather than focusing on a single component. Human and structural densities are found to vary considerably from location to location within the urbanized area.

The factor Room Density and the single characteristic, median persons per room, shown in Figures 4 and 5 respectively, indicate clearly that high room density is predominantly a suburban phenomenon. Only in locations which contain large expansive estates is there an exception to this conclusion. The Grosse Pointe communities on the eastern side of the city of Detroit, and Birmingham and Bloomfield Hills to the northwest are among the most affluent residential sites in the urbanized area. The homes in these locations average nearly eight rooms apiece leading to a low room density figure for the locations.

Higher room densities on the periphery rather than in the inner-city may at first seem illogical, for the popular residential image of urban America is one of inner-city overcrowding. One often visualizes the poor black family of eight in a two room dwelling. While it may be true that the interior of Detroit is poor and black, this portion of the city suffers no more from overcrowding than the suburbs -- in fact less so. An explanation for this pattern can again be found in Shevky and Bell's stage of the family cycle. The suburbs house families which are in the child-rearing stage, and while dwellings may contain more square footage in outlying areas, because of the presence of children, they average more people per room. Recalling that "overcrowding" has been defined as a level of room density, this pattern again raises serious questions about the association of this component of spatial restriction with behavior. If that relationship exists, the suburbs should demonstrate greater frequencies of family instability welfare

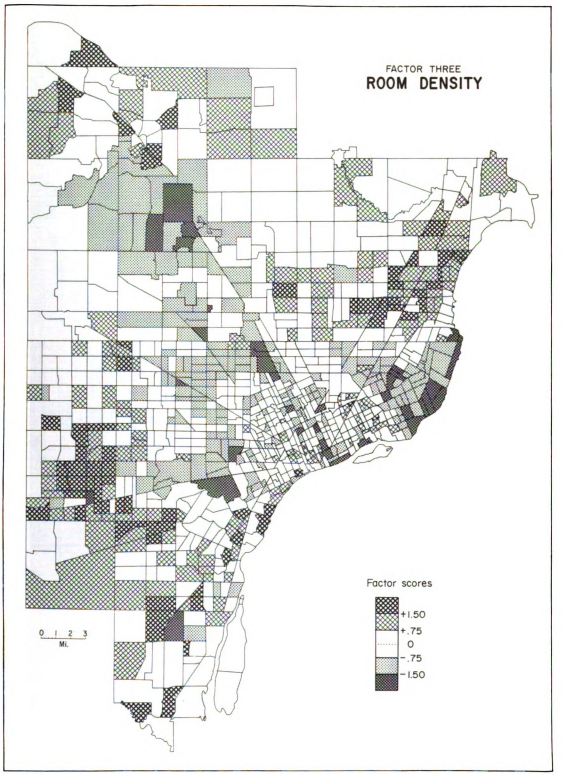
FACTOR THREE
ROOM DENSITY
Factor scores
+1.50
+.75
0
-.75
-1.50
0 1 2 3
MI.

Figure 4

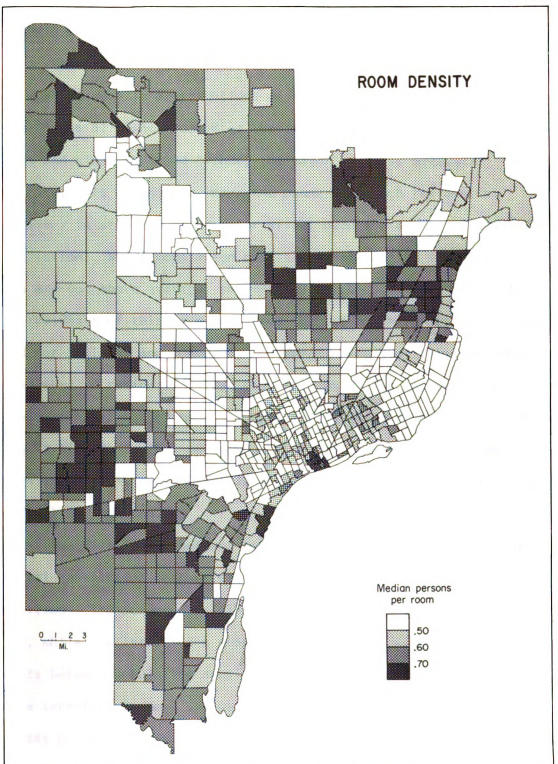

Figure 5

recipiency and similar forms of behavior. The behavioral factors will indicate whether this is the case.

Factor four, Apartment Dwellings, illustrates the pattern one might expect in distributions of spatial restriction components. (See Figure 6) Concentrated at the junction of Detroit's major thoroughfares and along Woodward Avenue, the major business artery of the city, this is an area where the manner in which residential territory is utilized has a major effect upon the degree of spatial restriction. While population and structural density for the total area are not above average, the density of the territory available to the residents of this area is. Because much of this part of Detroit is used for business and commercial purposes, little of this territory is given over to residential land use; that which is, is used very intensively. The number of housing units per square mile of residential area is highest in this portion of the city, and because of the intensity of this residential land use, it can be viewed as a spatially restrictive location.

The distinction between population density and the other forms of spatial restriction becomes clearer with a comparison of room and household densities. The former shown in Figure 7, is concentrated in the inner city, while the latter is a suburban phenomenon. A further distinction exists between population density and the density of residential area. Where territory is most intensively used, we are likely to find the greatest degrees of spatial restriction. This component appears to be a major distinguishing feature between the number of persons per residential area

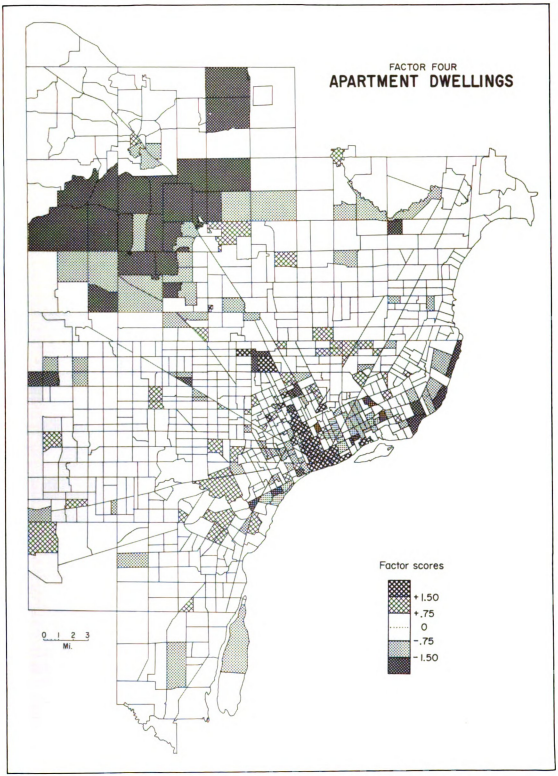
FACTOR FOUR
APARTMENT DWELLINGS
Factor scores
+1.50
+.75
0
-.75
-1.50
0 1 2 3
Mi.

Figure 6

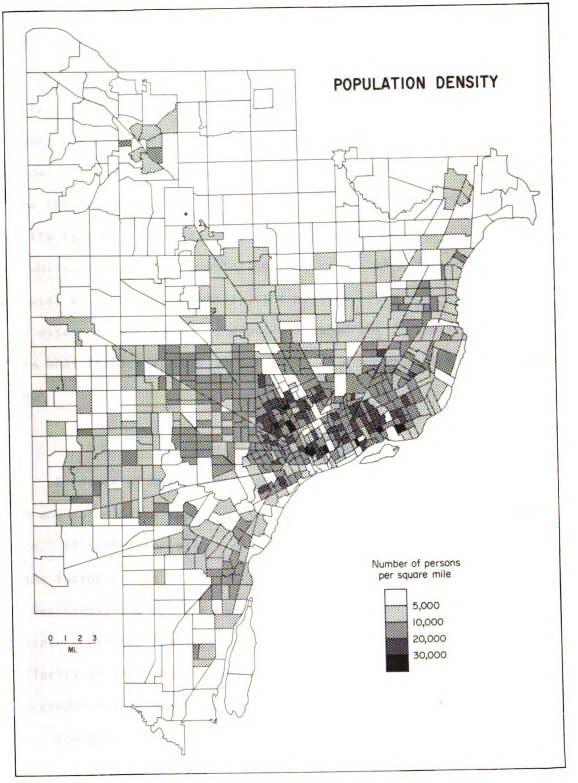
POPULATION DENSITY
Number of persons
per square mile
5,000
10,000
20,000
30,000
0 1 2 3
Mi.

Figure 7

and population density. Population density is based upon total area, and thus while a small amount of residential space may be used intensively, this form of restriction is not reflected in density figures because the number of people occupying the total census tract area is low. Structural density of residential land use also seems to accentuate the degree of spatial restriction in those locations where population density is low. The pattern of distribution is basically the same, but while areas of high population density are also likely to have high measures of residential density, the opposite does not necessarily follow. This essential difference is especially apparent in the inner-city, where what little residential territory is available is highly restrictive.

Spatial Variations in Behavior

Evidence of association between the components of spatial restriction and pathological behavior lies in the co-occurrence of the two in space. If such associations exist, one source of information will lie in the factor scores of the three behavioral patterns: Low Density Behavior, New Residents, and Non-Residential Divorce. Their factor scores will indicate where the "healthy" portions of the city are located, and a similarity in their patterns with those of spatial restriction will lend some credence to a place-behavior relationship.

Low Density Behavior, which is a composite of behavioral stability and low components of spatial restriction, displays the most striking pattern of the six factors extracted from the data. Scores of Factor One

are shown in Figure 8. Very clearly it is the inner-city which is the "unhealthiest" part of the urbanized area. The residents of this portion of Detroit display far greater tendencies to become welfare recipients, fail to graduate from high school and abandon their families. Where room densities are highest, very little of this behavior is exhibited This lack of a positive association is demonstrated in a comparison of outlying and inner-city tracts, selected on the basis of the contrasting factor scores (Table 5).

TABLE 5

Factor Scores for Selected Inner-City and Suburban Census Tracts: Low Density Behavior and Room Density

		FACTOR SCORES	
Tract		Low Density Behavior	Room Density
Inner-City			
	564	-1.42	-1.60
	569	-1.32	- .76
	573	-3.89	-3.86
	741	-1.88	.18
	742	-1.10	- .52
	408	-1.40	- .29
	409	-1.45	.12
Suburbs			
Waterford Twp.	252	1.04	1.89
Bloomfiled Hills	229	1.13	-2.10
Bloomfield Twp.	225	1.03	-1.73
West Bloomfield Twp.	216	1.32	- .95
Southgate	929	1.00	1.83
Wayne	911	.41	1.58

SOURCE: Calculated by author

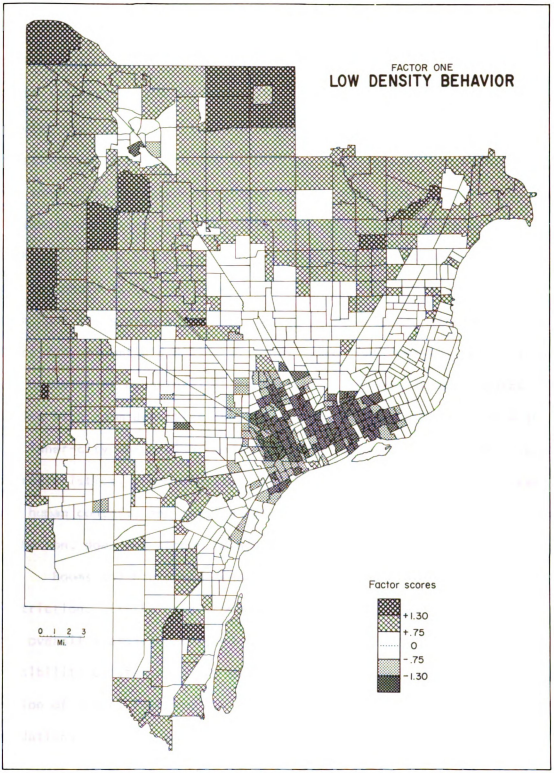
FACTOR ONE
LOW DENSITY BEHAVIOR
Factor scores
+1.30
+.75
0
-.75
-1.30
0 1 2 3
MI.

Figure 8

Negative scores on the behavioral factor are indications of pathology for they describe characteristics that are the inverse of those loadings in the pattern. The difference in behavior among the populations residing in these sets of locations is apparent but the relationship of room density to this behavior is not. In both suburban and inner-city locations are found tracts which have extremely low household densities, yet they have populations behaving in opposite fashions. Tract 573 in Table 5 has among the lowest number of persons per household (2.38) and room (.26) of any census tract in the urbanized area but it is also among the highest in behavioral pathologies. Tract 229, Bloomfield Hills, also has a low room density, but is virtually the opposite in behavioral characteristics. Tracts in the suburbs having high room densities exhibit low pathology, while those few in the inner-city which also score high on this factor have opposite behavioral characteristics. Room density, despite its ramifications for privacy and human contact, and notwithstanding the findings of Galle, Gove and McPherson, does not appear to be associated with behavioral pathology.

Rooms and household densities, however, do not encompass spatial restriction. If the other components of spatial restriction, as well as the overall measure, are found to co-occur with pathology, then the possibility exists that they may be causally connected. As the distribution of scores from the Low Density Behavior factor demonstrates, gradations in family stability, welfare recipiency, and high school drop-outs are spatially correlated with population density and housing unit density.

Only household and room density measures appear unconnected with pathology. Marital Unrest also demonstrates a high concentration in the inner-city; however, the peripheral areas are high in this characteristic and for the most part these are locations which are not spatially restricted (Figure 9).

It has been hypothesized that a positive relationship exists between spatial restriction and social indicators. This premise can be extended to another form of behavior, migration. Migration data have been collected for the purpose of analyzing what initially seems to be a logical response to an unpleasant environment -- avoidance. Scores from Factor One, Low Density Behavior, have established the core of social indicators and high spatial restriction as the inner-city. An examination of migration behavior in locations throughout the urban area will provide clues to what should be an inverse relationship between measures of low social well-being and residential relocation. If the hypothesis is confirmed, we can expect to see out-migration from areas of high spatial restriction and social indicators and in-migration to locations which provide more space and are socially more healthy. Factor Two, New Residents, focuses upon residential movement, and its factor scores provide the information necessary to test the hypothesis.

Figure 10 depicts residential relocation in the Detroit Urbanized area. As expected, those tracts scoring highest on this factor are located on the periphery. These suburbs are the focus of the most recent residential construction, and are receiving the greatest influx of

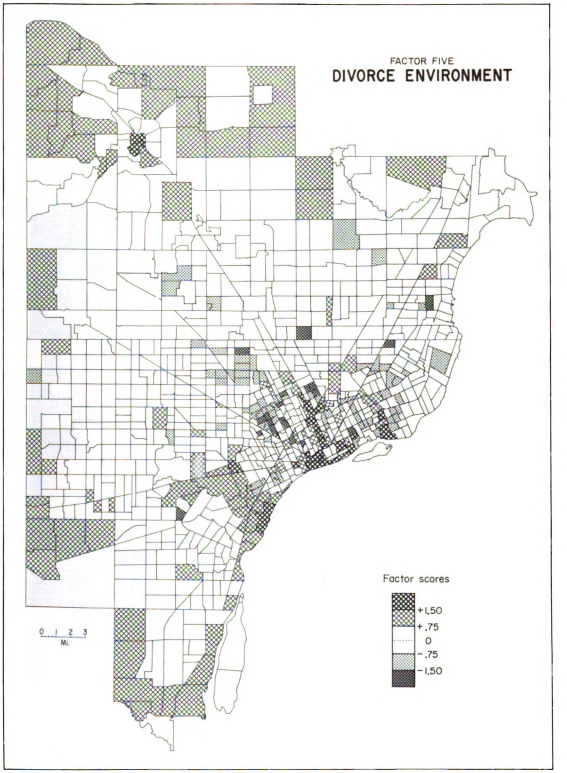
FACTOR FIVE
DIVORCE ENVIRONMENT
Factor scores
+1,50
+,75
0
-,75
-1,50
0 1 2 3
Mi.

Figure 9

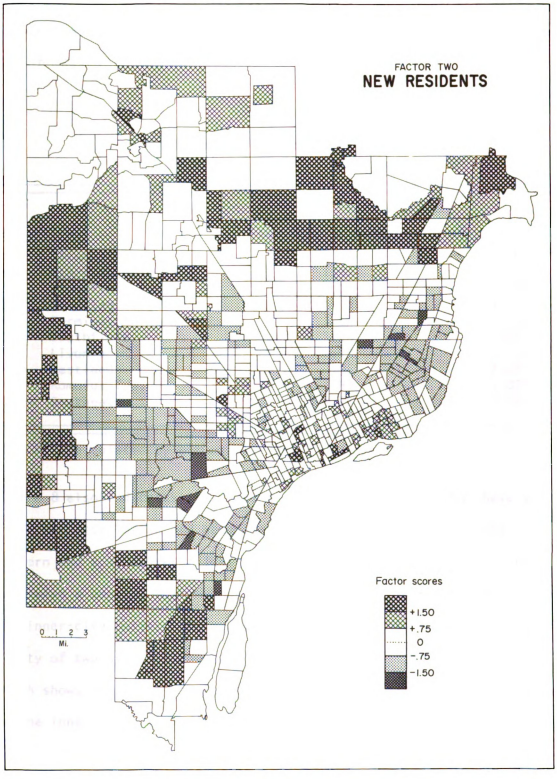
FACTOR TWO
NEW RESIDENTS
Factor scores
+1.50
+.75
0
-.75
-1.50
0 1 2 3
Mi.

Figure 10

intra-urban migration. Moreover, these locations also score highly on Factor One. As Table 6 indicates new suburbanites are moving to locations that are low in spatial restriction as well as social indicators. However,

TABLE 6

Aggregate Factor Scores for
Suburban Behavioral Stability and In-Migration

Census Tract		FACTOR SCORES	
		Low Density Behavior	New Residents
101	Clinton Twp.	1.30	1.06
51	Sterling Heights	1.31	3.97
228	Bloomfield Twp.	1.27	2.10
53	Sterling Heights	1.17	4.11
207	Farmington Twp.	1.44	2.95
177	Southfield	1.28	1.87
794	Livonia	1.13	2.30
844	Westland	.95	2.06
919	Romulus Twp.	.99	3.07
930	Southgate	1.71	2.88

SOURCE: Calculated by author

Figure 8 also indicates there are areas of in-migration that have very different restriction and behavior characteristics. On both the western and southeastern sides of the inner-city census tracts are receiving a considerable number of new residents. Given the peripheral and inner-city pattern of in-migration, there exists the strong possibility of two distinct populations engaging in this movement. Figure 11, which shows the black population in Detroit, reveals a clear concentration in the inner-city, including those portions receiving an influx of new residents. This pattern and data focusing on areas of in-migration confirm this possibility. The maps indicate that blacks and whites are engaged in separate migration patterns within the urbanized area.

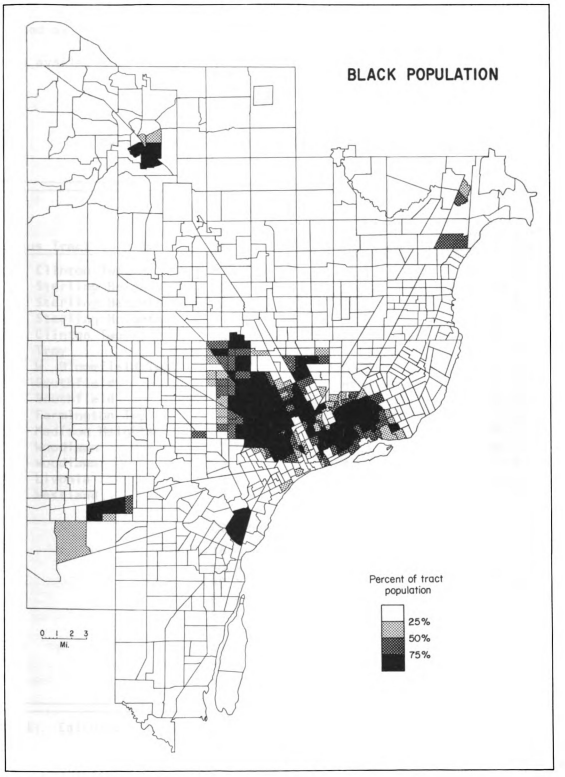
BLACK POPULATION
Percent of tract population
25%
50%
75%
0 1 2 3
MI.

Figure 11

Table 7 provides evidence that the areas available to blacks are not only limited by location, but that the conditions in them differ radically from those available to recently migrated whites.

TABLE 7

Racial Contrasts in Housing and In-Migration
Detroit Metropolitan Area

Census Tract		Percent Black	Percent of New Structures	Percent of New Residents
		SUBURBS		
103	Clinton Twp.	0.3	76.7	45.6
51	Sterling Heights	0.0	95.5	59.9
53	Sterling Heights	0.2	90.6	67.4
60	Sterling Heights	0.0	79.3	31.4
102	Clinton Twp.	0.0	80.9	65.6
185	Troy	0.1	75.4	70.3
215	W. Bloomfield Twp.	0.1	64.5	57.4
170	Southfield	0.1	94.3	61.3
171	Southfield	0.1	99.9	70.3
207	Farmington Twp.	0.1	69.3	69.6
130	Madison Heights	0.3	80.9	86.9
927	Woodlawn	0.0	85.8	88.2
931	Woodlawn	0.1	66.8	66.6
795	Livonia	0.0	80.6	53.5
843	Westland	0.1	71.9	72.4
		LOWER EAST SIDE		
544		16.5	46.5	61.3
549		50.4	79.6	70.5
566		48.3	1.1	50.9
568		67.4	14.1	50.5
677		53.7	0.6	56.8
697		89.9	0.0	54.7
696		83.5	0.0	56.6
700		44.3	0.0	54.2
680		54.6	9.1	53.2

SOURCE: Calculated by author

While factor two contains a high loading for new structures, very clearly those new structures are primarily available in the suburbs and to only one segment of the population. Selected suburban tracts

show considerable residential development in the form of a high percentage of dwellings having been constructed between 1965 and 1970. This construction is directly related to the high percentage of tract populations living in their current residences for two and one-quarter years or less.

Tracts selected from the lower east side of Detroit present a much different situation. Almost equally high in their percentage of new residents, very few of these inner-city locations have been sites for recent housing construction. Tracts 544 and 549 are exceptions to this statement. The city of Detroit has an on-going program of river-front redevelopment and this portion of the inner-city has recently experienced construction activity. However, as Table 7 indicates, more whites than blacks have been able to take advantage of this redevelopment.

The lower east side of Detroit represents the now well-known story of black intra-urban migration.[9] Unable to gain access to new housing in the suburbs, most blacks are spatially limited to housing previously occupied by others who have been able to escape the inner-city. Thus the two patterns of intra-urban migration: white movement to new housing on the periphery, and black relocation in older residences of the inner-city.

This dual patterns of migration complicates the avoidance issue. It seems relatively straightforward from an analysis of the data that

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[9] Morrill, R.L., "The Negro Ghetto: Problems and Alternatives," The Geographical Review, vol. 55 (1965), pp. 339-361; Rose, H.M., "The Development of an Urban Sub-System: The Case of the Negro Ghetto," Annals, Association of American Geographers, vol. 60 (1970), pp. 1-5; Rose, H.M., Social Processes in the City: Race and Urban Residential Choice, Commission on College Geography Resource Paper No. 6, Association of American Geographers, 1969.

white Detroiters are able to avoid areas of spatial restriction and social indicators. But this is not the case for blacks. The premise at hand is one of avoidance: populations will avoid restriction and such behavior by relocating, or remaining in areas that contain more open space and behavioral stability. Data from Table 7 suggest two possible explanations of black migration in relation to unpleasant environments. Either these residents of Detroit do not view the inner-city in the same fashion as whites, and therefore respond to it differently, or they simply are so limited in their choice of new residences that regardless of where they relocate, they are unable to avoid such characteristics as high population and structural density. An analysis of environmental perception is needed to deal with the first explanation, and will be provided in the following chapter. Aggregate data are supportive of the latter explanation.

The data in Tables 8, 9, and 10 dealing with black residential location suggest that blacks, within their limited sphere of mobility, tend to avoid areas of high social indicators and spatial restriction -- whenever possible. Each table places a control on race which shows that blacks tend to have higher mobility than whites.

In Table 8 the notion that blacks are unable to avoid spatial restriction and social indicators through a change in residence is further substantiated. The lower east side, previously discussed as a focus of black in-migration, is compared with the other location within the inner-city that is receiving large numbers of new residents. Both sections of the city are similar in their racial makeup, degree of in-migration and new housing. The distinguishing characteristic is the degree of spatial restriction and social well-being in each. The northwest side is understandably receiving an influx of new residents, as it is one of the more attractive

TABLE 8

Inner-City Contrasts in Residential Change in Black Environments

Census Tract	Low Density Behavior Factor Score	Percent Black	Percent of New Structures	Percent In-Migration
		Northwest Detroit Sample		
457	-.67	58.1	0.0	47.1
440	-.95	52.8	0.0	48.9
442	-.69	61.8	7.1	54.0
433	-.26	51.4	12.2	51.7
432	-.09	57.9	3.6	40.6
		Lower East Side Detroit Sample		
677	-1.97	53.7	0.6	56.8
701	-1.86	42.3	0.0	46.4
678	-1.84	62.4	0.6	49.1
700	-1.75	52.2	0.0	52.2

SOURCE: Calculated by author

areas of housing available to inner-city residents. Note, however, that none of these tracts scores positively on Factor One. Despite forms of spatial restriction and behavior that range up to three times as great as those in the northwest, the lower east side is receiving a comparable number of new residents. With available housing limited, those portions of the inner-city offering a degree of openness cannot meet the demands of new residents, who are forced to turn to far less desirable locations.

Once situated in an amenable location, there is evidence that blacks tend to remain. Few tracts in the inner-city exhibit low density and behavioral stability characteristics, but those that do also demonstrate a high degree of residential stability. Table 9 compares two

locations in the inner-city that are similar in their racial characteristics, but differ in their scores on the low density behavioral factor.

TABLE 9

Residential Stability in Black Environments

Census Tract	Low Density Behavior Factor Score	Percent Black	Percent of 5 Years or More Residence
	Northside Detroit		
469	.28	71.3	69.1
477	-.32	96.8	79.4
478	-.29	96.8	69.9
470	.37	70.0	74.4
468	.22	76.4	71.4
609	-.31	91.9	73.5
607	-.13	60.9	70.0
	Central Detroit		
315	-1.98	73.0	28.4
386	-1.10	76.5	41.8
387	-2.48	92.8	38.0
388	-1.36	93.8	47.3
397	-1.76	97.6	39.4
398	-1.88	97.7	36.7
399	-1.32	90.5	44.1
400	-1.93	95.3	47.4
401	-1.91	91.3	47.6

SOURCE: Calculated by author

The north side of the inner-city is one of the few locations within the residential limits of blacks that offers some degree, although small, of spatial openness. Central Detroit is more typical of the residential environment available to the black population. Vastly different in factor scores, the north side and central Detroit differ considerably in their degree of out-migration as well. Over seventy percent of Northside Detroit's population has been living in the present residence for at

least the past five years. Well under half of the spatially restricted population of central Detroit has done the same.

It is difficult to generalize about aggregate black responses to spatial restriction because so few areas available to them offer a sufficient contrast in environment. If the northside of inner-city Detroit is representative, most blacks will avoid pathological locations by migrating to, and remaining in areas of the city which have more open space and populations which behave in a more stable manner. Unfortunately, for the vast majority of the city's blacks this is not possible. Only on the fringe of the inner-city, in those areas of racial transition, is there available a residential environment which is reasonably "healthy." In comparing the distribution of scores from Factor One (Figure 8) and the distribution of Detroit's black population (Figure 11) this conclusion becomes inescapable. With reference to the avoidance hypothesis a qualified conclusion must be made, for the relationship between spatial restriction and migration ultimately depends on race. Aggregate data indicate that whites are able to avoid areas of restriction and pathology by moving to new residential developments on the fringe of the urbanized area or by remaining in older but "healthier" suburbs.

For blacks limitations in housing make it difficult to test the avoidance hypothesis. We have some indication that black areas low in spatial restriction and social indicators have little population turnover. But these locations are few in number. As Table 10 indicates, the vast majority of blacks move into areas high in such behavior, or are left behind in similar environments. Table 10 describes a fact of

TABLE 10

Black Migration in High Pathology Locations

Census Tract	Low Density Behavior Factor Score	Percent New Structures	Percent Non-Migrancy	Percent In-Migrancy	Percent Black
324	-3.61	0.4	44.8	38.3	83.0
326	-2.64	0.1	46.2	44.6	48.6
335	-2.61	0.0	43.8	45.7	36.1
337	-3.44	0.0	50.3	39.3	65.1
424	-2.87	0.3	35.6	42.5	98.9
497	-2.50	1.1	43.1	32.1	40.8
565	-3.99	1.3	61.3	26/3	99.2
573	-3.89	0.0	46.1	50.0	27.1
675	-2.74	0.7	35.8	49.0	84.2
694	-2.60	0.0	40.7	48.8	93.6
696	-2.56	0.0	37.0	56.6	83.5
699	-2.70	0.0	37.8	33.3	74.1

SOURCE: Calculated by author

life for the black residents of Detroit: avoidance is perhaps a logical objective but it is nearly impossible to achieve.

Conclusions from Analysis -- The results of a factor analysis of spatial restriction and behavioral characteristics lead to a number of conclusions, as well as several inferences which can be tested by other statistical methods. Conceptually, it has been argued that no single element of the environment acts alone in affecting the degree of desired and undesired contact between individuals and populations; factor loadings and scores verify this argument. The various forms of population and structural densities form separate patterns but each contributes to the degree of spatial restriction found in a particular location. Because such components as room density and structural density form virtually opposite patterns in the study area, it is difficult to argue that either is the characteristic which measures spatial restriction. When viewing the demographic structure of an urban area with the objective of

determining variations in spatial restriction, it appears more beneficial to include both human and structural measures of density.

There is limited support in the findings generated by the factor analytic model for accepting the hypothesized positive relationship between spatial restriction and behavioral social indicators. Only population density and housing unit density loaded on the same factor with these behaviors. If population and housing unit density can be considered additional forms of spatial restriction, then it can be suggested that some aspects of the parameter are associated with certain forms of behavior. But the evidence could also be interpreted in an opposite fashion. Correlation and regression analyses are needed to provide a more definitive testing of this hypothesis. Results of such analyses will indicate to what degree behavioral social indicators are functions of spatial restriction or other social and racial characteristics. This is done by measuring the extent values of behavior and environment vary together around their respective means as well as the direction of this covariation. These findings are presented below.

The migration findings have particular importance within the context of race. It appears that blackness is closely associated with both a spatially restrictive environment and low social well-being. This tentative conclusion is further substantiated by the results of a factor analysis which includes social class and racial characteristics in addition to those previously analyzed. Table 11 presents the rotated factor loadings of this analysis. The patterns, or factors, are essentially the same as those previously reported. The apartment dwelling factor is replaced by an upper-class suburban grouping.

TABLE 11

Aggregate Social, Economic and Restriction Factors: Rotated Factor Loadings

Variable	Low Density Behavior	Room Density	New Residents	Upper-Class Suburbs	Res. Spatial Restriction	Divorce Environment	Communality
NormFam	.8742	.1188	-.0690	.1814	.1168	-.1797	.8619
Pers HsHld	.1729	.6817	-.0650	.6156	.0659	-.1281	.8985
% Negro	-.8312	-.0619	.0470	.1166	-.0826	-.0485	.7197
Hi Sch Drop	-.6699	.1073	.1430	-.3025	.1733	.0183	.6026
PerStrct 65	.4019	.1030	.7515	.1356	.0177	.0374	.7569
Med Income	.7270	-.1762	.0502	.4891	-.0460	-.0577	.8068
Med Schl Yrs	.7416	-.1651	.1038	.3555	-.1373	-.0683	.7380
Matriar ID	-.9371	-.1378	-.0158	-.0548	-.0766	.1214	.9210
Marital Unrest	-.3814	-.1839	-.0091	-.0528	-.3358	.5801	.6315
Welfare	-.8966	.0355	.0662	.0266	-.1227	.1878	.8605
Fertility	-.4435	.3573	-.0927	.3797	.0034	.1262	.4930
Non Migran	.1828	.1386	-.9119	.0355	.0467	-.0264	.8884
Male Unempl.	-.7494	.1066	.0881	-.0566	-.0066	.0221	.5834
Poverty	-.8790	-.0201	.0707	-.0822	-.1331	.2173	.8497
Rms per HsUnit	.2331	-.0728	-.0600	.8925	.1041	-.1303	.8875
% Overcrowding	-.4204	.8179	-.1582	-.0519	.0069	.0471	.8756
New Residents	-.2015	-.0885	.8859	-.1804	-.0436	.0529	.8706
Dist CBD	.6318	.3559	.2448	.2628	.0676	.0865	.6669
Pop Density	-.6720	-.1516	-.1907	-.1230	-.2132	-.4496	.7737
Persons per Rm	.2448	.8732	.0079	-.1293	-.0968	-.0169	.8488
HU per Sq. Mile	-.5251	-.2336	-.0775	-.2691	-.3072	-.3930	.6576
% Residential LU	.0986	-.0332	-.0524	.1233	-.1334	-.6362	.4514
HU per Res Area	-.2026	-.0052	.0477	-.3795	-.6681	.0600	.6373
Proportion Var.	.3365	.1013	.0996	.0932	.0577	.0549	
Cum. Pro. Var.	.3365	.4378	.5374	.6306	.6882	.7431	

SOURCE: Calculated by author

More importantly, the high loadings of racial and social class characteristics in the low density behavioral grouping indicates that they may account for the variation in behavior rather than the components of spatial restriction. These loadings suggest that not only do social indicators and certain restriction components co-occur in space but their locations are also likely to be associated with poverty and high percentages of blacks in the total population. Such findings raise difficult questions. We know that blacks are confined to spatially restrictive areas of the city. Is it the characteristics of the black residential environment which lead to low social well-being or blackness per se which is related to behavioral instability? Or can the two be separated? It is primarily to this issue that the remainder of this chapter is devoted.

The Association of Race, Spatial Restriction and Social Indicators

Hypothesis One states that populations residing in spatially restrictive locations will exhibit greater frequencies of behavioral social indicators than those which do not. A testing of this hypothesis through correlation and regression of the data from all 934 census tracts yields results which are best interpreted within the context of race. In order to focus on the racial issue, as it relates to behavior and spatial restriction, the census tracts of the Detroit Urbanized Area were divided into three racial categories: white-tracts with populations less than twenty-five percent black; mixed - those which are twenty-five to seventy-four percent black; and black - those over seventy-four percent black.[10] Each population was then subjected to a correlation and

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[10] White N = 676, mixed N = 97, black N = 161.

regression analysis utilizing spatial restriction, social class and social indicators. As shown in Table 12, the strength of the relationship between forms of spatial restriction and behavior generally increases with the proportion of the population that is black. Thus the simple correlation between family abandonment (matriarchial index) and the number of housing units per residential area among whites is only .174 while among blacks it is .432. With the exception of marital unrest, densities increase in their association with each of the dependent variables as the percent black increases. Room density (percent of dwellings overcrowded) and/or structural density are significantly associated with welfare recipiency, fertility and several forms of family instability. The degree of association between these restriction components and behavioral social indicators increases considerably among black populations.

Thus the research hypothesis can be accepted but with major qualifications. The measures of spatial restriction are significantly associated with some forms of behavior, but only among blacks. Spatially restricted blacks do exhibit greater frequencies behavioral social indicators than blacks provided with more open space and privacy. However, it should also be noted that when the various components of spatial restriction are examined, whites also appear to be detrimentally affected by room and structural density, as well as general population concentration. Where population and structural dnesities are low, white children are also more inclined to remain at home, their fathers less likely to abandon the family, and divorce is less likely to occur. But, the general conclusion that can be reached from a cross-racial comparison of simple correlations between spatial restriction and behavior is that blacks appear to be particularly susceptible to difficulties associated with lack of residential space and privacy.

TABLE 12

Restriction - Behavior Associations by Race

Variable	Normal Family			High School Dropouts		
	White	Mixed	Black	White	Mixed	Black
Pers/Household	.524*	.517*	.393*	-.281*	.039	.057
Rms Per Housing Unit	.503*	.592*	.420*	-.362*	-.276*	-.091
% Overcrowded	-.028	-.173	-.146	.193*	.506*	.296*
Population Density	-.262*	-.068	-.182	.209*	.124	.205
Housing Units/Sq. Mile	-.380*	-.203	-.302*	.258*	.070	.231*
% Residential Land Use	.115*	.450*	.244*	-.138*	-.325*	-.104
Housing Units/Res. Area	-.341*	-.275*	-.323*	.189*	.130	.298*
Persons Per Room	.165*	-.166	.304*	-.103*	.364*	.055
Median Income	.516*	.496*	.883*	-.540*	-.065	-.441*
Median School Years	.570*	.483*	.703*	-.656*	-.618*	-.414*

Variable	Matriarchical Index			Marital Unrest		
	White	Mixed	Black	White	Mixed	Black
Pers/Household	-.539*	-.193	-.259*	-.555*	-.253	-.636*
Rms Per Housing Unit	-.393*	-.338*	-.390*	-.597*	-.118	-.645*
% Overcrowded	-.011	.399*	.247*	-.044	.094	-.177
Population Density	.465*	.162	.278*	.176*	-.139	.102
Housing Units/Sq. Mile	.506*	.209	.373*	.427*	.052	.209
% Residential Land Use	-.074	-.237	-.243*	-.161*	-.235	-.234*
Housing Units/Res. Area	.174*	.161	.432*	.641*	.087	.254*
Persons Per Room	-.419*	.018	-.165	-.037	-.241	-.356*
Median Income	-.558*	-.065	-.816*	-.362*	-.205	-.558*
Median School Years	-.619*	.008	-.614*	-.308*	.006	-.455*

* Significant at the .01 level of confidence

White N = 676
Mixed N = 97
Black N = 161

SOURCE: Calculated by author

TABLE 12 (cont'd.)

Variable	Welfare			Fertility		
	White	Mixed	Black	White	Mixed	Black
Pers/Household	-.237*	-.116	.013	.292*	.306*	.534*
Rms Per Housing Unit	-.321*	-.258*	-.164	.175*	.124	.323*
% Overcrowded	.216*	.473*	.384*	.331*	.546*	.507*
Population Density	.195*	.123	.168	.088	.041	.034
Housing Units/Sq. Mile	.267*	.248	.188	-.036	.015	-.123
% Residential Land Use	-.127*	-.232	-.234*	.021	-.099	-.120
Housing Units/Res. Area	.198*	.240	.384*	-.120*	-.075	.153
Persons Per Room	-.083	-.031	-.003	.072	.002	.264*
Median Income	-.457*	-.611*	-.729*	-.174*	-.252	-.248*
Median School Years	-.537*	-.523*	-.675*	-.258*	-.329*	-.359*

* Significant at the .01 level of confidence

White N = 676
Mixed N = 97
Black N = 161

SOURCE: Calculated by author

Are behavioral social indicators inherently a black problem? An initial examination of Table 12 might lead one to conclude that this question should be answered positively. Evidence has been presented which indicates that the residential environment of the black urbanite is associated with low levels of social well-being. However, an additional finding from these simple correlations also suggests that race, in and of itself, is not necessarily tied to unstable behavior. Table 12 also includes the correlations of income and education with those of behavior. Like spatial restriction, the association between these independent variables and behavior grows with increases in the black proportion of the population. However, the direction of association is negative and much higher between income, education and behavioral social indicators. In essence, the data suggest that blacks are not only susceptible to such behavior because of their residential environment but also because blackness often means poverty, and poverty in turn is associated with behavioral instability. The poor, whether they be white or black, suffer from more family instability than the middle or upper class. The higher correlation of income and education with the matriarchical index, rather than marital unrest, demonstrates this relationship particularly well. In a sense, divorce and legal separation is the rich man's means of ending a marriage. The poor white or black, unable to afford what can be an expensive process, simply leaves. Blacks, however, are more likely to have lower incomes, less education and greater poverty than whites. Given this discrepancy, it is not surprising that correlations between pathology and income are higher for census tracts which are over seventy-five percent black.

Simple correlations have established that spatial restriction and its components are associated with behavioral social indicators; but the stronger correlations of income and education suggest that they may be more important or basic factors in the incidence of behavioral instability. Under these circumstances, simple correlations alone do not fully describe the relationships between dependent and independent variables. Given this ambiguity it becomes necessary to turn to a step-wise multiple regression which measures the proportion of behavioral variance accounted for by each of the independent variables. In this manner it will be possible to discern whether it is spatial restriction or some other characteristic which has the greatest effect upon the behavior of populations.

The results of a stepwise regression indicate that while spatial restriction does present behavioral difficulties for black Americans, lack of space and privacy are decidedly secondary to the problems of low income and poverty. With the exception of fertility, the greatest proportion of the variance in each behavior is accounted for by income or poverty. As shown by the results presented in Table 13 the most severe and immediate difficulty faced by the black resident of Detroit is the strain of poverty. While it is true that blacks suffer from the greatest frequencies of behavioral instability, this is best understood within the context of low income, rather than race per se. Pathology is a racial problem, but only indirectly so. The fact that blacks overwhelmingly compose Detroit's poor is perhaps the best response to questions previously raised in this chapter. Poverty is as much a part of the black environment as spatial restriction. Table 13 provides convincing evidence that once a higher income is achieved by these Detroit residents, then they can and will concern themselves with

TABLE 13

Stepwise Regression of Aggregate Behavior in Black Environments

Step	Independent Variable	Percent of Variance	Total	Direction of Regress. Coeff.
DEPENDENT VARIABLE: Normal Family Index				
1	Median Income	.7806	.7806	+
2	Persons Per Room	.0222	.8028	+
3	Percent Overcrowded	.0130	.8158	-
4	Housing Units/Sq Mile	.0103	.8261	-
5	Poverty	.0102	.8363	-
DEPENDENT VARIABLE: High School Dropouts				
1	Median Income	.1945	.1945	-
2	Percent Overcrowded	.0459	.2394	+
3	Distance from CBD	.0328	.2712	-
4	Population Density	.0176	.0288	+
5	New Structures	.0164	.3052	-
DEPENDENT VARIABLE: Matriarchical Index				
1	Median Income	.6674	.6674	-
2	Housing Units/Res Area	.0390	.7064	+
3	Poverty	.0358	.7422	+
4	Persons Per Room	.0275	.7697	-
5	Housing Units/Sq Mile	.0246	.7943	+
6	Percent Overcrowded	.0083	.8026	+
DEPENDENT VARIABLE: Marital Unrest				
1	Poverty	.4229	.4229	+
2	Persons Per Household	.2337	.6606	-
3	Median Income	.0179	.6785	-
4	Rooms Per Housing Unit	.0137	.6922	-
5	Persons Per Room	.0131	.7053	-
DEPENDENT VARIABLE: Welfare Recipiency				
1	Poverty	.5618	.5618	+
2	Persons Per Household	.0445	.6063	+
3	Median Income	.0369	.6432	-
4	Male Unemployment	.0289	.6721	+
5	Housing Units/Sq Mile	.0154	.6875	+
DEPENDENT VARIABLE: Fertility				
1	Persons Per Household	.2862	.2862	+
2	Median Income	.1996	.4858	-
3	Persons Per Room	.0205	.5063	+
4	Rooms Per Housing Unit	.0191	.5254	-

SOURCE: Calculated by author

with the quantity and quality of their residential space. Until this is the case, the stress of a low level income has to be the black's most immediate and pressing concern.

Relative to income and poverty, components of spatial restriction are not as important in accounting for unstable behavior among black residents of the Detroit urbanized area. This conclusion does not, however, discount the role of spatial restriction in the occurrence of behavioral social indicators. Table 14 presents the total behavioral variance accounted for by restriction components and in most cases that explanatory power is considerable. The sizable proportion of explained variation in

TABLE 14

Variance in Aggregate Behavior Explained by Restriction Elements in Black Environments

Dependent Variable	Percent Variance Explained By Restriction Components	Total Variance Explained
Normal Family Index	5.37	86.06
High School Dropouts	11.90	38.21
Matriarchial Index	10.64	81.70
Marital Unrest	27.92	73.74
Welfare Recipiency	9.30	72.44
Fertility	34.88	55.89
Non-Migration	16.04	35.83
New Residents	22.09	45.02

SOURCE: Calculated by author

behavior by components of spatial restriction means that these characteristics of place have considerable influence on behavior in space. This is especially true for those behaviors relating to family stability and fertility.

With the established importance of spatial restriction for black behavior, the inability of Detroit's black population to avoid this type

of environment further accentuates the racial nature of the problem. Findings generated from a factor analysis of restriction and behavioral characteristics have tentatively established that most populations will logically avoid locations that are restrictive. That not all blacks are able to do so is further substantiated by the results of the stepwise correlations and regression analysis. In the cases of both population turnover and stability in black census tracts, restriction components account for one-half of the explained variation (Table 14). The direction of this relationship becomes clearer with an examination of the simple correlation matrix shown in Table 15. These correlations

TABLE 15

Simple Correlations of Black Mobility with Spatial Restriction

	Non-Migration			New Residents		
Variable	White	Mixed	Black	White	Mixed	Black
Persons Per Household	.138*	.294*	.091	.232*	-.260*	-.165
Rooms Per Housing Unit	.011	.342*	.183	-.211*	-.307*	-.281*
Percent Overcrowded	.279*	.158	.058	-.157*	-.070	-.044
Population Density	.302*	.001	-.343*	-.276*	.028	.407*
Housing Units/Sq Mile	.139*	-.047	-.378*	-.114*	.168	.462*
% Residential Land Use	.086	.202	-.070	-.104*	-.185	.134
Housing Units/Res Area	-.081	-.083	-.094	.091	.181	.095
Persons Per Room	.106*	-.211	-.064	.078	.081	.052
Median Income	-.067	-.010	.169	-.112*	-.082	-.228*
Median School Years	-.097	-.062	.070	-.034	.118	.086

* Significant at .01 level of confidence

SOURCE: Calculated by author

support the avoidance hypothesis and the suggestion that there are two patterns of migration in Detroit -- white and black. Table 15 shows that measures of spatial restriction not only bear a stronger association with the decision to stay by Detroit's black population but are the inverse of the white relationship. Where

spatial restriction is highest in black census tracts, the behavioral tendency is to leave such locations.

Simple correlations for the white population do not seem to support the avoidance hypothesis. However, it must be remembered that many of the older suburbs, which are highly stable demographically, have higher population densities than the new white suburbs of Detroit's periphery. Within the white population, the simple correlations could lead one to conclude that these Detroit residents are not attempting to avoid highly restrictive residential environments. But it must also be remembered that relative to the degree of black spatial restriction, these older suburbs possess far more open space and can provide a measure of privacy virtually unattainable in the black community. This is particularly apparent when correlations of population density for the two populations are compared. Population density bears no positive association with white residential stability, while for blacks its relationship is highly significant in an inverse direction. In essence, the positive direction of certain restriction components among whites is a reflection of within versus between group association.

While there is an inverse relationship between spatial restriction components and the decision to remain in such an environment, the positive correlations of the same characteristics with migration also indicate that blacks are relocating in areas which are at least as restrictive as those left behind. Even when a stepwise regression is carried out, spatial restriction, and especially structural density, accounts for the greatest proportion of variation in both migration and residential stability. This result is presented in Table 16.

TABLE 16

Stepwise Regression of Mobility in Black Environments

Step	Independent Variable	Percent of Variance	Total	Direction of Regress. Coeff.
DEPENDENT VARIABLE: Non-Migration				
1	Housing Units/Sq Mile	.1430	.1430	-
2	Percent Negro	.1069	.2499	+
3	Median School Years	.0409	.2908	-
4	Poverty	.0249	.3157	-
5	Median Income	.0187	.3344	+
DEPENDENT VARIABLE: New Residents				
1	Housing Units/Sq Mile	.2137	.2137	+
2	Median School Years	.0738	.2875	+
3	Percent Negro	.0685	.3560	-
4	Poverty	.0373	.3933	+
5	Median Income	.0245	.4178	-

SOURCE: Calculated by author

Findings from this multiple correlation and regression analysis confirm the tentative conclusions suggested by the factor analytic model. However, what was originally considered as a problem of environment and behavior, mediated by perception, has emerged as one with an important racial character. Components of spatial restriction are significantly associated with behavioral social indicators, but primarily among blacks. But it is a secondary problem, for most restricted populations are poor as well. That spatial restriction is primarily a problem of the black and the poor does not make restriction a difficulty of less impact. It may make it more so. It has long been known that the black American is disproportionately poor relative to his white counterpart. It is now apparent that the quantity and quality of his residential space is markedly inferior as well.

This investigation is attempting to establish a relationship between the quantity and quality of space and the occurrence of behavioral instability. Various theories and hypotheses, primarily focusing on the perception of stress, have been used as explanations for these aggregate findings. The established relationship between spatial restriction and pathology among blacks raises a further series of questions focusing on the role of stress, especially among blacks:

1. Do blacks moreso than whites, perceive their environment as stressful?

2. How will an individual, white or black, respond to a stressful environment when he is confined to such locations?

With a better understanding of the association between place and behavior, we can now turn to the perceiver to answer these questions.

CHAPTER 4

Perceptions of Environmental Stress

It has been established on an aggregate level that forms of spatial restriction are significatnly associated with behavioral social indicators, although these characteristics appear to have less importance than race and social class in accounting for this form of behavior. In addition, factor analysis results of restriction and behavioral data have indicated that relationship as primarily manifested in the inner-city. In keeping with the objectives of this study, it is now possible to turn to the issue of why spatial restriction has behavioral consequences. This chapter examines that connection through the medium of perceived stress. Individual variations in stress will be measured and a determination made of environmental associations with perceptions and, in turn, behavior.

When population and structural densities combine to increase the degree of desired and undesired contact between individuals, it becomes difficult for residents of such an environment to obtain the privacy necessary for stable behavior. But requirements for privacy and territorial needs vary with the individual. Thus two residents of the same restrictive environment may not respond in similar fashions to their surroundings because their perceptions of that environment vary. One

may view his environment as restrictive because of greater needs for privacy and individual space than the other. Unless the perceiver evaluates his surroundings as stressful, he is unlikely to view them as threatening and respond in turn in a manner that is potentially harmful. In order to draw a link between place and behavior, the intervening role of the perceiver must be considered.

Stress as a Meaning

Added understanding of aggregate behavior in restrictive locations may be gained if it can be shown that people in such places perceive their surroundings as stressful and have lower levels of social well-being. Most social scientists would agree that how a person behaves in a situation depends upon what the situation means or signifies to him. Most would also agree that one of the most important factors in social activity is meaning, whether it be measured as an attitude, value or perception.[1] This argument can be generalized to physical environments as well as social situations. One will also respond to his environmental surroundings according to the perceived meaning he has attached to them. For example, when the individual perceives his residential surroundings as threatening, he gives to them a stressful meaning. Thus perception can be spoken in terms of meaning one gives his environment.

Environmental perception has an affective or evaluative dimension and stress falls on the negative end of that continuum. The individual who perceives his surroundings as threatening or stressful is very likely to evaluate them in negative terms. The more stressful the

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[1] Osgood, Charles E., et al., The Measurement of Meaning, (Urbana: University of Illinois Press, 1957), p. 1.

individual's environment, the greater is its negative connotation. Conversely, one who is comfortable in his residential setting will likely evaluate his environment positively.

In summary, mental images of the environment have cognitive, evaluative and behavioral dimensions. On the evaluative dimension, stress can be defined as negative meaning. Stress is cognitive because it is in the individual's mind; it is affective because it has a dimensional value and it is behavioral because theoretically it influences responses to the stimulus.

The Measurement of Stress

How can environmental stress be operationalized and measured? Questionnaires or survey approaches to the study of environmental influences are limited by the fact that the environment tends to affect people in ways they are not directly aware. Except in rare instances people are not likely to articulate in any precise fashion how their environment affects them.[2] We can attempt to obtain measures of stress among individuals by asking them, "How do you feel about the amount of space you have?", or similar questions. But such responses have severe limitations in comparability, measurement and evaluation. Unrestricted linguistic output of this sort has high presumptive validity according to Osgood. Except for highly intelligent and verbally fluent individuals, most people find it difficult to spontaneously express meaning for any subject.[3] It is possible to observe individuals in various settings

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[2] Sommer, Robert, "Man's Proximate Environment," Journal of Social Issues, vol. 22 (October 1966), p. 67.

[3] Osgood, op.cit., p. 19.

and infer meaning from non-verbal responses -- facial expressions, features, gross bodily movements, etc., but such behavior is difficult to quantify and place in comparable units.

Even though open-ended questions are limited in their usefulness as measures of environmental perception and behavioral influences, this fact does not eliminate the use of linguistic output altogether. These responses can be used as indices of meaning but several criteria must be met: 1) alternative responses must be limited in number and standardized; 2) linguistic alternatives must be elicited from subjects rather than emitted in an open-ended fashion, so that fluency can be controlled as a variable; and 3) these alternatives must be representative of the major ways in which meanings vary.[4] By meeting these criteria, responses are limited in their potential variability, thereby allowing comparison among individuals of different environmental experiences.

Osgood's semantic differential has been designed as a generalized test which meets these criteria and therefore may be an effective instrument for measuring perceptions of stress.[5] One major advantage of this technique is its flexibility. It is a highly generalized technique of measurement of each research problem to which it is applied. There are no standard concepts and no standard scales; rather the concepts and scales used depend upon the nature of the research. A semantic differential can be designed around the focus of the problem rather than the problem around the technique.

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[4] Ibid.

[5] Ibid.

The semantic differential is essentially a combination of controlled association and scaling procedures. The respondent is provided with a set of bipolar adjectival scales against which he differentiates a provided concept, which in this study will be an element of the person's surroundings. For each concept his only task is to indicate the intensity and direction of association on a multi-step scale. The selection of successive adjectival alternatives gradually eliminates uncertainty as to the concept being defined, and selection among successive pairs isolates the meaning the concept has for the respondent. The sensitivity of the instrument is increased by inserting a scale between each pair of adjectives.[6] The respondent can then indicate both the direction and intensity of each judgment.[7] The key to the instrument lies in selecting the sample of descriptive polar adjectives. Ideally, the selection of terms would be as representative as possible of all the ways the concept can be defined and yet be small enough in size to be efficient in practice.

The perception of stress has been conceptualized as a mediation process between the environment and behavior. There has been no explicit statement of the relation between the theoretical definition of stress

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[6] For example, suppose we are interested in what meaning a respondent gives to his or her home. The concept home will be defined by series of bi-polar adjectival scales.

HOME

Beautiful					Ugly
	1	2	3	4	5
Warm					Cold
	1	2	3	4	5
Good					Bad
	1	2	3	4	5

[7] Ibid., pp. 19-20

as a meaning given to environment and its operational definition through the semantic differential technique. The link between theory and operation can be expressed through the constructs of a geometric model. The model postulates a semantic space, a region of n dimensions and Euclidian in nature. Each semantic scale, defined by a pair of polar adjectives, is assumed to represent a straight line function that passes through the origin of this space, and a sample of such scales then represents a multi-dimensional space. When a subject judges a concept against a series of scales, each judgment represents a selection among a given set of alternatives and serves to localize the concept as a point in the semantic space. The larger the number of scales and the more representative the selection of these scales, the more validly does this point in space represent the operational meaning of the concept. The location of that point is defined as its orthogonal projection onto any line passing through the origin of the space, i.e., onto any adjectival scale. Meaning then, is defined as the successive allocation of a concept to a point in the multidimensional semantic space by selection from among a set of given scaled adjectival alternatives. The difference in meaning two individuals give to their environment is merely a function of the differences in their respective allocations of the concept in the same semantic space, i.e., it is a function the distance between the two points.[8]

A graphic explanation of meaning is presented in Figure 12. Each of the vectors represents the bi-polar adjectival dimensions used by the individual to define the concept. The direction from the origin

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[8] Ibid., p. 26.

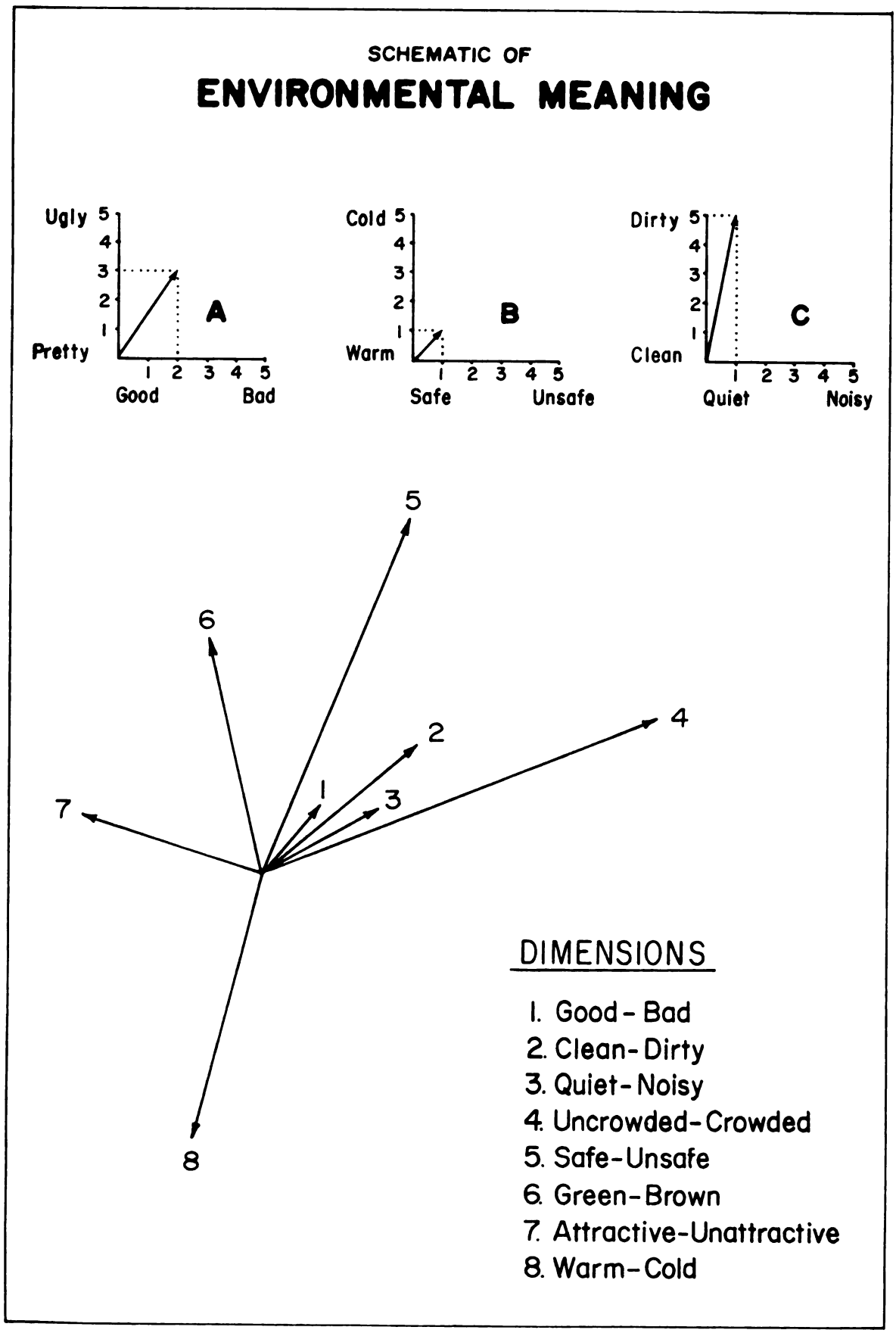
SCHEMATIC OF
ENVIRONMENTAL MEANING
Ugly 5
4
3
2
1
Pretty
A
1 2 3 4 5
Good
Bad
Cold 5
4
3
2
1
Warm
B
1 2 3 4 5
Safe
Unsafe
Dirty 5
4
3
2
1
Clean
C
1 2 3 4 5
Quiet
Noisy
5
6
2
4
1
3
7
8
DIMENSIONS
1. Good - Bad
2. Clean - Dirty
3. Quiet - Noisy
4. Uncrowded - Crowded
5. Safe - Unsafe
6. Green - Brown
7. Attractive - Unattractive
8. Warm - Cold

Figure 12

of the semantic space by any diemnsion is determined by its similarity with all others. Distance from the origin is determined by the value selected on the numerical scale of each dimension. In the initial examples relationships are calculated for only two-dimensions at a time. The final example represents the interrelationships of eight bi-polar adjectival scales. In this case, the first three dimensions are most closely interrelated and their distances from the origin are also similar. This distance and direction defines the meaning given by this individual to his environment.

Perceptions of stress represent one of many meanings a person's surroundings can have for him. Stress, as well as the myriad of other meanings, all occupy points in the semantic space specified by a series of differentiating judgments. Stress is cognitive and if the individual perceives his environment as such the semantic differential will determine this evaluation on the basis of the point it occupies in multi-dimensional space. That point in space which serves as the operational definition of meaning has two essential properties -- direction from the origin and distance from the origin. These properties can be identified with the quality and intensity of meaning, respectively. Stress occupies the negative end of the evaluative specturm. Therefore, a semantic differential can be designed which will measure the distance and direction of environmental evaluation. If a person perceives his environment as stressful, he should allocate his surroundings to the negative end of each evaluative dimension in semantic space.

Factor analysis may be used to uncover the dimensions of distance and direction from origin in semantic space. According to Hypothesis Two residents in spatially restrictive locations will attach greater

meanings of stress to their environment than those who reside in unrestrictive neighborhoods. An orthogonal rotation of axes will locate one's perception of his surroundings. Loadings will indicate how adjectives have grouped together to form quality dimensions of environmental meaning and factor scores will measure the intensity of meaning. In this way factors of meaning can be compared between residents of contrasting environments.

Application of Semantic Differential to Study

The general concept whose meaning will be measured by the semantic differential used in this study is the individual's environment. Given the range of the average person's daily activity, one's "environment" could include a multitude of locations, ranging from the home and neighborhood to work place, recreational and shopping sites, and the territory covered in each trip. Each of these locations is potentially stressful but in order to maintain some focus in the research and to facilitate comparisons between aggregate and individual data, here "environment" shall consist of the home, neighborhood and the individual's census tract of residence. Aggregate measures of spatial restriction and pathological behavior have been gathered in census tract form. These data describe the household and its surroundings. If we are to see whether physical measures of spatial restriction are perceived as stressful and confining, then the object of perception must be the same as described by the aggregate characteristics. Thus each respondent was asked to evaluate only his neighborhood, including his home and property, the surrounding homes, streets and parks and the people who live there.

The home and neighborhood environment offers particular advantages as the basic element from which to view man in his urban surroundings.

Homes commonly involve more of their occupants' time than any other single place in the metropolitan area. More activities in a man's life and in that of his family begin and end in his home than in any other location. To be sure, people meet and activities occur elsewhere, all of which may influence individual perception and behavior. But given the proportion of the day which is spent in the home and its immediate environs, the housing unit and neighborhood appear to be the most constant and potentially influential element in a person's environment.[9]

A successful semantic differential includes enough adjectival dimensions to adequately measure the meaning each concept has for the individual without becoming so lengthy that it loses its effectiveness as a survey instrument. Spatial restriction is only one of many elements in a person's neighborhood environment which can influence his perception of his surroundings. The individual may possess more than adequate quantities of open space, but if there is a great deal of crime in his location, he may perceive his surroundings as stressful. Therefore, adjectival dimensions were selected which would account for other potential sources of stress in the environment besides spatial restriction. Table 17 presents the semantic differential developed to measure perceptions of stress in the neighborhood environment.

The number of dimensions was purposely limited in order to avoid an overly long questionnaire, but it is believed that those included sufficiently describe most of the elements in a person's environment which might lead him to perceive his surroundings stressfully.

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[9] Michelson, William, Man and His Urban Environment: A Sociological Approach, (Reading, Mass.: Addison-Wesley, 1970), p. 47.

TABLE 17

Semantic Differential for the Measurement of Perceptions of Stress

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Think of this neighborhood, including your home and property, as well as the surrounding homes, streets and parks and the people who live here. Rate this enighborhood on the following categories:

Physical Appearance

-2	-1	0	+1	+2
a. Very Unattractive	b. Unattractive	c. Average	d. Fairly Attractive	e. Very Attractive

Noise

-2	-1	0	+1	+2
a. Very Noisy	b. Somewhat Noisy	c. Average	d. Fairly Quiet	e. Very Quiet

Privacy

-2	-1	0	+1	+2
a. Very little Privacy at all	b. Less privacy than I'd like	c. Average	d. Fairly Private	e. Great deal of privacy

Crowdedness

-2	-1	0	+1	+2
a. Very Crowded	b. Somewhat Crowded	c. Average	d. Fairly Uncrowded	e. Very Uncrowded

Safety

-2	-1	0	+1	+2
a. Very Unsafe	b. Somewhat Unsafe	c. Average	d. Fairly Safe	e. Very Safe

People in Neighborhood

-2	-1	0	+1	+2
a. Very Unpleasant	b. Somewhat Unpleasant	c. Neither Pleasant or Unpleasant	d. Fairly Pleasant	e. Very Pleasant

TABLE 17 (cont'd.)

Improvement

Taking into consideration physical appearance, safety, privacy, noise, crowdedness and people, during your residence in this neighborhood, has it:

-2	-1	0	+1	+2
a. Become much worse	b. Become Somewhat worse	c. Stayed the same	d. Improved Somewhat	e. Greatly Improved

Future of Surroundings

In the future your neighborhood will:

-2	-1	0	+1	+2
a. Become Much worse	b. Decline Somewhat	c. Stay the same	d. Improve somewhat	e. Improve a great deal

SOURCE: Constructed by author

Spatial restriction has been the term used in this study to describe the various forms of density that affect the quantity and quality of space available to the urban resident. The term was not used in the instrument because it proved to be lacking in meaning for the large majority of individuals involved in the pretest. "Crowdedness" proved to be the most successful alternative as an adjective describing the amount of space available in each respondent's residential environment.

The traditional form of the semantic differential has included only a numerical scaling on each adjectival dimension. However, a pretest of this instrument indicated that such a large percentage of individuals had difficulty interpreting and completing the instrument that the inclusion of the verbal scaling was necessary. Respondents were better able to make judgments on each dimension with the inclusion of the verbal scale. In addition, the verbal scaling helped to reduce the possibility of any bias on the part of a respondent to select a particular position on the numerical scale.

The semantic differential requires the respondent to rate his neighborhood environment on each of eight dimensions, ranging from the physical appearance to the people occupying the same setting. The rating of his surroundings on these different qualities should provide an overall picture of his mental evaluation. Numerically speaking, negative evaluations shall be interpreted as perceptions of environmental stress. The greater the evaluation on the negative end of each dimension, the more stressful is that respondent's environment.

The Questionnaire -- The entire questionnaire, including the semantic differential, appears in Appendix A. A number of questions were asked of each respondent regarding certain facets of his or her behavior

in order to compare individual behavior with that of perception. For purposes of this study measures of individual social indicators. would be the ideal, but it would be virtually impossible to obtain cooperation in answering such questions as, "Have you ever committed a violent crime?"' "Have you ever been treated for a psychological disorder?" Such questioning falls in the "offensive" category, and an instrument containing such items has little hope of being completed. People simply will not supply a stranger with such information.

As a result, attempts to obtain measures of individual social indicators were severly limited. However, some measures of family stability, fertility and migration were obtained, allowing for limited comparisons with aggregate characteristics and individual perceptions of stress. A "divorced" response was included among possible answers to the marital status question, providing some indirect measurement of family instability among individuals occupying different environments. The number of reported children serves as a fertility indicator. In the aggregate analysis discussed in Chapter 3 fertility proved to be significantly associated with various measures of household density, especially among blacks. An association of individual data with perception of the environment might add to the understanding of the aggregate analysis.

If the perception of stress is high for an individual or household, then we would expect a high degree of desired, if not actual, movement as an avoidance response to the level of stress. Aggregate figures demonstrated the limited ability of blacks to avoid restrictive environments through migration. At the same time, areas possessing more open space showed far less out-migration. Questions regarding actual and desired movement may provide an added dimension of understanding to the decision

to move within a metropolitan area, and the inability of blacks and other urban residents to avoid locational stress.

Each respondent was asked if he desired to relocate. The desire to move will be compared with levels of perceived stress. In this way it will be possible to determine if variations in place utility are related to migration trends.

Individual data were also collected for length of residence, number of people residing in the subject's home, number of room and bedrooms and previous residential location. These data will enable a further assessment of the influence household density has upon perceptions of stress. Aggregate findings have indicated that room and household densities are primarily reflections of family life cycle stage and bear little relation to aggregate behavior. These individual data will enable a further scrutiny of the question.

In a previous discussion of the concept stress, mention was made of the temporal nature of the problem of stress-related behavior. If the individual perceives a series of threat cues in this environment, he will commit physical and mental resources to combat that stressful image. If the initial commitment is inadequate, greater allotments must follow if stability is to be maintained. Over time, a cost is involved in this allocation of resources which weakens the individual, making him vulnerable to any further stress. Thus time, combined with perceptions of stress, may contribute to the incidence of behavior indicative of a low social well-being. If it does we would expect to find a positive correlation between length of residence and degree of perceived stress.

Length of residence however, may have the opposite effect on perceptions of stress. Given the adaptive abilities of the individual,

it is possible that longer periods of residence in a restrictive environment might enable the resident to adjust to the situation. If time does play an adjustment role in the perception of environmental stress, then the new resident, unaccustomed to his surroundings, may be the most likely person to give a stressful meaning to his environment. Data on length of residence, when examined in relation to perceptions of environmental stress will help to test this hypothesis.

Potential adjustment is also the rationale for including an item indicating in broad categories the previous residence of the respondent. It seems likely that a person previously exposed to an environment similar to that in which he is now residing would not face the difficulties of adjustment experienced by one who has never lived in such surroundings. The person moving from a rural location to an inner-city residence (as have many blacks in the Detroit metropolitan area) would seem to face greater adjustments than one who previously resided in a similar residential environment.

Questions were also posed in an effort to measure the subject's social class. Ownership or rental status are two indicators of social class, with those owning their residences falling predominantly in the middle or upper class. However, because an above-average percentage of residents in the Detroit area own their homes, a further indicator of social class is needed. Each respondent was then also asked to indicate the occupation of the major wage earner in the household, and this information was used in conjunction with owner-renter status to place the respondent in the upper, middle, or lower class. Poverty and social class have been strongly related with pathology in the aggregate analysis. Do individuals subjected to the difficulties of poverty

and low income perceive their environments more stressfully than their higher class counterparts? If they do, this information would make the aggregate findings more

Finally, information was gathered on the sex and race of each respondent. Stokols et al., in their laboratory experiment on room density and feelings of crowdedness, found that men were much more susceptible to cognitions of crowding-stress than were women.[10] Data on sex will indicate whether this phenomenon exists outside of the laboratory and room environment as well.

Perhaps the most striking element to emerge from the aggregate analysis of spatial restriction and behavioral social indicators has been the issue of race. Racial minorities, particularly blacks, have been exposed to greater degrees of restriction than any white population in Detroit. They have also shown greater frequencies of the behaviors in question. It has also been demonstrated that blacks, although they exhibit a high degree of intra-urban mobility, are unable to avoid areas of restriction through migration. On an aggregate level, the high frequencies of behavior and exposure to spatial restriction among blacks raises a fundamental question which can only be answered on the individual level of analysis. As a result of exposure to spatially restrivtive environments, do blacks perceive their surroundings as more stressful than whites? A positive answer to this question would lend considerable credence to the thesis that perception of stress contributes to the incidence of behavior. A negative finding would lead to a rejection of the hypothesized relationship between place, perception and behavior.

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[10] Stokols, Daniel, Marilyn Rall, Berna Pinner, Joyn Schopler, "Physical, Social, and Personal Determinants of the Perception of Crowding," Environment and Behavior, vol. 5 (March 1973), pp. 87-115.

As previously noted, spatial restriction is not the only potentially stressful element in a person's environment. An inductive argument has been made for its contribution to behavioral instability, but it is possible that noise, crime, physical appearance and other factors in the residential environment may be more significant in the occupant's perception of stress. Loadings from a factor analysis of the semantic differential will indicate which of the elements included in the instrument are actually stressful and to what degree. From these findings it will be possible to determine how important is spatial restriction, relative to other elements in the environment, in leading to any perception of stress on the part of an individual. A determination that spatial restriction is not associated with perceptions of stress would not refute the theory that environmental meaning is closely tied to behavior in space. An environment of poverty and high crime may indicate stress to its occupants and therefore lead to lower levels of social well-being.

In summary, the basic objectives of the questionnaire are twofold: 1) to measure stress as a meaning given through perception of the environment and 2) to find a plausible explanation for the spatial variation of aggregate behavioral social indicators. In attempting to meet these objectives, hypothesis two, which states that people residing in spatially restrictive environments will perceive their surroundings as more stressful than those who do not, will be tested. It is far more difficult to directly test the hypothesized relationship between environmental stress and behavior on an individual level because of the inability to obtain answers to "offensive" questions. Some measures of individual behavior will be analyzed but the focus of the instrument shall be maintained upon trying to understand aggregate patterns of behavior through individual perceptions of environment.

Administration of Questionnaire and Sampling Framework

The survey strategy selected in the administration of the questionnaire was to interview people living in parts of the Detroit metropolitan area that differed in the degree their environment might be potentially stressful. The assumption here is that a cross-sectional analysis of persons living in various census tracts with differing degrees of spatial restriction and aggregate behavior will reveal some major differences in individual perceptions of quantity and quality of residential space. The selection of census tracts to conduct interviews will reflect some degree of subjectivity. There was no attempt to generalize for the entire Detroit metropolitan population by randomly interviewing individuals. The objective of the study is to examine perceptions and behaviors in contrasting environments and therefore the survey strategy has been developed to seek out such contrasts.

With a concern for making some link between aggregate and individual characteristics, the selection of surveyed census tracts is based upon the following:

1. factor scores of restriction and aggregate behavioral data,
2. distance and direction from C.B.D., and
3. racial and social class characteristics.

Six factors discussed in Chapter Three were produced from a factor analysis of aggregate behavioral and restriction data. Of these Factor One proved to be the most extensive grouping of behavioral and spatial restriction components; it accounted for the greatest proportion of explained variance. Because of the similarity in

spatial patterns and the grouping of behavioral characteristics with those of population and structural density, factor scores from the low density behavior factor have been primarily used to categorize census tracts according to their behavior and environment.

A second presentation of the spatial pattern formed by scores from the low density behavior factor is provided in Figure 13. Census tracts have been divided into five categories, based upon the gradation of factor scores. Two tracts were selected from each category for interviewing based upon differences in spatial restriction, their racial and social class characteristics, and their location relative to the central city. In order to account for possible sectoral differences in environmental characteristics, care was taken to select ten tracts whose locations provided some degree of spatial coverage over the entire study area. However, the tracts selected within each category of factor scores are essentially representative of others on that group of characteristics.

Of greater concern, given the objectives of the study, was to find tracts that not only differed in their restriction and behavioral characteristics, but in their racial and social class makeup as well. If we are to determine whether race and poverty are associated with perceptions of stress and forms of behavior then differences in these characteristics must be included in our population. Aggregate findings have indicates that most census tracts are highly restrictive also tend to be predominantly black. Thus almost any tract selected in the high positive factor score category will offer a sufficient racial

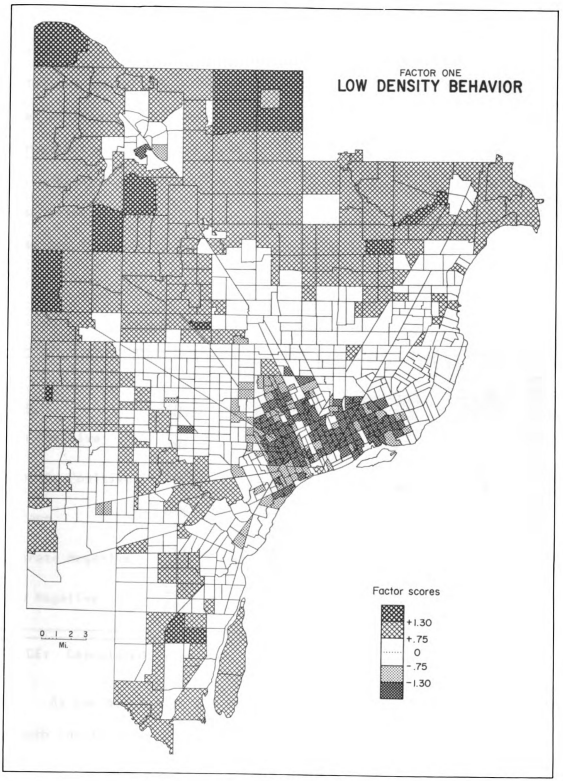
FACTOR ONE
LOW DENSITY BEHAVIOR
Factor scores
+1.30
+.75
0
-.75
-1.30
0 1 2 3
MI.

Figure 13

contrast with tracts in the high negative grouping. Within variance in racial and social class characteristics is desirable because such differences will enable a comparison of perceptions among populations whose aggregate characteristics are similar but whose social backgrounds vary.

Based upon these criteria, ten tracts were chosen for surveying. Those selected along with their distinguishing characteristics, are presented in Table 18 and displayed in Figure 14.

TABLE 18

Characteristics of Sample Census Tracts

Group	Tract	Low Density Behavior Factor Score	Population Density	Percent Black	Median Family Income
High Positive	222	1.3745	689	0.2	29,471
	797	2.1055	1,092	2.6	20,741
Moderate Positive	271	.9741	1,323	0.0	20,219
	62	.9614	891	0.0	13,107
Average	605	.0477	4,664	20.0	10,331
	11	.2975	16,981	0.0	13,085
Moderate Negative	411	-.9057	17,283	96.6	8,146
	698	-1.1800	5,473	83.9	9,050
High Negative	408	-1.4003	15,843	96.6	8,146
	697	-2.4516	21,775	89.9	7,582

SOURCE: Calculated by author

As can be seen in the above table there is considerable contrast in both the forms of aggregate behavior and residential environment among these census tracts. Two tracts were specifically selected because they offered striking contrasts within racial groups. Tract 11,

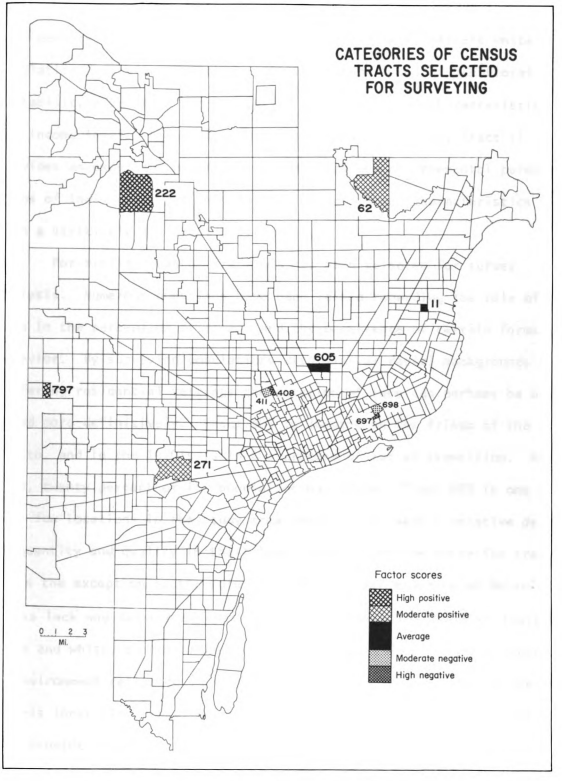
CATEGORIES OF CENSUS TRACTS SELECTED FOR SURVEYING
222
62
11
605
797
408
411
698
697
271
Factor scores
High positive
Moderate positive
Average
Moderate negative
High negative
0 1 2 3
MI.

Figure 14

in northeastern suburb of Roseville has the highest level of population density for any census tract with an over eighty percent white population. It also displays a relatively high level of behavioral instability especially for a location with its racial characteristics and income level. Given these aggregate characteristics, Tract 11 provides an excellent opportunity to analyze the environmental perceptions of individuals with similar racial and income characteristics but with a strikingly different environment.

For similar reasons tract 605 has been selected for survey analysis. Numerous questions have been raised regarding the role of race in the perception of stress and the occurrence of certain forms of behavior. By surveying populations with similar racial backgrounds but differing residential settings the question of race can perhaps be answered more definitively. Tract 605 is located on the fringe of the black ghetto, and in the 1970's is in the process of racial transition. As of 1970, twenty percent of its population was black. Tract 605 is one of the very few locations in the study area where blacks have a relative degree of quantity and quality in their open space. Like the Roseville tract it is the exception to the rule: whereas the vast majority of Detroit's blacks lack any measure of open space and privacy, residents of tract 605, black and white, do not encounter these difficulties. Is the difference in environment reflected in the perceptual evaluations of the residents of this inner-city tract? Data from the semantic differential hopefully will provide an answer to this query.

By including tracts that differ not only in their physical environmental characteristics, but their social makeup as well, it will be possible to test for within and between group variances in behavior.

Each is representative of the other locations having similar factor scores and findings from this individual survey analysis should be able to tell us much about the individual's environmental perception in similar spatially restrictive environments.

To enhance the chances for a representative sample, a random cluster sample was carried out. A detailed street map of each tract to be surveyed was overlain with a grid containing 100 cells per square inch. The total number of cells in the grid varied with the size of the tract. A total of five sampling points initially were selected within each tract by obtaining two figures from a table of random numbers, one within the range of coordinate values on the Y axis of the grid and the other within the range of values on the X axis. The random ordinate and abcissa values located the sampling point. At each of these five locations within a tract, the ten nearest households were surveyed, providing a total of fifty interviews per tract. One hundred households were interviewed in each of the five factor score categories, for an N of 500.

This sampling technique had the basic advantage of efficiency. Given the wide range of locations it was necessary to find a means of obtaining a representative sample that was not overly time consuming. The cluster sampling greatly simplified the process of obtaining the necessary number of interviews. In addition, the selection of a random process of sampling proved highly conducive to the nature of the spatial distribution of population in each tract. Berry and Baker have noted that the choice of geographic sampling procedure depends on how the phenomenon being studied is distributed.[11] Because most of the

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[11] Berry, Brian J.L. and Alan M. Baker, "Geographic Sampling," in Berry and Duan F. Marble, eds., Spatial Analysis: A Reader in Statistical Geography, (Englewood Cliffs, N.J.: Prentice-Hall, 1968), p. 91

surveyed tracts were almost entirely residential in their land use, they possessed a fairly even distribution of population throughout the area. This distribution provided assurances that the randomness of the sampling procedure would provide unbiased estimates of the total population.[12]

Through this sampling technique, a total of 500 interviews were obtained, an equal number in each of the ten survey tracts. The social class characteristics of the sample closely resembles the aggregate census characteristics describing the entire population of each tract. (Table 19)

TABLE 19

Comparison of Sample and Tract Population Characteristics

Group		Percent Black	Percent Male	Percent Professional	Percent Rental
HIGH POSITIVE	Tracts	1.7	45.2	61.2	3.8
	Sample	0.0	41.0	70.0	1.0
MODERATE POSITIVE	Tracts	0.0	50.4	46.1	8.2
	Sample	0.0	48.0	50.0	4.0
AVERAGE	Tracts	10.7	49.6	14.2	13.0
	Sample	41.0	51.0	10.0	15.0
MODERATE NEGATIVE	Tracts	90.3	46.8	9.0	56.3
	Sample	99.0	45.0	5.0	59.0
HIGH NEGATIVE	Tracts	93.3	48.4	3.5	52.4
	Sample	99.0	43.0	6.0	49.0
TOTAL	Tracts	35.6	48.5	27.8	28.0
	Sample	47.8	45.6	28.2	25.4

SOURCE: Calculated by author

The same cannot be said for the racial composition of the sample population. Because of the sampling results of tract 605, the percentage black in the average category is fairly biased. Eight-two percent of those interviewed in this tract were black, whereas the tract black

[12] Ibid.

population is less than one-fourth this figure. However, it is not believed that this bias will severly influence the overall results. As mentioned above, the racial bias in the average census tracts may actually prove beneficial by facilitating within group comparisons of environmental perception.

Perceptions of the Environment Among Selected Detroit Residents

It has been argued that behavior in space results from influences characteristic of that space tempered by the meaning the occupant gives to those environmental elements. If a location is perceived as stressful, it is likely to detrimentally influence the individual. If this premise is correct, there must first be a demonstrated link between environment and perception. This proposition can be initially tested by a factor analysis of the evaluative dimensions of the semantic differential and comparing the factor scores of perception among the individuals residing in different urban environments. If the research premise is to be accepted, there must be a significant difference in the mean factor scores between each sample population. As hypothesized, individuals residing in low restriction census tracts should give positive meanings to their surroundings and vice-versa.

A factor analysis of the various environmental dimensions from the semantic differential produces two factors which combine to account for sixty-eight percent of the variance. The sample population has structured its environment primarily into two segments: quality, and quality change. As shown in Table 20 each of the social and physical elements used by the respondent to define his environment has loaded positively on a single factor, Positive Perception of Environmental Quality. This

TABLE 20

Environmental Perception Factors of Semantic Differential Dimensions

Semantic Differential Dimensions	Positive Perception of Quality	Perception of Quality Change	Communality
Physical Appearance	.7321	.2704	.6091
Noise	.82.9	.2620	.7441
Privacy	.7686	.0466	.5930
Crowdedness	.8359	.2278	.7507
Safety	.6843	.4740	16928
People	.5869	.5297	.6249
Past Change	.1290	.8831	.7964
Future Change	.2321	.7565	.6222
Proportion of Variance	.4230	.2466	
Cumulative Proportion of Variance	.4230	.6796	

SOURCE: Calculated by author

grouping suggests that when an individual perceives his environment as offering him an adequate degree of open space, he is also likely to view his surroundings positively in terms of its physical appearance, level of noise and privacy, and degree of safety.

It is not surprising that spatial restriction is interrelated with other characteristics. It is likely that surroundings poor in quantity and quality of space are also deficient in other items in the eyes of the residents. But how does this single characteristic compare with others in contributing to the overall impression one has of his neighborhood environment? The loadings of each dimension or characteristic indicate how important that item is in the composition of the factor. For Factor One, crowdedness is the most important item in the grouping. In other words, the quantity and quality of space in a person's environment, more than any other element, influences the overall meaning a person gives to his environment.

If one lives in a spatially restrictive environment, where his degree of undesired contact with others is high, it would not be surprising that he felt his surroundings provided little peace and quiet. Thus, the other items most likely to be interrelated with spatial restriction, noise and privacy, follow crowdedness as the most important characteristics in this factor.

Factor Two reflects the individual's perception of change in the quality of his environment both in the past and in his expectation for the future. The social environment appears to have some importance in the perception of changes in quality. Both the type of people residing in the neighborhood and the degree of safety found there are associated with perceptions of change. These social elements are perhaps more immediately noticeable for the resident. Many respondents, particularly in the inner-city, commented on fears they had over increasing rates of crime and the "wrong kind" of people in their neighborhoods.

Stress has been defined as a negative meaning given to the environment by its occupants. This definition can be operationalized by examining the direction and intensity of individual factor scores on the grouping representing the first dimension. Of the two factors extracted from the semantic differential data, the first contains all of the social and physical elements that make up the environmental meaning, and the second is the perception of change in the nature of those elements. In essence, Factor One represents the content of the environmental meaning, and factor two represents change or potential change in the direction of that meaning. A positive loading for each of the elements indicates factors describing a neighborhood environment which is perceived in very affirmative terms. Each of the adjectival dimensions on the

semantic differential was designed so that positive values were indicative of low levels of noise and spatial restriction, and high degrees of privacy and safety.

Given the nature of the loadings on the basic factor of environmental meaning, it follows that variations in the factor scores of individuals on this grouping will measure the degree of perceived environmental stress on the part of each respondent. Scores from Factor Two will indicate the extent to which the perception of stress is likely to occur in the future. A negative score on the first factor denotes perception of stress, with the larger values equating greater intensities of the meaning. A similar direction and intensity of scores from Factor Two would indicate a stressfully perceived future of the neighborhood environment.

Table 21 presents in summary form the essentials of the findings resulting from the factor analysis of environmental perception. If there is a relationship between spatial restriction and perceptions of stress, then a variation in characteristics of place should reflect concurrent changes in perception. Residents in areas of low restriction should not perceive stress, while their counterparts should. Table 21 very clearly shows this to be the case. Residents of census tracts scoring most highly on the low density behavior factor also see their environment in the most positive terms while occupants of census tracts which are restrictive define their environment in negative terms. The difference in perception is most striking among residents living in sharply contrasting environments. The average or mean factor score of perceived meaning is .698 for the 100 respondents occupying census tracts that are low in population and structural density; for residents of tracts having opposite restriction characteristics, their perception as expected is the opposite: -.941.

TABLE 21

Comparison of Environmental Perception Factor Scores
with Aggregate Density and Behavior

		AGGREGATE	INDIVIDUAL	
Group	Tract	Low Density Behavior	Positive Perception of Quality	Perception of Change
HIGH POSITIVE		1.735	.698	.229
	222	1.374	1.020	.044
	797	2.105	.375	.414
MODERATE POSITIVE		.967	.067	.503
	271	.974	.447	-.444
	62	.961	-.124	1.450
AVERAGE		.172	.426	.269
	605	.047	1.617	.038
	11	.297	-.769	.500
MODERATE NEGATIVE		-1.042	-.249	-.662
	411	-.905	-.256	-.808
	698	-1.180	-.241	-.516
HIGH NEGATIVE		-1.925	-.941	-.339
	408	-1.400	-.652	-.097
	697	-2.451	-1.188	-.581

SOURCE: Calculated by author

There are, however, anomalies in the results. If perfect association existed between spatial restriction and the perception of stress, gradations in stress would directly reflect changes in the environment. They do not. Respondents in the average category, instead of falling at the middle on perception of stress, actually give a more positive meaning to their neighborhood environment than those who have moderate degrees of quality and quantity in their residential space. An examination of respondents in the individual tracts explains this discrepancy.

It has been previously noted that spatial restriction is one of many characteristics in a resident's neighborhood environment which might lead him to view his surroundings as stressful. For this reason a number of elements in addition to restriction were included in the semantic differential to account for this likelihood. Although residing in an area virtually beyond the metropolitan fringe on the northern side of Detroit, occupants of tract 62 perceive their environment in negative terms. The low density behavior factor score of .961 indicates that this is a location which confronts the occupant with less spatial restriction than nearly two-thirds of all the other tracts in the urban area. Yet the mean factor score of perceived environmental quality for the fifty respondents is -.124. The explanation for the perception of stress must lie among the other elements of the neighborhood environment, i.e., physical appearance, noise and people. In fact the location of this tract adjacent to a major north-south freeway traversing the metropolitan area appears to be the primary reason for relatively high perceptions of environmental stress. A large percentage of those responding to the questionnaire indicated that while there was more than adequate space available to them, the traffic noise from the nearby freeway

represented intrusions on their privacy as well as a noisy environment. As a result, the overall image was a negative one. Thus, while spatial restriction proved to be the most important environmental element leading to the perception of stress among all 500 respondents interviewed, in one subgroup noise levels proved to be more stressful.

Relative to residents of the nine other locations included in the survey, occupants of Census Tract 605, on the fringe of the black ghetto, give the most positive meaning to their environment. In other words, there is less perceived stress at this location than any other surveyed in the city. Yet this tract is only average in its degree of open space. This discrepancy between objective and subjective evaluations of environment is best understood within the context of race. It has been previously asked if blackness is necessarily associated with stress. From an aggregate standpoint this racial minority is more susceptible to behavioral instability. The four tracts comprising the two negative categories of low density behavior are each over ninety percent black. Table also demonstrates the association between this type of environment and levels of perceived stress. Is this association a question of race or environment? Evidence gathered from interviewing forty-one black respondents in tract 605 suggests that race is not automatically tied to perceptions of environmental stress and, in turn low social well-being.

Compared to other locations which are heavily occupied by blacks, tract 605 provides its black residents with a high quantity and quality of residential space. When considering the population as a whole, there is little doubt that Detroit's blacks are far more spatially restricted and are undergoing greater degrees of stress than their white opposites.

But, as the residents of tract 605 illustrate, when the individual can gain access to open space, the qualitative nature of his environmental perception is likely to improve dramatically. Black or white, these occupants on the fringe of the inner-city see their neighborhood in more positive terms than any other member of the sample population. While the degree of open space cannot match that provided white occupants in many of the outlying suburbs, relative to that which most Detroit blacks can attain, the residential environment of tract 605 is exceptional. And the perception of its black residents reflect that point.

It does not, therefore, follow that blackness is necessarily associated with stress and behavior. Blacks perceive greater degrees of stress than whites, but only because of the formidable differences in their residential environments. This argument is further supported by noting that where whites are confronted with spatial restriction, they also perceive their environment as stressful. The community of Roseville, located north of the city of Detroit, is one of the older suburbs in the urbanized area. Almost exclusively white in its racial composition, it provides residents with one of the highest degrees of spatial restriction found in any of the predominantly white areas of the city. This is particularly true of tract 11, where the factor score for low density is only .297, one of the lowest figures for any tract over fifty percent white in Detroit. The residents of this location perceive their environment in negative terms. In fact the degree of perceived environmental stress is higher in this white community than in every black location with the exception of one inner-city tract.

Comparison of Perceived Stress -- That there are differences in the perceptions of individuals according to the environments in which they

reside has been made clear. But can it be demonstrated that these differences are significant and have occurred by more than mere chance? The statistical significance of the perceptual differences among the sample populations must be demonstrated if we are to be in a position to make any definitive conclusions regarding the relationship between characteristics of individuals' locations and their perception of stress.

In order to test the hypothesis that there will be a significant difference in the mean perception of environmental stress between each sampled population, an analysis of variance was first conducted. Primarily a difference-of-means test, an analysis of variance is particularly useful when more than two samples are involved in testing a hypothesis.[13] Tables 22 and 23 present the results of the analysis of variance of perceived environmental stress. The significance of

TABLE 22

Analysis of Variance: Positive Perception of Environmental Quality - Five Groups

Source of Variation	Sums of Squares	d.f.	Mean Square	F
Between Groups	162.06	4	40.51	59.34*
Within Groups	337.06	495	.68	
TOTAL	500.00	499		

* Significant at .001 level of confidence

SOURCE: Calculated by author

[13] Blalock, Hubert, Social Statistics, (New York: McGraw-Hill, 1960), p. 242.

TABLE 23

Analysis of Variance: Positive Perception of Environmental Quality - Ten Tracts

Source of Variation	Sums of Squares	d.f.	Mean Square	F
Between Groups	340.83	9	37.87	116.59*
Within Groups	159.17	490	.32	
TOTAL	500.00	499		

* Significant at .001 level of confidence

SOURCE: Calculated by author

differences in perception was first tested between the one hundred respondents in each of the five spatial restriction categories and then the sample populations of the ten census tracts. Both F statistics are highly significant, allowing us to accept the research hypothesis that perceptions of environmental stress by those residing in spatially restrictive locations are significantly different than those Detroit residents who have greater quantities and qualities of residential space.

Sets of five and ten means have been shown to differ significantly, but results of an analysis of variance do not tell us how the means differ. Is every mean significantly different from every other? Are there significant differences between some of the means and not between others? Answers to these questions are needed if we are to determine the degree of spatial restriction which is associated with significantly higher perceptions of stress among individuals.

Duncan's New Multiple Range Test has been cited by Edwards as a suggested procedure for determining which of the means differ

significantly from others.[14] The test, which is based upon the shortest significant range of means is determined from the within group mean square of the analysis of variance and the level of significance desired. Any difference between two means which exceeds the shortest acceptable range is significantly different at the stated level of confidence.

In comparing the means of the individual tracts or spatial restriction categories, the significance of differences between means of the "extreme" degrees of restriction is considerable. The comparison of means test are shown in Table 24 and 25. The greatest difference in mean perceptions of stress is between the categories which also vary by the widest margin in their degrees of spatial restriction. Environmental extremes are associated with extremes in perceptions of stress. Residents of high positive and high negative low density environments differ in their perceptions of stress by more than five times the minimum significance range for the .001 level of confidence.

In determining the minimum level of spatial restriction associated with significant differences in perceptions of environment stress Table 25 is especially useful. Recalling the importance of race as related to perceptions of stress, it becomes necessary to determine minimum significance levels of spatial restriction according to racial as well as environmental characteristics. Occupants of six of the ten tracts perceive some degree of stress. Of the non-stress tracts only the sample population of tract 605 is predominantly black. With its low density behavior factor score of .047, it can be concluded on the

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[14] Edwards, Allen, Experimental Design in Psychological Research, third edition, (New York: Holt, Rinehart and Winston, Inc., 1968), p. 131.

TABLE 24

Comparison of Means Test for Positive Perception of Environmental Quality - Five Groups

Groups	Means	High Negative -.941	Moderate Negative -.249	Moderate Positive .067	Average .425	High Positive .698	Shortest Significant Ranges
High Negative	-.941		.492*	1.008*	1.366*	1.639*	.3840
Moderate Negative	-.249			.316	.674*	.947*	.3958
Moderate Positive	.067				.358	.631*	.4041
Average	.425					.273	.4104

*means are significantly different

Protection Level for .001: 99.6%

SOURCE: Calculated by author

TABLE 25

Comparison of Means Test for Positive Perception
of Environmental Quality - Ten Tracts

Tract	Means	697 -1.225	11 -.773	408 -.657	62 -.332	411 -.255	698 -.243	797 .366	271 .467	222 1.029	605 1.624	Shortest Significant Ranges
697	-1.225		.452*	.568*	.893*	.970*	.782*	1.591*	1.692*	2.254*	2.849*	.2936
11	- .773			.116	.441*	.518*	.530*	1.139*	1.240*	1.802*	2.397*	.3060
408	- .657				.325*	.402*	.414*	1.023*	1.124*	1.686*	2.281*	.3143
62	- .332					.077	.089	.698*	.799*	1.361*	1.956*	.4009
411	- .255						.012	.621*	.722*	1.284*	1.879*	.4057
698	- .243							.609*	.710*	1.272*	1.867*	.4099
797	.366								.101	.663*	1.258*	.4133
271	.467									.562*	1.157*	.4164
222	1.029										.595*	.4190

* Means are significantly different
Protection level for .001: 99.9%

SOURCE: Calculated by author

basis of the sample of Detroit's blacks that this is the minimum level of residential open space needed to avoid perceptions of stress. For white residents surveyed, the minimum degree of tolerable spatial restriction is less than the .974 factor score of tract 271. A comparison of population and structural densities indicates that the black spatial restriction minimum is nearly four times that of white populations (Table 26).

TABLE 26

Minimum Stressful Density Levels

Tract	Persons Per Sq. Mile	Housing Units Per Sq. Mi.
271 (white)	1323	402
605 (black)	4664	1574

SOURCE: Calculated by author

It is very likely that a more extensive survey of census tracts in the study area may have produced a lower minimum figure of acceptable spatial restriction for white residents. However, a comparison of mean perceptions of stress by race does yield an interesting conclusion: it appears that whites need more open space than blacks. This finding does not seem to mesh with previous conclusions showing that blacks are more susceptible to perceptions of stress. However, it must be remembered that relative to Detroit's white population, blacks have few opportunities to obtain the types of environment available to whites. In essence, the perception of stress is relative to the type of environment achieved by each race. As black residents of tract 605 and the white occupants of tract 11 in Roseville clearly demonstrate, a degree of open space which is beneath white standards is totally acceptable to blacks. But it must

also be recalled that the vast majority of the city's black residents cannot obtain even this minimally acceptable level of spatial restriction. Ultimately the conclusion regarding racial differences in environments and perceptions of stress needs to be expanded: whites not only have learned to need more open space than blacks, but they have it and can get it. The opposite cannot be said.

The results shown in Table 21 suggest that variations in spatial restriction are positively associated with perceptions of environmental stress. This research hypothesis will be more formally tested through a correlation and regression analysis of restriction characteristics with preception data. But for now, this tentative conclusion provides us with a working basis for examining aggregate behavior as it is theoretically related to environmental stress.

It is difficult to draw conclusions regarding any association between perception and behavior, because on the one hand we have individual measures of perception, and on the other aggregate indices of behavior. As its title implies, the aggregate factor, low density behavior, describes the behavior of the tract population as well as many of the restriction characteristics of the tract environment. However, given the theoretical link between perceptions of environmental stress and certain forms of behavior, it is possible to discuss findings regarding behavior and perception within these limitations.

An additional anomaly appears in the results of Table 21. It has already been noted that because of freeway noise levels, respondents in tract 62 of Utica perceive a fair degree of stress despite possessing above-average quantities of residential space. In addition, residents of tract 11 in Roseville perceive a high degree of environmental stress,

despite being in the average category of spatial restriction. If there is a link between stress and behavior, we would expect to find higher frequencies of behavioral social indicators in these locations than where there is little or no perception of stress. This is the behavioral paradox found in the results of the analysis; despite higher rates of environmental stress, both of these tract populations exhibit relative degrees of behavioral stability. This suggests a lack of support for the hypothesized association.

However, the second factor of perception, perception of past and future changes in environmental quality, appears to explain this behavioral discrepancy. Differences in the perception of future change in environmental quality among the sample population seem to have an effect upon environmental stress and behavior. While perceiving environmental stress at the time of being interviewed, respondents in tracts 62 and 11 also perceived a future change for the better in the meaning they gave to their residential environment. In essence, while their surroundings are now perceived as uncomfortable, these residents perceive much better prospects in the future. In fact, respondents in these two locations perceive their environmental futures in brighter terms than any other sub-group of the sample population.

Given this perception of the future it is plausible that incidences of behavioral instability in the Roseville and Utica tracts would be low despite perceptions of stress. If one believes that conditions will improve, chances are much better that he will be able to successfully cope with the present. In every other case where perception of present environmental conditions is stressful, the image of the future is equally dim. This is particularly true of residents in areas where spatial restriction is

moderately high. In these inner-city census tracts, residents expect their residential surroundings to further deteriorate.

The Nature and Degree of Association Between Environment and Perception

The analysis of variance and difference of means test have demonstrated that perceptions of stress are significantly different among individuals according to the nature of their residential environment. However, the results of these tests do not necessarily demonstrate an association between changes in environment and variations in perception.

It is the purpose of this remaining section of the chapter to determine the degree and direction of the association between spatial restriction characteristics in the residential environment and perceptions of stress. If an association can be determined, it will then be possible to deal with the question of individual behavior as a response to stress. These objectives will lead to a testing of the remaining research hypotheses:

1) spatial restriction is positively associated with perceptions of environmental stress, and

2) individuals who perceive their environment as stressful will exhibit greater frequencies of behavioral social indicators than those who do not.

These major research hypotheses have a number of questions associated with them which might be viewed as sub-hypotheses:

1) To what extent are variations in perceptions of environmental stress and behavior reflections of race and poverty, and sex?

2) Is length of exposure to spatially restrictive environments facilitating adjustment on the part of the resident?

3) Which components of spatial restriction are most associated with perceptions of environmental stress?

To obtain answers to these questions and test the major hypotheses, a correlation and regression analysis of perception and environmental characteristics was conducted. Factor scores of the two factors, perception of environmental quality and change in that quality by the individuals of the sample population are the dependent variables. Elements of their home and census tract environment are the independent characteristics. If the research hypothesis is to be accepted, we can expect to find a significant inverse correlation between positive perceptions of environmental quality and change and forms of spatial restriction.

The simple correlations of the various restriction components with perception confirm the research hypotheses (Table 27). There is a significant positive association between the perception of high environmental quality and the number of rooms and bedrooms in an individual's dwelling. The more opportunity a person has to find privacy

TABLE 27

Simple Correlations of Environmental Perception Factors with Social and Restriction Characteristics

Variable	Positive Perception of Quality	Perception of Quality Change
Race	-.16874*	-.37897*
Sex	.04043	.01461
Length of Residence	.28886*	-.07756
Ownership	-.39722*	-.21994*
Occupational Class	-.22638*	-.21971*
Marital Status	.12549	-.06315
Number of Household Residents	-.18634*	.04681
Number of Rooms in House	.46386*	.00410
Number of Bedrooms	.34362*	.16032*
Previous Residential Location	.04764	.01265
Persons per Bedroom	-.39551*	-.08171
Persons per Room	-.41025*	.05329

*Significant at .001 level of confidence

SOURCE: Calculated by author

within his home, the greater is the positive meaning given to the residential environment. This conclusion is further substantiated by the significant inverse relationship of positive environmental perception with room and bedroom densities.

All forms of spatial restriction are significantly associated with stress in the direction hypothesized. These results suggest that room, bedroom and household densities are important factors in leading to a person's perception of environmental stress. Neither sex nor previous residential location bears any relation to perception of the environment.

These findings do not deny the importance of such elements as race and social class, however. Race is associated with stress -- blacks view their environments in significantly negative terms in comparison with whites. Home ownership and occupation, as measures of social class, also indicate that members of the lower end of Detroit's social spectrum are more prone to perceptions of stress. However, as noted in the earlier discussion of environmental stress and its variation by racial group, it appears to be more reflection of the surroundings this population is subjected to, rather than race or social class per se. But it is ultimately fruitless to argue for a complete separation of the issues. When two populations with similar class and racial characteristics are subjected to different degrees of spatial restriction, we can expect their environmental perceptions to reflect the differences in their surroundings. The vast majority of Detroit's blacks and poor are confined to spatially restrictive environments and consequently perceive their surroundings in negative terms. To reduce environmental stress first would seem to require removal of the social and economic barriers that are preventing them from occupying less stressful locations.

Aggregate findings have strongly indicated the difficulties of being black and/or poor. Simply placing the city's poor in a more open residential area is not likely to improve their outlook towards the present and especially the future. It may initially reduce the stress due to perceptions of place but not the stress of being poverty-striken. The problems of spatial restriction, environmental stress, and race and poverty are intertwined, and any realistic assessment and suggested solutions cannot separate them. This argument is further substantiated with an examination of correlations with the perception of past and future changes in environmental quality. The number of bedrooms is significantly correlated with a positive perception of the future, but the degree of association is not nearly that of the inverse correlation of race. In addition, both measures of social class are also inversely associated with a positive perception of the future.

In summary, an analysis of simple correlations of environmental meaning and potential changes in individual meaning reveals that various components of spatial restriction, room, bedroom,and household density, all are significantly associated with stress. Residents of spatially restrictive environments perceive their environments in more stressful terms than those who do not reside in such locations. While place characteristics appear to make the major contribution to environmental stress, race and poverty are important as well, especially when considering the individual's perception of the future of his residential environment.

As in the case of the aggregate analysis, simple correlations are suggestive, but alone do not fully describe the relationships between dependent and independent variables. It is not possible to

determine whether spatial restriction or race and social class account for the greatest proportion of variance in perceived environmental stress. However, a stepwise multiple regression will enable us to make a final determination of conclusions tentatively reached from the analysis of simple correlations.

When each characteristic of the individual's social and physical environment is entered into the regression model the impact of spatial restriction upon a person's perception of his environment is immediately apparent. As shown in Table 28 the number of rooms in the housing unit and bedroom density account for well over one-half of the explained variance in perceived stress. This finding is especially important in

TABLE 28

Stepwise Regression of Social and Restriction Characteristics with Positive Perceptions of Environment

Step	Variable	Percent of Variance	Total	Direction of Regress. Coeff.
1	Number of Rooms	.2152	.2152	+
2	Persons per Bedroom	.1079	.3231	-
3	Length of Residence	.0313	.3544	+
4	Persons per Household	.0210	.3754	-
5	Ownership	.0154	.3908	-
6	Occupational Class	.0105	.4013	-

All R^2's are significant at .01 level

SOURCE: Calculated by author

understanding the paradox previously reported in the aggregate data analysis: despite the popular notion that room density is associated with stress and pathology, this form of spatial restriction is actually higher in the outlying areas where perceptions of the environment are generally positive. It is clear that the key distinction is one of bedroom, rather than

general room density. Residents of the suburbs are able to gain privacy in what most would consider to be one of the more private portions of their residence. While many inner-city housing units have almost as many rooms, it is apparent that fewer of them are bedrooms. As a result, residents of this part of the city are faced with greater difficulties in avoiding undesired contact with others.

Social class and length of residence are the only non-restriction variables significantly associated with perceptions of environmental stress. This finding confirms the conclusions derived from the simple correlations: that environment, in the form of spatial restriction, can be linked to individual perceptions of stress and that social class is significantly, but secondarily, related to perceptions of place.

The significant association between length of residence and positive perceptions of the environment is an additional important finding. Previous questions have been raised regarding the temporal component of the environment-perception-behavior relationship. The positive association between length of residence and the lack of perceived stress suggests two conclusions: 1) that people are inclined to remain in low stress environments and 2) that there is an adjustment process important in the reduction of individual stress. It is the new resident who is most likely to be susceptable to perceptions of environmental stress. Residents longer exposed to the same environment appear to have simply gotten used to their surroundings, thereby reducing the degree of perceived stress. However, there is obviously a limit to personal adjustment, because most residents of spatially restrictive environments perceive their surroundings as stressful.

A stepwise regression of racial, social class and restriction characteristics with perceptions of past and future environmental quality also confirms conclusions drawn from a simple correlations. Only a

TABLE 29

Stepwise Regression of Social and Restriction Characteristics with Perceptions of Environmental Quality Change

Step	Variable	Percent of Variance	Total	Direction of Regress. Coeff.
1	Race	.1436	.1436	-
2	Occupational Class	.0196	.1632	-
3	Number of Rooms	.0111	.1743	-

All R^2's are significant at .01 level

SOURCE: Calculated by author

small portion of the variance in perception of environmental future is accounted for by the regression equation, but the largest amount is determined by race. Spatial restriction is significantly associated with negative expectations for the future, but it is decidedly secondary to the importance of race.

The results of the stepwise regression analyses of both environmental meaning and potential change in that meaning serve to reemphasize the link between environment and perception. They also emphasize the importance of race and poverty as issues in the perception of stress. A change in the man-made environment may yield temporary benefits for these residents, but long-term positive effects will only result with a removal of their social and economic barriers as well. It should also be noted, however, that these characteristics do not explain a great portion of the variation in perceived environmental stress. This suggests that other forms of spatial restriction beyond the immediate

home environment are associated with stress.

In order to determine how other forms of restriction are associated with stress, an average perception of environment was calculated for each sample population. This perception was then compared with variations in spatial restriction which describe the tract in which the population resides. Before this analysis can be performed a factor analysis of spatial restriction characteristics, exclusive of behavior, race and social class was conducted. This simplified the comparison process. When subjected to a varimax rotation of axes, the characteristics formed three factors of spatial restriction: Room Density, Low Restriction and Residential Land Use Density. Loadings of each factor are shown in Table 30. The Room Density factor contains high loadings on persons per room, percent overcrowded and persons per household. It is a general measure of density within the home. Factor Two, Low Restriction, is so entitled because its positive loadings emphasize a large number of rooms per housing unit and the negative presence of population density, housing units per square mile of residential land use, and overall spatial restriction. It describes a residential environment which provides considerable degrees of openness both within and beyond the home. The final restriction factor, Residential Land Use Density, portrays those census tracts which are primarily residential but are heavily populated and provide a minimum of space to their occupants.

Variations in spatial restriction are represented by the factor scores of each tract environment. When correlated with the average perception of stress by each population, a measure of association between environment and perception is obtained. As in the case of individual

TABLE 30

Spatial Restriction Factors: Rotated Factor Loadings

Variable	FACTORS and LOADINGS			
	Room Density	Low Restriction	Residential Land Use Density	Communality
Persons per Household	.6980	.6048	.2192	.9011
Rooms per Housing Unit	-.0668	.7974	.3331	.7513
% Overcrowded	.8660	-.1951	-.0565	.7912
Population Density	-.0247	-.5730	.2488	.3909
Persons per Room	.8978	.0433	-.0550	.8110
% Residential Land Use	-.0696	.1048	.6891	.4907
Housing Units/Res Area	.0444	-.7456	.1280	.5743
Proportion of Variance	.2571	.2479	.1550	
Cummulative Propostion of Variance	.2571	.5050	.6600	

SOURCE: Calculated by author

perceptions of stress, we would expect to find a significant inverse correlation between positive perceptions of the environment and the room and residential density factors, and a positive association with low restriction if we are to accept the hypothesized relationship between forms of spatial restriction and stress.

With only ten observations, it is not meaningful to conduct a linear correlation and regression analysis. Spearman's rank-order correlation was used as a means of describing the general nature of the relationship between tract environment and perception of stress. The r_s obtained from this technique is somewhat analogous to product-moment correlations.

The rank-order correlations of the room density and low restriction factors with perception confirm the research hypothesis. The r_s for the room density factor is -.782 and .818 for the low restriction factor. Populations residing in environments which have high room, household, population and housing unit densities perceive their surroundings in significantly stressful terms. It is clear, on both an individual and aggregate basis, that spatially restrictive environments are perceived as potentially harmful by their occupants.

The Association of Environmental Stress with Behavior

Within the limitations of the survey data, it has been possible to measure perceptions of environmental stress as they are associated with individual behavior. It is hypothesized that residents perceiving stress will be more inclined to engage in behavior which is potentially harmful to their social well-being.

The results of testing this hypothesis appear to reflect the limitations of the instrument rather than any relationship or lack thereof between perception and behavior. Most of the behaviors obtained on an individual basis do not fall within the pathological category as they appear to bear little relationship with stress of the individual's residential environment. As shown in Table 34, fertility, a behavior Galle et al. consider to be pathological, bears no relationship with perceptions of the environment or potential changes in the environment.

TABLE 31

Simple Correlations of Environmental Perception Factors with Individual Behaviors

Behavior	Positive Perception of Environmental Quality	Perception of Change
Fertility	.01205	-.05590
Number of Moves	-.28628*	-.11595*
Desire to Migrate	.19273*	.10362
Length of Residence	.28554*	-.07884

* Significant at the .01 level of confidence

SOURCE: Calculated by author

Data were also collected on individual migration and expressed desires to migrate for the purpose of gaining further insight into aggregate results, which show a positive association between out-migration and spatial restriction. White populations tend to relocate in areas of open space, and blacks demonstrate a high degree of residential stability in tracts where spatial restriction is relatively low. If spatial restriction leads to perceptions of stress, do individuals leave, or hope to leave, as one response to locational stress?

Of the behaviors noted in each respondent, the decision to migrate or remain is the only activity that proved to be significantly associated with positive perceptions of environmental quality. Actual migration, the reported number of moves by each respondent in the last five years, is inversely associated with perceptions of quality and environmental change. This association suggests that individuals perceiving environmental stress have greater tendencies to seek other residential environments. It also suggests that the degree of environmental exposure is important in perceptions of stress. Those individuals who have moved most often are also among the most recent arrivals in their present locations. The positive correlation of length of residence with perception of high quality environment is further evidence of a temporal adjustment factor in reducing stress.

When perception characteristics and other variables are correlated with individual behavior in a stepwise fashion, the limitations of the questionnaire become apparent (Table 32). Variations in individual birth rates are most accounted for by household population and marital status. Galle et al. have argued that high room densities and household populations do not allow parents to step back and examine their situation, reducing chances for effective family planning. In light of the findings generated by this analysis, this argument does not seem to hold a great deal of credibility. Statistically speaking, it is not surprising that household population and marital status of each respondent explains the greatest proportion of the variance in individual birth rates. The vast majority of mothers and fathers are married, and the presence of children naturally increases the household population. Significance, in this case, does not infer causality. When

TABLE 32

Stepwise Regression of Individual Behaviors with Social and Restriction Characteristics

Step	Variable	Percent of Variance	Total	Direction of Regression Coeff.
DEPENDENT VARIABLE: Fertility				
1	Household Population	.3269	.3269	+
2	Marital Status	.1033	.4302	+
3	Length of Residence	.0474	.4776	+
4	Ownership	.0159	.4935	-
5	Race	.0113	.5048	+
DEPENDENT VARIABLE: Number of Times Moved				
1	Length of Residence	.3706	.3706	-
2	Perception of Quality Change	.0270	.3976	-
3	Positive Perception of Environmental Quality	.0129	.4105	-
DEPENDENT VARIABLE: Expressed Desire to Migrate				
1	Length of Residence	.0367	.0367	+
2	Occupational Class	.0259	.0626	-
3	Perception of Quality Change	.0176	.0802	+
4	Positive Perception of Environmental Quality	.0149	.0951	+
5	Race	.0119	.1070	+

All variables listed are significantly associated with behaviors at the .01 level

SOURCE: Calculated by author

each of the independent variables is held constant, perception of the environment bears no relationship with fertility. While significantly associated with actual migration and the expressed desire to leave, the proportion of explained variance in these behaviors is relatively small.

Length of residence accounts for most of the variance in migration behavior and is positively correlated with perceptions of high environmental quality. These findings support the hypothesis that individuals will avoid environmental stress when able and add to the understanding of correlations between aggregate migration behavior and spatial restriction.

A key to this conclusion lies in an understanding of the ability to migrate. It explains what initially appears to be a paradox in the migration findings. While mobility is inversely associated with positive environmental meaning, the desire to move is also significantly correlated but in the opposite direction. Where perceptions of stress are high, individuals actually prefer to remain in locations which are perceived in negative terms. This finding is totally inconsistent with previous conclusions, but can be understood when the ability of the individual to avoid stressful environments is taken into account.

As previously noted in the aggregate analysis, blacks are spatially limited in their relocation opportunities. With few exceptions, relocation for most blacks does not mean a significant change for the better in the nature of their residential environment. This fact is reflected both in the perception of their surroundings and in their expressed desire to relocate. While most black respondents see their neighborhoods in negative terms, they also see futility in further migration. Many blacks expressed hope in finding a better location as the primary reason for previous moves and reported that further migration is useless.

As in the case of aggregate migration, there is also a dual pattern of stress and individual movement among blacks and whites. For whites the grass is always greener on the other side of the hill, and many expressed a desire to move elsewhere, despite very positive perceptions of their present locations. This difference in the ability of each race to find a better residential environment explains why the desire to migrate has the opposite association with environmental stress than one might expect. It reemphasizes the need not only to improve residential conditions for the city's black population but improve its relocation opportunities as well.

In summary, it is clear that perception accounts for little variation in individual behavior. This could lead one to reject the hypothesis that those who perceive environmental stress behave in manners detrimental to their social well-being. However, the behaviors measured cannot be considered to represent the full range of social indicators and obviously are influenced by other factors. This makes it difficult to reach such a definitive conclusion. The survey analysis has clearly established that environment is associated with perception of stress. The fact that respondents who perceive environmental stress are members of populations with high degrees of behavioral social indicators is suggestive of an opposite conclusion, but we are not in a position to make either determination. The established relationship between environment and stress is important because it points towards a line of research which hopefully will enable us to fully understand spatial variations in behavior.

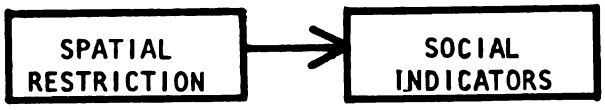
CHAPTER 5

Conclusions, Implications and Recommendations

The aims of this study have been threefold: 1) to determine if there is a relationship between a characteristic of place, spatial restriction, and behavior indicative of low social well-being, 2) to indicate where in the urban environment that relationship is manifested, and 3) to explain why it results in certain parts of the city and not in others.

As the guideline for this study, the author has turned to the traditional concern among geographers for the potential influences of the environment upon human activity. Concern in this study for the mediating role of perception has been a major addition to the hypothesized link between place and behavior. As noted in the introductory chapter, the problem of this study can be stated graphically:

Forms of spatial restriction, room, household, structural and population densities, are the environmental characteristics which were hypothesized to affect behavior detrimentally. This link was first tested in a direct fashion through the use of aggregate characteristics of place and behavior.



This analysis served two purposes: it determined how the forms of restriction and behavior varied throughout the Detroit Urbanized Area; and it served to establish the degree of association between environment and behavior. Aggregate data describe the inner-city as that part of the metropolitan area where spatial restriction and low social well-being most prominently co-occur.

Having established in theory that behavior in space is most likely to be detrimentally influenced when the individual perceives that space as stressful, it follows that one explanation of the aggregate results is that perceptions of stress are greatest in the inner-city, where measures of restriction and behavior are high. In order to test this hypothesis,

analyses of individual perceptions of the environment were needed. Census tract sample populations were selected on the basis of the degree of spatial restriction present in their environment and the frequencies of behavioral social indicators found in the population. In this manner, it would be possible to determine if spatially restrictive environments were stressful. If spatial restriction proved stressful, this finding would provide one explanation as to why these behaviors occurred in greater frequency in parts of the Detroit Urbanized Area and not in others.

As noted in the literature review dealing with previous aggregate studies, results linking spatial restriction and behavior have been highly inconsistent. Perhaps it is appropriate then that qualifications must be placed upon the ecological aspects of this study. A statistically significant relationship has been found to exist between household, room, housing unit and population densities, and such

social indicators as family abandonment, run-away children and marital unrest, but primarily among one segment of the population. Spatial restriction is predominant in the inner-city, home for most black urban Americans, and it is usually the black urban resident who is the victim of a low social well-being and who has low quantities of residential space. In some cases, measures of overall spatial restriction are twenty times higher in the inner-city than in the suburbs. The racial nature of these findings emphasizes the relatively secondary role environment has in the incidence of these forms of behavior. When characteristics of place and social class are entered into the regression equation in a stepwise fashion, the poverty among black people is clearly more important in explaining the high incidence of behavioral social indicators than spatial restriction. In most cases, poverty and income accounted for well over one-half of the variance in aggregate behavior.

Do the aggregate findings summarily dismiss spatial restriction as a characteristic of location which has any consequence for a population's behavior? Clearly not, for the individual analysis of environmental perception demonstrates that spatial restriction leads to the cognition of environmental stress by most of those confronted with such conditions. Spatial restriction is stressful -- more than any other element in the sample population's residential environment.

This knowledge about perception, in relation to the co-occurrence of spatial restriction and certain forms of behavior, is perhaps the most important contribution this study has made in understanding why and where spatial restriction and behavior co-occur. Place can

ghetto, have demonstrated this relationship. Spatial restriction does not necessarily lead to perceptions of environmental stress but survey data indicate that it usually does. Limitations of the research design prevent us from being in a position to state with absolute certainty that spatial restriction through stress leads to detrimental behavior. The aggregate findings suggest otherwise. But if black residents perceive their surroundings as threatening and have little hope of escaping that threat, the consequences can hardly be termed beneficial.

The issue of race, poverty, spatial restriction, and behavior is ultimately an inseparable one. The stress of being black and poor, when combined with the inability to attain privacy and some personal space, makes it easier to understand why behavioral indicators of low social well-being occur most often in the inner-city.

Comparison of Research Findings

The aggregate work of Freedman and Galle, Gove and McPherson, relied on for much of this research, represent the current divergence and status of this form of spatial restriction research.[1] The latter found a significant relationship between room density and various forms of behavior in Chicago, even after controlling for race and socio-economic status. In New York Freedman determined that race and social class are far more important in the variance of such behaviors as juvenile delinquency and mental illness than either room or general population density. He concluded that it is implausible to argue that

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[1] Freedman, Jonathan L., "Population Density, Juvenile Delinquency and Mental Illness in New York City," Population Dsitribution and Policy (Washington, D.C.: U.S. Government Printing Office, 1973), pp. 510-523; Galle, Omer, Walter Gove and J. Miller McPherson, "Population Density and Pathology: What are the Relationships for Man," Science, vol. 176 (1972), pp. 23-30.

population density alone is responsible for the ills of America's cities.

The aggregate results for Detroit can best be described as falling somewhere in the middle of the spectrum of these authors. While we are not in a position to argue that the various forms of spatial restriction are related to many of the city's ills, it is apparent that they are not completely unrelated. Structural *and* population density were correlated with behavior, but primarily among blacks. When a stepwise regression analysis was conducted however, the various forms of spatial restriction were found to be of far less importance than income, although still significantly associated with behavior.

In summation, the aggregate findings of this research more closely resemble the results obtained by Freedman than those by Galle et al.. However, they do not allow the dismissal of spatial restriction as a potential contributor to the ills of urban living, especially when the relationship between this aspect of the residential environment and perceptions of stress are considered.

The individual analysis of this study sheds a light on the role of spatial restriction as related to behavior that cannot be gained from an ecological analysis. Recently Stokols and other psychologists have begun to analyze the importance of the individual's evaluation of his surroundings as an influence upon his behavior in a given setting.[2] Their research has focused primarily upon room densities in a controlled laboratory environment. The findings of this study have particular value because it has been shown that perception varies with the environmental setting, and the influence spatial restriction has upon a person's mental evaluation

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[2] Stokols, Daniel, et al., "Physical, Social and Personal Determinnats of the Perception of Crowding," Environment and Behavior, vol. 5 (March, 1973), pp. 87-115.

relative to other potential influences in the environment is considerable. The laboratory has the advantage of controlling for other elements of the environment and focusing on room density effect on behavior. But this advantage is a liability as well because the influence of this environmental characteristic, relative to others, cannot be measured. Research in the laboratory cannot grasp the spatial aspects of restriction and pathology as well. Geographical research in the field is one of the most important contributions of this study. It enables a determination of where spatial restriction, environmental stress, and behavioral social indicators co-occur. In addition, the broadening of the problem to include various forms of spatial restriction enables a comparison of the influence each has on perceptions of stress.

The perceptual influences of spatial restriction have not previously been tested in the field by geographers and other social and behavioral scientists. As a result, comparison of these research findings with others is somewhat difficult. However, despite differences in the mode of research, the laboratory work of Stokols et al. represents a similarity in study objectives, and thus offers the best comparison of results. The results of this research and that of Stokols make a strong case for the inclusion of personal variations in perception in any analysis measuring the effects of spatial restriction.

In the present study it was found that spatial restriction clearly led to the perception of environmental stress among individuals, regardless of racial or income characteristics. Intra-racial comparisons focusing on tracts 605 and 11 indicated that when spatially restricted, both whites and blacks perceive environmental stress. High population, structural and bedroom densities are among forms of restriction most

associated with environmental stress. Stokols et al. found that reductions of room size tended to affect task performance among subjects and also resulted in greater feelings of aggressiveness and restriction. Perceptions of restriction varied with the individual according to personal, social and cultural background.

The results of this Detroit field study and Stokols' laboratory investigation are essentially the same. However, Stokols found a major difference in feelings of restriction between men and women; men reported greater feelings of restriction with increased room density while women reported an opposite reaction. This sexual difference did not come forth in the present study. Environmental perceptions of both men and women reflected variations in spatial restriction, rather than any sexual, racial or class differences.

Stokols et al. were able to conclude that behavior, in this case task performance, also varied with feelings of restriction. The design of this study does not permit a conclusion regarding ties between perception and behavior, although results of individual and aggregate analyses are highly suggestive. This study has established that location can bring about the perception of stress.

Suggestions for Future Study

The most immediate task facing those engaging in future research of this nature is to pursue the remaining link in the hypothesized environment-perception-behavior relationship. If it can be established that perception of stress contributes to a low level of social well-being, it will then be possible to eliminate the characteristics leading to this condition.

Reference has been made to the role length of residence may have in perceptions of and reactions to environmental differences.

Results of this study suggest that there is an adjustment factor in perceptions of stress. Most current research, including this study, is based on a mental image at one point in time. This research has attempted to measure the temporal aspect of the problem by asking the respondent to report changes in images of the environment as well as his length of residence. Research is needed which better measures the process of perceived stress. This requires an analysis of perceptions over a period of time rather than a single instance. Such research would be particularly important in areas that are likely to become more densely settled.

As has been previously noted, spatial restriction is but one of many potential sources of stress. If we are to better understand the impact of the environment man has built for himself, it would be wise to examine how individuals actually perceive it. Spatial restriction appears to affect individuals in a more subtle and less direct fashion than other elements which receive greater attention. For example, air and water pollution are serious problems, but the high rates of stress in spatially restricted locations also is a characteristic of the urban environment which merits concern. It may well be that other characteristics of a person's physical and social environment are potentially stressful. "Environment" consists of the immediate territory around the person's home but his or her place of work and the entire sphere of the individual's activities may also be stressful. In addition, elements in the person's social environment, such as family, occupation, and life cycle, as well as the aforementioned question of race may be potentially stressful. Results of this study also suggest that migration not only may be a response to environmental stress, but stressful itself as well. The most

recent arrivals in spatially restrictive environments tend to have greater perceptions of stress. Difficulties of adjusting to new social surroundings may be stressful as well.

Implications of Findings

What are the implications of these results for the future of American cities and for programs dealing with the quality of urban life?

At present the American city continues to expand horizontally. Detroit is typical in its development of new housing on the urban fringe. It is also representative in the housing conditions provided for the inner-city residents. If mass transit is further developed, this pattern of housing conditions and spatial restriction is likely to continue well into the future. But there are limited areas of expansion on the fringes of many American cities, and there is also a cost in movement over great distances. It may well be that the urban future of America may see a return to vertical expansion and higher density living. The latter prospect may add greater numbers to the spatially restricted if steps are not taken to ensure privacy through building design and quality construction.

Neither prospect will improve the urban environment of those already enduring such conditions. The quality and quantity at present of residential space in much of the inner-city fails to attract high income households, and the only means landlords have of maintaining revenues is to subdivide their holdings and lower rents to attract lower income groups. As a result population and room densities continue to rise. Room density, especially bedroom density, is shown to be statistically associated with individual perceptions of environmental stress. This finding, in light of present housing conditions, adds

further strength to the back stage theories of Goffman. The modern metropolis is a collection of housing units that are likely to be smaller in the future.[3] Under these circumstances, the intimate contacts and privacy each of us needs may be increasingly difficult to attain. The home should offer physical insulation against the invasions of strangers, traffic and noise. With high structural densities in the inner-city, protection from outside incursions becomes difficult as well.

The bedroom is usually the locus of each family member's back stage. With high bedroom densities it becomes difficult to find the privacy necessary for complete relaxation, concentration, introspection or healthy sensuousness. As Goffman and Suttles have noted, invasion of this personal territory can affect the role relationships among family members.[4] Room densities are actually higher in the suburbs, but among the individuals surveyed, bedroom densities are much higher in the inner-city than in the outlying residential areas. This important difference in one form of spatial restriction, when taken in the context of back stage and personal space, offers a plausible explanation for higher rates of family instability in the inner-city and other types of behavioral social indicators as well. Unable to obtain the necessary privacy and proper role behavior, relations among family members become strained to the point that children leave home and marriages are disrupted. Obviously

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[3] Alexander, Christopher, "The City as a Mechanism for Sustaining Human Contact," in William Ewald, ed., Environment for Man, (Bloomington, Ind.: Indiana University Press, 1967), pp. 62-3.

[4] Suttles, Gerald, The Social Order of the Slum, (Chicago: University of Chicago Press, 1971); Goffman, Erving, The Presentation of Self in Everyday Life,

many other factors, primarily social and economic also can contribute to behavior. But it is important to realize that spatial restriction aggravates a potentially harmful situation.

Recommendations

Evidence from data collected on individual perceptions of the environment has substantiated the stressful effects of spatial restriction. If we can assume that continued perceptions of threat cues over long periods of time are not a healthy phenomena, the need to remove the sources of stress is immediately apparent. While the need for residential space varies with the individual, it is clear that most residents of spatially restricted environments view them as stressful. This perception of stress is present even among long time residents, although adjustment over time appears to reduce that stress.

If our finding is correct, then the question is: what change or introduction in urban design will reduce perceptions of stress due to spatial restriction? The author is not an architect or an urban planner, and the purpose of the study has not been one of environmental design, but to find the locus of spatial restriction, stress and behavior.. However, a number of specific and more general recommendations are recommended to urban planners, architects and city governments regarding one of the basic necessities of all human beings -- the quantity and quality of space:

1. Minimum standards of structural and household densities should be established.

2. Steps should be taken to prevent continued subdivision of housing by landlords.

3. Site plans for public and private housing should contain features that enable an individual(s) to

seal off portions of the dwelling from incursion by others within the housing unit and beyond.

4. More generally, there must be a systematic re-orientation of planning toward the individual, to his physical and psychological needs.

5. Finally, the continuing social and economic inequities of racial differences in this country must be removed.

The residential environments found in tract 271 of Dearborn and 605 in Detroit serve as a general minimum standard for the provision of residential space to each individual. Tract 605 offers figures of room, household, structural and population densities which are acceptable at present for the city's black population, and the Dearborn location does the same for whites. The density of population in the inner-city tract is 4,664 persons per square mile, while in Dearborn this indicator of restriction is only 1,323.

The disparity as minimum standards is obvious, and this author is not suggesting that the urban planner maintain one standard of open space for blacks and another for whites. The difference in minimum standards implies that at present, because of differences in residential environments, these are the maximum degrees of spatial restriction that can be present in each setting before the majority of the residents will begin to perceive stress.

Emphasis should be placed on the temporal nature of these standards. If blacks are finally given equal access to facilities that will enable them to become more competitive in the job and housing market, the disparity in the need for residential space is likely to dimish, if not disappear entirely. At the moment the difference in need exists primarily because most members of the black community have not experienced the

degree of openness in housing and employment found in white suburbs. It is very likely that the desire for open space will increase if blacks are provided greater resources by lowering unemployment, raising income and removing the barriers of housing discrimination.

It is not practical to suggest maximum restriction standards found in the suburbs. America's cities are presently not equipped with the space nor the finances to place all of its residents in single-family dwellings. It is very probable that most white residents could reside in areas of higher restriction than found in Dearborn without perceiving stress, but measurements of environmental perception in such locations would have to be conducted before this premise could be verified.

An additional means of protecting the resident from the stresses of spatial restriction lies with the design of each housing unit and the quality of its construction. Units designed so that primary and back stage can be achieved by each household member will help to eliminate perceptions of environmental stress.

Concern must also be allotted to the density and spacing of multiple-family, as well as single-family residential structures. Thin walls and high structural density enable invasions of back stage from outside the housing unit. It will do little to provide the individual with privacy separation from other families members if he cannot have privacy from complete strangers as well.

The continued sub-division of housing in the inner-city is the most immediate example of spatial restriction in the metropolitan area. It can only be eliminated by the implementation of the two broad recommendations of the study. Planning for too long has had a mass production and physical connotation. Until recently, little concern has been

given the individuals who are to occupy new housing projects. Urban renewal has mainly dealt with the physical aspects of the inner-city. What is needed is a greater with the personal needs of each city resident. It is fruitless to continually ask the urban resident to make further adjustments to his setting. Until that reorientation takes place, none of the previous recommendations is likely to be implemented.

Finally, a theme which has assumed increasing importance throughout this study must receive the last word. The inequities of residential quality and quantity between the races have been clearly established. The problem of spatial restriction is inseparable from the larger question of racial discrimination. Without the resources and ability to reside in the environment he desires, the black American will never escape the stress of spatial restriction. Nor will the reconstruction of the inner-city serve the environment. The black resident of Detroit not only perceives the present in negative terms but the future as well. Governments can rebuild residential inner-city environments so that they provide adequate space. But if nothing is done to give its occupants real hope for the future, that renewal project will soon match the bleakness of perceptions of tomorrow.

APPENDICES

APPENDIX A

QUESTIONNAIRE

ADRESS_____

SEX_____

RACE_____

1. How long have you lived at this location? _____
2. Do you own or rent this residents?_____
3. What is the occupation of the major wage earner in the household?
   _____
4. What is your marital status?
   a. Single b. Married c. Divorced d. Widowed
5. How many children do you have?_____
6. What is the total number of people in this residence?_____
7. How many rooms in this home, not including bathrooms?_____
   a. How many bedrooms in this house?_____
8. Where did you last live prior to this residence?
   a. Inner City Detroit
   b. Suburban Detroit
   c. Another city
   d. Rural location
   e. Same city
   f. Have never moved
9. How many times have you moved in the past 5 years?_____
10. Think of this neighborhood, including your home and property, as well as the surrounding homes, streets and parks and the people who live

APPENDIX B

CODING OF SURVEY DATA

Race: 1 - white 2 - black 3 - other

Sex: 1 - male 2 - female

Length of Residence: 1 - 0-6months 2 - 7 months to 1 year
3 - 13 months to 3 years 4 - 3 years to 7 years
5 - 7 years to 10 years 6 - 10 years or more

Owner-renter status: 1 - Own 2 - rent

Occupational class: 1 - Professional-technicial 2 - other
3 - retired

Marital Status: 1 - single 2 - married 3 - divorced
4 - widowed

Number of children: 1 - 0 to 1 2.....8 9 - 9 or more

Number of people in residence: 1. . .n

Number of rooms in residence: 1. . .n

Number of bedrooms in residence: 1. . .n

Previous residence: 1 - inner city Detroit 2 - suburban Detroit
3 - another city 4 - rural 5 - same city
6 - never moved

Number times moved: 1.....n

Physical Appearance: -2 -1 0 1 2

Noise: -2 -1 0 1 2

Privacy: -2 -1 0 1 2

Crowdedness: -2 -1 0 1 2

Safety: -2 -1 0 1 2

People: -2 -1 0 1 2

Improvement: -2 -1 0 1 2

Future: -2 -1 0 1 2

Migration: 1 - Yes 2 - NO

APPENDIX C

AGGREGATE VARIABLE ABBREVIATIONS

	Abbreviation	Variable
1.	Normfam	Normal Family Index
2.	Pers Hshld	Persons per Household
3.	Hi Sc Drop	High School Dropouts
4.	New Struct	Structures built since 1965
5.	Matriar ID	Matriarchy Index
6.	Mar Unrest	Marital Unrest Index
7.	Welfare	Welfare Recipiency
8.	Fertility	Fertility
9.	Non Migran	Non-Migrant Index
10.	Rms Hs Unit	Rooms per Housing Unit
11.	Per Ov Crowd	Percent Overcrowded
12.	New Res	New Residents
13.	Dist CBD	Distances from Central Business District
14.	Pop Dens	Population Density
15.	Pers per Rm	Persons per Room
16.	HU per Sq. Mi.	Housing Units per Square Mile
17.	Per Res LU	Percent of Land Use Residential
18.	Male Unemp	Male Unemployment
19.	Poverty	Poverty
20.	Per Negro	Percent Negro
21.	HU per RsA	Housing Units per Residential Area

APPENDIX D

INDIVIDUAL VARIABLE ABBREVIATIONS

	Abbreviation	Variable
1.	Race	Race
2.	Sex	Sex
3.	Ownership	Ownership
4.	Occup. Clas	Occupational Class
5.	Length Res	Length of Residence
6.	Marital St.	Marital Status
7.	Num Child.	Number of Children
8.	Num Res	Number of Residents in Household
9.	Num Rms	Number of Rooms
10.	Num Bdrms	Number of Bedrooms
11.	Prev. Res	Previous Residence
12.	Times Mvd	Times Moved
13.	Pers Bdrm	Persons per Bedroom
14.	Pers Rm	Persons per Room
15.	Prcep Qual	Positive Perception of Environmental Quality (Factor)
16.	Prcep Chng	Perception of Change in Environmental Quality (Factor)

APPENDIX E

SIMPLE CORRELATIONS OF AGGREGATE ENVIRONMENTAL AND BEHAVIORAL CHARACTERISTICS - BLACK TRACTS

	Norm fam	Pers Hshld	Per Negro	Hi Sc Drop	New Struct	Med Income	Med Schyrs	Matriar ID	Mar Unrest	Wel fare	Ferti lity	Non Migran
Normfam	1.000											
Pers Hshld	.393*	1.000										
Per Negro	-.250	-.024	1.000									
Hi Sc Drop	-.397*	.057	.062	1.000								
New Struct	.145	.221	.114	-.118	1.000							
Med Income	.883*	.325*	-.171	-.441*	.065	1.000						
Med Schyrs	.703*	.075	-.107	-.414*	.092	.768*	1.000					
Matriar ID	-.886*	-.259*	.211	.444*	-.089	-.816*	-.614*	1.000				
Mar Unrest	-.678*	-.636*	.125	.107	-.130	-.588*	-.455*	.663*	1.000			
Welfare	-.694*	.013	.156	.521*	-.056	-.729*	-.675*	.793*	.357*	1.000		
Fertility	-.165	.534*	.101	.262*	.037	-.248	-.359*	.216	-.173	.480*	1.000	
Non Migran	.144	.091	.272*	-.288*	.041	.169	-.070	-.216	-.052	-.158	.036	1.000
Male Unemp	-.478*	-.154	.014	.234	-.017	-.459*	-.520*	.486*	.384*	.515*	.181	-.043
Poverty	-.822*	-.254	.127	.381*	-.108	-.887*	-.748*	.808*	.650*	.749*	.250	-.164
Rms Hsunit	.420*	.713*	-.015	-.091	-.085	.454*	.148	-.390*	-.645*	-.164	.323*	.183
Per Ovcrwd	-.146	.613*	.142	.296*	.405*	-.234	-.302*	.247	-.117	.384*	.507*	.058
New Res	-.210	-.165	-.196	.378*	-.168	-.228	.086	.285*	.111	.236	.011	-.818*
Dist CBD	.413*	.306*	-.069	-.281*	.402*	.349*	.352*	-.365*	-.365*	-.279*	.009	.143
Pop Dens	-.182	-.019	.153	.205	-.170	-.116	.068	.278*	.012	.168	.034	-.343*
Pers P Rm	.304*	.662*	-.006	.055	.430*	.178	.171	-.165	-.356*	-.003	.264*	-.064
HU per SqM	-.302*	-.335*	.136	.231	-.163	-.229	.055	.373*	.209	.188	-.123	-.378*
Per Res LU	.244	-.061	.073	-.104	.014	.210	.362*	-.243	-.234	-.234	-.120	-.070
HU per RsA	-.323*	-.054	.057	.298*	-.033	-.298*	-.312*	.432*	.254	.384*	.153	-.094

APPENDIX E (cont'd.)

	Male Unemp	Poverty	Rms Hsunit	Per Ovcrwd	New Res	Dist CBD	Pop Dens	Pers P Rm	Hu per SqM	Per Res LU	HU per RsA
Male Unemp	1.000										
Poverty	.484*	1.000									
Rms HsUnit	-.200	-.398*	1.000								
Per Ovcrwd	.104	.250	.039	1.000							
New Res	.007	.215	-.281*	-.044	1.000						
Dist CBD	-.167	-.352*	.102	.284*	-.204	1.000					
Pop Dens	.113	.028	-.062	-.092	.407*	-.292*	1.000				
Pers P Rm	-.161	-.122	.017	.710*	.052	.441*	.022	1.000			
HU per Sq M	.154	.116	-.361*	-.207	.462*	-.330*	.914*	-.112	1.000		
Per Res LU	-.170	-.317*	.029	-.243	.134	.029	.271*	-.032	.270*	1.000	
HU per RsA	.272*	.347*	-.158	.142	.095	-.217	.238	-.006	.241	-.603*	1.000

SOURCE: Calculated by author

* Significant at the .01 level of confidence

APPENDIX F

SIMPLE CORRELATIONS OF AGGREGATE ENVIRONMENTAL AND BEHAVIORAL CHARACTERISTICS - ALL TRACTS

	Norm fam	Pers Hshld	Per Negro	Hi Sc Drop	New Struct	Med Income	Med Schyrs	Matriar ID	Mar Unrest	Wel-fare	Fert-ility	Non Migran
Normfam	1.000											
Pers Hshld	.384	1.000										
Per Negro	-.789	-.100#	1.000									
Hi Sc Drop	-.608	-.236	.405	1.000								
New Struct	.340	.173	-.289	-.240	1.000							
Med Income	.673	.306	-.516	-.603	.366	1.000						
Med Schyrs	.654	.226	-.450	-.682	.343	.806	1.000					
Matriar ID	-.890	-.317	.802	.564	-.387	-.685	-.661	1.000				
Mar Unrest	-.512	-.291	.292	.172	-.144	-.310	-.227	.469	1.000			
Welare	-.807	-.158	.729	.551	-.280	-.625	-.625	.881	.465	1.000		
Fertility	-.220	.293	.192	.285	-.152	-.253	-.331	.318	.137	.376	1.000	
Non Migran	.255	.195	-.196	-.242	-.507	.070#	.012#	-.174	-.131	-.208	.051#	1.000
Male Unemp	-.625	-.136	.584	.514	-.246	-.565	-.584	.664	.214	.670	.282	-.174
Poverty	-.836	-.259	.712	.553	-.295	-.666	-.661	.881	.468	.884	.303	-.229
Rms Hsunit	.410	.615	-.123	-.345	.147	.614	.431	-.314	-.266	-.250	.152	.117
Per Ovcrwd	-.279	.445	.318	.320	-.216	-.449	-.417	.309	.093#	.408	.418	.172
New Res	-.275	-.266	.167	.276	.475	-.193	-.083#	.198	.176	.234	-.031#	-.845
Dist CBD	.602	.434	-.507	-.407	.454	.493	.528	-.646	-.291	-.510	-.092#	-.012#
Pop Dens	-.541	-.193	.584	.354	-.440	-.474	-.420	.621	.161	.499	.159	.008#
Pers P Rm	.228	.590	-.185	-.122	.173	.026#	.093#	-.317	-.149	-.164	.045#	.121
HU per SqM	-.458	-.328	.430	.297	-.312	-.397	-.327	.488	.212	.416	.025#	-.070#
Per Res LU	.161	.055#	-.086#	-.165	-.011#	.123	.145	-.134	-.125	-.149	-.026#	.104#
HU per RsA	-.303	-.286	.159	.205	-.105#	-.239	-.206	.232	.217	.257	.021#	-.134

APPENDIX F (cont'd.)

	Male Unemp	Pov-erty	Rms Hsunit	Per Ovcrwd	New Res	Dist CBD	Pop Dens	Pers P Rm	Hu Per SqM	Per Res LU	HU per RsA
Male Unemp	1.000										
Poverty	.667	1.000									
Rms HsUnit	-.237	-.332	1.000								
Per Ovcrwd	.344	.354	-.217	1.000							
New Res	.168	.259	-.264	-.083#	1.000						
Dist CBD	-.285	-.543	.315	-.058#	-.017#	1.000					
Pop Dens	.419	.473	-.196	.178	.008#	-.611	1.000				
Pers P Rm	-.133	-.200	-.141	.609	-.102#	.372	-.201	1.000			
HU per SqM	.351	.426	-.294	.051#	.102#	-.504	.723	-.213	1.000		
Per Res LU	-.122	-.168	.110	-.069#	-.101#	.040#	.085#	-.013#	.039#	1.000	
HU per RsA	.223	.312	-.361	.050#	.162	-.271	.312	.020#	.379	-.130	1.000

NOT significant at .001 level of confidence

SOURCE: Calculated by author

APPENDIX G

MEANS AND STANDARD DEVIATIONS OF ALL AGGREGATE CHARACTERISTICS

Variable	Mean	Standard Deviation
Normfam	78.9584	16.6604
Pers Hshld	3.2721	.5576
Per Negro	22.2622	35.5441
Hi Sc Drop	17.0878	12.6201
New Struct	10.6276	17.5044
Med Income	12002.4807	4157.8419
Med Schyrs	11.4353	1.3704
Matriar ID	13.0730	9.3280
Mar Unrest	.1599	.3685
Welfare	5.7847	7.0482
Fertility	3.2589	.7365
Non Migran	55.5092	14.5114
Male Unemp	5.7751	4.0962
Poverty	8.3751	8.8970
Rms Hsunit	5.2327	.8403
Per Ovcrwd	8.0535	4.2651
New Res	29.1534	12.8058
Dist CBD	10.8145	6.4152
Pop Dens	9335.9904	6945.6161
Pers P Rm	.5548	.1027
HU per SqM	3295.5396	3538.1501
Per Res LU	71.4925	48.3054
HU per RsA	9879.0846	31389.1794

SOURCE: Calculated by author

APPENDIX H

SIMPLE CORRELATIONS OF ALL INDIVIDUAL CHARACTERISTICS

	Race	Sex	Length Res	Owner ship	Occup Clas	Marital St	Num Child	Num Res	Num Rm	Num Bdrms	Prev Res	Times Mvd
Race	1.000											
Sex	-.010	1.000										
Length Res	-.038	-.058	1.000									
Ownership	.444*	.004	-.385*	1.000								
Occup Clas	.219*	-.100	.017	.198*	1.000							
Marital St	-.097	.051	.265*	-.297*	.138	1.000						
Num Child	.013	-.044	.261*	-.258*	.028	.333*	1.000					
Num Res	-.099	-.011	-.059	-.063	-.121	.021	.572*	1.000				
Num Rm	-.200*	.043	.200*	-.335*	-.248*	.106	.285*	.240*	1.000			
Num Bdrms	-.418*	.030	.163*	-.481*	-.266*	.109	.294*	.343*	.623*	1.000		
Prev Res	-.188*	.073	-.037	-.154	-.089	-.065	.019	.070	.019	.055	1.000	
Times Mvd	.174*	.030	-.607*	.337*	.063	-.228*	-.172*	.048	-.124	-.200*	.004	1.000
Pers Bdrm	.221*	.018	-.178*	.319*	.045	-.093	.332*	.714*	-.152	-.338*	.024	.183*
Pers Rm	-.002	-.019	-.146	.098	-.004	-.033	.389*	.820*	-.297*	.010	.052	.110
Percep Qual	-.168*	.040	.288*	-.397*	-.226*	.125	.012	-.186*	.463*	.343*	-.047	-.285*
Percep Chng	-.378*	.014	-.077	-.219*	-.219*	-.063	-.055	.046	.004	.160*	.012	-.117

	Pers Bdrm	Pers Rm	Percep Qual	Percep Chng
Pers Bdrm	1.000			
Pers Rm	.769*	1.000		
Percep Qual	-.395*	-.410*	1.000	
Percep Chng	-.081	.053	-.001	1.000

SOURCE: Calculated by author

* Significant at the .01 level of confidence

APPENDIX I

MEANS AND STANDARD DEVIATIONS OF ALL INDIVIDUAL CHARACTERISTICS

Variable	Mean	Standard Deviations
Race	1.48	.50
Sex	1.58	.49
Length of Res	4.43	1.49
Ownership	1.19	.41
Occup Clas	1.57	.67
Marital St	1.98	.61
Num Child	2.60	2.00
Num Res	3.89	1.67
Num Rm	6.68	1.67
Num Bedrm	2.96	.82
Prev Res	2.42	1.38
Times Mvd	.79	1.16
Pers Bdrm	1.37	.61
Per Rm	.60	.27
Percep Qual	-.01	1.00
Percep Chng	.00	1.00

SOURCE: Calculated by author

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