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A Statistical Analysis of the Residential Distribution of Blacks in Nashville, Tennessee

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A STATISTICAL ANALYSIS OF THE RESIDENTIAL
DISTRIBUTION OF BLACKS IN
NASHVILLE, TENNESSEE

A Thesis
Presented to
Western Kentucky University
Bowling Green, Kentucky

In Partial Fulfillment
of the Requirements for the Degree
Master of Public Service

by
Kenneth N. Szymanski
December 1974

A STATISTICAL ANALYSIS OF THE RESIDENTIAL
DISTRIBUTION OF BLACKS IN
NASHVILLE, TENNESSEE

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A STATISTICAL ANALYSIS OF THE RESIDENTIAL DISTRIBUTION
OF BLACKS IN NASHVILLE, TENNESSEE

Kenneth N. Szymanski

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70 pages

Directed by: W.L. Hoffman, H.K. Dansereau, and J.M. Bingham

Western Kentucky University

The purpose of the study was to explain the temporal variations of the residential distribution of Blacks in Nashville, Tennessee. A stepwise regression model revealed that Black occupancy exhibits positive relationships with substandard units and overcrowded units and an inverse relationship with average monthly rent. While the quality of housing became more equitable in the period of 1950 to 1970, overcrowding increased in severity. During this period of Black population augmentation, residential expansion took place. One of the three areas of ghetto growth was chosen as a study area in which to simulate residential diffusion in the 1960 - 1970 decade. Although the diffusion model was far from accurate, the pattern simulated proved beneficial in gaining insight into the succession process.

I'm a poor man's son from across the railroad tracks...

Stevie Wonder
"Uptight"
1967

CHAPTER 1

FACTORS AFFECTING THE RESIDENTIAL DISTRIBUTION OF BLACKS

Introduction

The residential distribution of Blacks in United States cities is a phenomenon that has far-reaching social, economic, and political implications. Residential enclaves within central cities today house some fifteen million Black Americans. In response to the consequences of these spatially separate colonies, policy makers and social scientists have recently recognized the relationships between Black residence and social ills and have sought to ameliorate the effects of segregated housing through numerous programs.

The growth of urban ghettos and resulting racial polarization is a considerable barrier for minority groups and for society as a whole. As Kain has noted:

Racial segregation (or ghettoization) is "the urban problem," and some modification of his-toric patterns of racial segregation in metropolitan housing is necessary to achieve reasonably efficient solutions to an ever increasing array of related problems.¹

In popular usage, the term "ghetto" is used to refer to that area of a city in which Black Americans live.² The term often generates connotations of a derogatory nature such as slum housing, crime, social disorganization, and poverty. It is a reflection of the current American social climate that while the income and educational levels of Black ghetto residents have improved relative to those of Whites, mainly since the Civil Rights Act of 1964, they still remain at only about three-fourths of the White level. Unemployment remains more than double that of Whites. Ghettos remain "colonies" in an economic sense, since a high proportion of land, housing, and business is owned outside the Black community.³ Ghettos are void of modern shopping centers and the amenities of newer suburban housing. Urban renewal and other Federal programs aimed at improving the housing conditions of poor Blacks have failed to recognize that better job and income opportunities are their real needs. Often, the high rise slum towers are even worse than the tenements that they left.⁴

Studying contemporary ghettos and the residential segregation of Blacks might be dismissed by some as being unimportant, but most concerned and aware persons agree that such study is worthwhile. The research reported here is undertaken with the conviction that within the metropolitan context, the interaction and relationships between ghetto residence and intergroup relations as well as urban growth patterns deserve attention. It was this conviction that led to a formulation of the purpose for this thesis.

Purpose of the Study

The residential distribution of Blacks is a highly complex phenomenon, being the function of myriad factors. Such a distribution may be related to the human characteristics of the city's occupants such as racial attitudes, education, and income, or physical characteristics within the urban landscape such as transport routes, public services, and employment opportunities. It is the function of the urban planner or analyst to discern the degree to which these factors are related in order to explain the distribution and the changes of Black residence over time.

The purpose of this study is to explain the temporal variations of the residential distribution of Blacks in a single urban center: Nashville, Tennessee. These variations can be explained by analyzing aspects of residential segregation, mobility, and housing conditions. For the sake of convenience, these three groupings will be discussed separately in a literature review, though there is no argument that they are certainly interrelated. Moreover, through the use of a testing model this treatise will attempt to examine the process of neighborhood change.

Review of Literature

Factors Influencing Residential Segregation

The human ecologists of the "Chicago school" viewed spatial and social relationships as being ultimately related.⁵ The processes which operate to produce a relatively stable balance within every human community are competition, domi-

nance, and succession, with the latter two being functions of the first.⁶ According to Park, these processes explain the patterns of residential segregation--on the basis of language, race, ethnicity, occupation, or other population characteristics.⁷ For the early human ecologists, the critical determinant of spatial location for residence groups was rent.⁸ The residential location of any group was thus determined by their relative ability to pay for space.

The emphasis on economic competition as a determinant of residential location runs through most of the earlier writings of the human ecologists. Despite the fact that they recognized discrimination separated Blacks from Whites, they did not view discrimination as the dominant factor behind residential segregation. Because Blacks were in an economically inferior position, they were prevented from competing for choice residential locations and were forced to settle in the most deteriorated parts of the city.⁹

Utilizing the conceptual framework of the human ecologists, recent researchers have examined the residential segregation of racial and ethnic groups and have attempted to uncover its causes and consequences, often with the aid of quantitative methods.¹⁰ These works generally suggest a restructuring of the simple economic explanation of residential segregation, since their results generally negate the theory that economic considerations are the major determinants of residential segregation. In comparing segregation indices for cities across the country, the Taeubers perceived that:

Residential segregation prevails regardless of the relative economic status of the white and Negro residents. It occurs regardless of the character of local laws and policies, and regardless of the extent of other forms of segregation or discrimination.¹¹

While it is popular among certain White groups to argue that since earlier occupants--the Irish, Italian, or Polish immigrants--have been rather thoroughly assimilated into the wider culture, the Black ghetto, too, is but a passing phenomenon. However, the sheer physical distinction of blackness and subsequent partially isolated cultural development may indefinitely impede the disappearance of the ghetto. The ghetto of the American city appears to be a product of social incompatibility, poverty, and relative power.¹²

During the early phases of the civil rights movement (1955-1965), the notion of residential integration and the belief that the ghetto as a segregated residential space should disappear was supported by both the Black leadership and White liberal supporters.¹³ Attempts at residential integration met with particularly violent and emotional resistance. At the same time, the prevailing attitude of Blacks shifted toward a pride in the Black community. The Black Power movement took hold, especially among the young, as an appreciation for cultural distinctiveness and the political potentiality of spatial concentration developed.¹⁴

The literature outlines active forces that have maintained urban ghettos. According to Becker and McEntire, external forces that maintain segregation include (1) legal barriers, (2) discriminatory real estate practices, (3) dis-

criminary financial practices, (4) organized resistance groups, and (5) land-use barriers.¹⁵ Morrill has cited internal forces that maintain the ghetto that include (1) poverty, (2) fear of the consequences of trying to escape, and (3) preference for the group.¹⁶ Each of these forces deserve brief mention.

Prior to 1950, both recommendations and prescriptions against mixed racial occupancy were incorporated into federal, state, and local housing legislation.¹⁷ After these direct legal barriers were removed, the real estate industry, through the use of both formal and informal practices, easily maintained segregation by such methods as refusing to show the home to potential buyers, saying it had already been sold, quoting an inflated price, and other evasive measures.¹⁸ The banking industry cooperated by refusing to make down payments or security conditions.¹⁹ Indeed, the ostensible reason for the real estate or banking industries discriminatory practices was the argument that racial integration in an area would reduce property values. But because this argument "is a persistent myth,"²⁰ the real reason was reduced simply to White fear of physical and cultural differences.²¹

The locational limits of Black residence have been dictated in the past by adjacent White ethnic or religious groups.²² As a final external force, it is clear that certain kinds of land use such as cemeteries, large parks, freeways or railways, and industrial corridors can serve as effective buffers between a ghetto and the White population,

and there is some evidence that freeways or parks have been purposely located to provide such limits.²³

Poverty alone prevents much of the ghetto population from seeking different housing.²⁴ For a pioneer Black to leave his place of residence, it takes a high level of dissatisfaction with the ghetto, a great dedication to the cause of integration, much courage, and faith in the ability of the Whites to change attitudes.²⁵ To a sizable, but unknown, proportion of ghetto residents, the company of one another and qualities of the Black community and culture are more important than the discomforts and psychology of the ghetto.²⁶

One final aspect of residential segregation that has particular significance on this discourse is variations in Southern cities as compared to Northern ones. In Southern cities, Black households have greater access to new housing.²⁷ Several factors may explain this condition. One suggestion is that Southern cities have more vacant land which can be occupied by Black households than do Northern cities.²⁸ Secondly, although usually located in designated zones, clusters of Black households in Southern cities are relatively scattered about the urban environs. These scattered clusters partly result from the incorporation of rural Black settlements into the cities as they expand.²⁹ The larger clusters tend to occur in newer Southern cities, while older Southern cities have a wider scattering of Black households.³⁰ Hence, a wide range of housing according to age exists in the Black market in Southern cities. Finally, Black households can have

access to new housing on the periphery of Southern cities. Black settlements just beyond the city limits may evolve from rural Black settlements which have become annexed.³¹

On the other hand, Blacks that inhabited Northern cities were initially migrants in search of industrial employment. Hence, they generally settled in the central city, within walking distance of factories and the central business district.³² Historically, access to additional housing space has been limited to the fringe areas of this original settlement.

Blacks and Residential Mobility

Since the population of a Black ghetto is growing both from natural increase and outside migration, severe pressure is being placed on the housing supply. For a while, increasing population can be accommodated through overcrowding, but eventually the real estate market must accommodate the demand. The literature suggests that Black households will search for a new residential location in relatively close proximity to its present location.³³ This is a logical occurrence because of the constraints imposed upon Black residential choice, mentioned in the previous section. Within the limits of these constraints, the expansion in the housing stock available to Black households generally takes place on the periphery of the contiguous Black residential areas where Black households replace White households.³⁴ In their study of residential succession in Chicago in the 1940's, the Duncans arrived at three main conclusions: Black residential succession is char-

acterized by irreversibility; room-crowding is a concurrent feature that spurs on succession; and the Black population that enters a neighborhood is very similar in social and economic measures to the White population that it displaced.³⁵

Other studies dealing with the changeover from White occupancy to Black occupancy also revolve around the idea of invasion-succession.³⁶ Often referred to in studies of succession is the "tipping point mechanism"--the threshold percentage of Blacks that is considered undesirable in a residential area by Whites.³⁷ Once the percentage of Black residents passes the tipping point, it is assumed that Whites will leave at an accelerated rate. Extension of the ghetto is often accomplished by a block-by-block transition. Truly integrated areas are very rare, and probably none can be considered stable. Regardless of how people may answer in surveys, the facts of behavior show that most Whites will not remain in an area after the transition is carried through--that is, at equilibrium most areas will be either more than 90 percent Black or less than 25 percent Black.³⁸ In his Seattle study, Morrill concluded that the tipping point averaged 10 percent Black.³⁹

Assuming that the tipping point mechanism does exist, it certainly varies from city to city and from neighborhood to neighborhood. The role of race interacts upon a host of other environmental variables to promote behavior that defies quantifiable expectations.⁴⁰ Such factors as age of housing, tenancy characteristics, quality of schools, economic and

social status of the population, stage in the life cycle, access to alternative housing, and the general condition of the local market all combine in various ways to impinge upon one's decision to move.⁴¹

Blacks and Housing Conditions

The restrictive nature of the ghetto housing market promotes conditions which lead to housing blight. In 1970, 28 percent of the nation's nonwhite population in SMSA's resided in substandard housing, a decrease from 44 percent in 1960. At the same date, only 7 percent of the nation's White population occupied substandard dwellings.⁴² There is a persistent and strong spatial relationship between the location of Black residences and substandard housing.⁴³ In quality and value the homes of minority families rank far below the general standard of the nation's housing.⁴⁴ The quality and value of housing are doubtless a function of the individual's purchasing power, since income is positively related to the value and rent of dwellings,⁴⁵ and the quality of dwellings.⁴⁶ Thus, by paying more rent the Black household acquires better quality housing.⁴⁷

The initial location of the Black housing market in the older areas of the city and its subsequent expansion outward from this initial zone of entry severely restricts the housing types available to Blacks at a given point in time.⁴⁸ In many cases, the intensive use of housing that is already on the threshold of deterioration shifts it from the standard category to the substandard category within a very few years

as the rate of structural deterioration begins to accelerate beyond some critical age.⁴⁹ Slum formation appears all but inevitable given economic characteristics, age of housing in Black neighborhoods, and family size.⁵⁰

Related studies that deal with overcrowding reveal that the intensity of the person-per-room ratio has a higher degree of severity in areas which experience increases in Black population.⁵¹ Mercer's research reveals a high correlation between overcrowding and race.⁵² Moreover, one of the major findings of the Chicago studies was the increased congestion of the Black population during succession because of a relatively high proportion of large families, atypical family groups, and sharing of dwelling units.⁵³ Population increases occurred without corresponding increases in the amount of housing space. Additional Black residents are housed in converted dwelling units or crowded into existing units.⁵⁴

Hypotheses to be Tested

The approach to the study assumes that there are definite factors in addition to (but not exclusive of) segregation and mobility in explaining the residential distribution of Blacks. The significant findings of the studies reviewed form a basis from which to postulate several research hypotheses that can be used to analyze the Black residential patterns within Nashville, Tennessee. These hypotheses will be tested for the entire city in order to investigate the temporal stability of the relationships.

The following hypotheses will be tested:

- Hypothesis 1. That intensity of Black occupancy is a positive function of percentage of substandard dwelling units.
- Hypothesis 2. That intensity of Black occupancy is a positive function of percentage of overcrowded units.
- Hypothesis 3. That intensity of Black occupancy is a negative function of the average monthly rent rate.

These three hypotheses when taken together form the general hypothesis to be analyzed.

- General Hypothesis. That the variables selected and set forth in hypotheses one through three explain a high percentage of the total variation of the residential distribution of Blacks.

Summary

This chapter was concerned with establishing the central purpose of the study. To achieve this objective the role of the Black ghetto as a significant agent within the metropolitan framework was illustrated. A review of related literature was conducted to provide justification and greater insight into the nature of the problem from spatial, social, and economic viewpoints. As a result of the findings of these sources the formulation of hypotheses to be tested was presented. Chapter II will deal with the selection of a methodology and a study area in which to test these hypotheses.

FOOTNOTES

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²The term "ghetto" originally referred to the Jewish quarter in European cities. See Louis Wirth, The Ghetto (first published Chicago: University of Chicago Press, 1928; Chicago: University of Chicago Press, Phoenix Books, 1956), pp. 1-3. Some studies which examine the origins of Black ghettos are: Kenneth B. Clark, Dark Ghetto (New York: Harper and Row, 1965); Gilbert Osofsky, Harlem: The Making of a Ghetto (New York: Harper and Row, 1968); Allan H. Spear, Black Chicago: The Making of a Negro Ghetto, 1890-1920 (Chicago: The University of Chicago Press, 1967); Robert C. Weaver, The Negro Ghetto (New York: Harcourt, Brace, and Co., 1948); and T. J. Woofter, Jr., ed., Negro Problems in Cities (Garden City, N.Y.: Doubleday, Doran, and Co., 1928).

³Robert Blauner, "Internal Colonialism and Ghetto Revolt," Social Problems, 16 (1969), pp. 393-408.

⁴William Moore, Jr., The Vertical Ghetto (New York: Random House, 1969), p. 11.

⁵Robert Ezra Park, Human Communities: The City and Human Ecology (Glencoe, Illinois: Free Press, 1952), p. 166.

⁶Robert Ezra Park, "Human Ecology," in George A. Theodorson (ed.) Studies in Human Ecology (New York: Harper and Row, 1961), p. 23.

⁷Ibid., p. 29.

⁸Amos H. Hawley, Human Ecology: A Theory of Community Structure (New York: The Ronald Press Co., 1950), p. 282.

⁹R. D. McKenzie, The Metropolitan Community (New York: McGraw-Hill Book Co., 1933), p. 245.

¹⁰For example, see Wendell Bell and Ernest M. Willis, "The Segregation of Negroes in American Cities: A Comparative Analysis," Social and Economic Studies, 6 (March, 1957), pp. 59-75; John F. Kain "Housing Segregation, Negro Employment and Metropolitan Decentralization," Quarterly Journal of Economics, 82 (May, 1968), pp. 175-97; Neil Maurer, "The Scope and Causes of Black Migration," City: Magazine of Urban Life and Environment, 5, No. 2 (March-April, 1971), p. 11; Leo F. Schnore, "Social Class Segregation Among Non-Whites in Metropolitan Centers," Demography, 2 (1965), pp. 126-133; and Raymond E. Zelder, "Residential Desegregation: Can Nothing be Accomplished?" Urban Affairs Quarterly, 5, No. 3 (March, 1970), pp. 265-277.

¹¹Karl Taeuber and Alma Taeuber, Negroes in Cities: Residential Segregation and Neighborhood Change (Chicago: Aldine Publishing Co., 1965), p. 36.

¹²Raymond Mack, Race, Class, and Power (New York: American Book Co., 1965), p. 199; and Gunnar Myrdal, An American Dilemma (New York: McGraw-Hill, 1964), pp. 46-52.

¹³Weaver, op. cit.

¹⁴Stokely Carmichael and Charles V. Hamilton, Black Power, The Politics of Liberation in America (New York: Random House, 1968).

¹⁵G. Becker, The Economics of Discrimination (Chicago: University of Chicago Press, 1957), pp. 21-26; and Davis McEntire, Residence and Race (Berkeley: University of California Press, 1960), pp. 96-99.

¹⁶Richard L. Morrill, "The Negro Ghetto: Problems and Alternatives," Geographical Review, 55 (1965), p. 341.

¹⁷Elmer M. Million, "Racial Restrictive Covenants Revisited," in Alfred Avins, ed. Open Occupancy vs. Forced Housing Under the Fourteenth Amendment: Symposium (New York: Bookmailer, 1963), pp. 6-9.

¹⁸K. and A. Taeuber, op. cit., p. 20.

¹⁹McEntire, loc.cit.

²⁰K. and A. Taeuber, op. cit., p. 21.

²¹Luigi Laurenti, Property Values and Race (Berkeley: Commission on Race and Housing, University of California Press, 1960).

²²Allen H. Spear, loc. cit.

²³Ozzie Edwards, "Patterns of Residential Segregation within a Metropolitan Ghetto," Demography, 7, p. 187.

²⁴Becker, loc. cit.

²⁵Clark, loc. cit.

²⁶Bruce Detwiler, "A Time to be Black," New Republic, 156 (1966), pp. 18-22.

²⁷Taeuber and Taeuber, op. cit., p. 124.

²⁸Ibid., p. 125, and Woofter, op. cit., p. 39.

²⁹Taeuber and Taeuber, op. cit., p. 56.

³⁰E. Franklin Frazier, The Negro in the United States (New York: The MacMillan Company, 1949), p. 237; and Woof-ter, op. cit., p. 28.

³¹David R. Meyer, Spatial Variation of Black Urban Households (Chicago: University of Chicago Press, 1970), p. 48.

³²Harold M. Rose, The Black Ghetto: A Spatial Behavioral Perspective (New York: McGraw-Hill, 1971), p. 9.

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³⁴This occupancy change is especially well-documented for Chicago from 1920 to 1950 in Otis D. Duncan and Beverly Duncan, The Negro Population of Chicago (Chicago: University of Chicago Press, 1957), pp. 87-107.

³⁵ibid.

³⁶Some examples are Eleanor K. Caplan and Eleanor P. Wolf, "Factors Affecting Racial Change in Two Middle Income Housing Areas," Phylon, 21 (1960), pp. 225-33; E. F. Schietinger, "Racial Succession and Value of Small Residential Properties," American Sociological Review, 16 (December, 1951), pp. 832-35; and Eleanor P. Wolf, "The Invasion-Succession Sequence as a Self-Fulfilling Prophecy," Journal of Social Issues, 13, No. 4 (1957), pp. 7-20.

³⁷Morton Grodzins, The Metropolitan Area as a Racial Problem (Pittsburgh: University of Pittsburgh Press, 1958).

³⁸McEntire, op. cit., p. 93.

³⁹Morrill, op. cit., p. 361.

⁴⁰Rose, op. cit., p. 35.

⁴¹ibid., p. 36.

⁴²President's Committee on Urban Housing, The Report of The President's Committee on Urban Housing Volume I, Housing Needs-Federal Housing Programs (Washington, D.C.: U. S. Government Printing Office, 1967), p. 56; and Rose, op. cit., p. 40.

⁴³ibid.

⁴⁴ibid.

⁴⁵Margaret G. Reid, Housing and Income (Chicago: University of Chicago Press, 1962), pp. 389-90.

⁴⁶Beverly Duncan and Philip M. Hauser, Housing a Metropolis--Chicago (Glencoe, Illinois: The Free Press, 1960), p. 190.

⁴⁷Ibid., p. 194.

⁴⁸Ibid., p. 204.

⁴⁹Rose, op. cit., p. 39.

⁵⁰Ibid.

⁵¹Duncan and Duncan, op. cit., p. 348; John Mercer, "Housing Quality and the Ghetto," in Perceptions in Geography 2, Geography of the Ghetto, ed. Harold M. Rose, (DeKalb, Ill.: Northern Illinois University Press), p. 153; and Richard F. Muth, Cities and Housing, The Spatial Pattern of Urban Residential Land Use (Chicago: University of Chicago Press, 1969), pp. 249-278.

⁵²Mercer, op. cit., p. 158.

⁵³Duncan and Duncan, op. cit., p. 14.

⁵⁴Taeuber and Taeuber, op. cit., p. 166.

CHAPTER II

SETTING AND RESEARCH DESIGN

Setting

The study will be conducted approximately within the city limits of Nashville, Tennessee during the period of 1950 to 1970 (Figure 1).¹ The study area remains relatively constant throughout the period; but since annexation did occur, the boundaries fluctuate somewhat. The state capital, Nashville, is located in north central Tennessee. The population of the study area has remained around 170,000 throughout the twenty year period. This stability reflects Black population increases that have offset out-migration of Whites to suburban areas. Nashville was chosen for study for a number of reasons that make it suitable for analysis. Situated in the Mid-South, the city should serve as a reliable case study in determining the validity of previous studies that cite North-South differences in racial distribution.² In addition, the Black population has experienced considerable growth in the last twenty years, increasing 30 percent from 1950 to 1970. Historically, although other smaller localizations have always been present, most of Nashville's Blacks

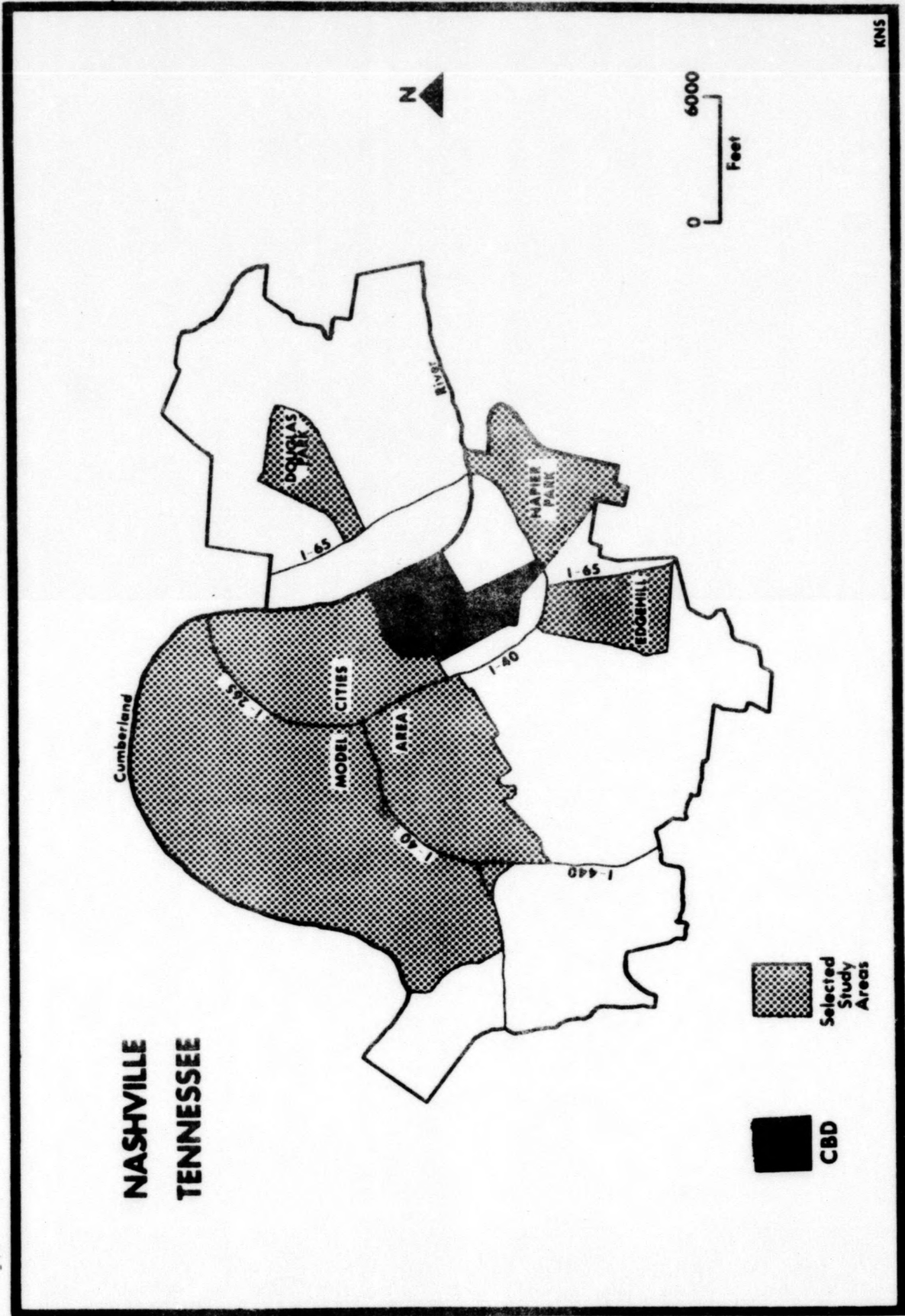


FIGURE 1

have been agglomerated on the northern side of the city (Figure 1). The map shows the major Black residential areas that will be analyzed throughout the study: the Model Cities Area in north Nashville; the Edgehill neighborhood; the Napier Park area; and the Douglas Park neighborhood. These spatial variations will be thoroughly discussed in the next chapter.

Although Nashville is famous as a publishing and recording center, it possesses a diversified economy. This economy maintains a varying mix of urban land use: industrial, commercial, residential, etc. The housing stock is especially diversified in terms of age and type of structures. After structural conditions increased in overall quality in the 1950 to 1960 decade, the proportion of units in sound condition declined slightly between 1960 and 1970.³ During this time period, rental housing's quantitative importance increased in the Nashville market; and the monthly level of rent rose sharply.

As a Standard Metropolitan Statistical Area, census tract information for Nashville is available in the decennial U. S. Census of Population and Housing.⁴ The data available from these documents facilitate a consistency in the comparison of temporal variations. These facts combine to make Nashville an appealing urban center for study, and consequently it was selected for consideration in this thesis.

Research Design

Collection of Data

The primary source agency of the statistical data utilized

in this report was the United States Bureau of the Census. The major advantage of this source is the widespread availability of the information. The Metropolitan Planning Commission also provided a valuable source in the preparation of this thesis, "An Analysis of the Nashville Housing Market." This publication provided more specific information on the local market. The sources incorporated into the operationalization of the analysis are widely considered adequate, but some of the shortcomings should be touched upon.

It is generally recognized that statistical data pertaining to demographic, social, and economic phenomena, including the housing market are subject to a variety of limitations. These limitations can be broadly categorized into four classes: (1) incomplete coverage; (2) data obsolescence; (3) imperfections in collection procedures; and (4) statistical error. Each deserves a brief explanation. Incomplete coverage may occur in data content, geographical coverage, or chronological consistency. To cite a specific illustration, the value of owner occupied housing units is reported only for one family structures located on lots of 10 acres or less.⁵ Data obsolescence is particularly acute with respect to the decennial Census of Population and Housing. Previous experience has shown that the processing and tabulation of all census data require two to three years before all final reports are issued. Any further delays by the researcher himself only compound the problem. To one degree or another, all data surveys are subject to imperfec-

tions in collection procedures. The Bureau of the Census has estimated that recent decennial censuses, even with all of their elaborate follow-up and allocation procedures, missed several million people in the enumeration process.⁶ Finally, any study or survey containing data obtained from a sample of the population will surely contain some statistical error; the degree of error can be minimized through sound procedures, but nevertheless some error will remain.

One other aspect of the collection procedure that has a considerable impact on the methodology of this thesis is the change in the interpretation of "substandard" housing as viewed by the U. S. Census of Housing. Information on structural condition of housing was collected in the 1950 and 1960 decennial censuses. In the 1950 Census, enumerators classified housing units as "dilapidated" or "not dilapidated." In 1960, units were categorized as "sound," "deteriorating," or "dilapidated." This information was obtained by having census enumerators rate the physical condition of each housing unit in the United States. Collection of data of this quality was discontinued in 1970, however, after a negative evaluation of their reliability and accuracy.⁷

Federal and local housing agencies have customarily used statistics on structural condition in combination with the availability of plumbing facilities to provide one of the key criteria for measuring the adequacy of the nation's housing.⁸ "Substandard" housing has been defined by these agencies to include housing units that lacked some or all plumbing fa-

cilities for exclusive use and those that had all plumbing facilities for exclusive use but which were rated as "dilapidated."⁹ Accordingly, those units lacking some or all plumbing facilities in the 1970 Census of Population and Housing will be used in the hypothesis testing of substandard housing in lieu of data reflecting structural deficiencies.

While all of the limitations enumerated above have a bearing on this study, it can be stated that the analysis was conducted with the best information available. More important, it is believed that these data provide a sufficiently broad base from which a sound assessment of the residential distribution of Blacks in Nashville can be made.

Preparation of Data

The U. S. Bureau of the Census data for census tracts for 1950, 1960, and 1970 provided the raw statistics for testing the hypotheses. The variables chosen for analysis were converted to percentages with the exception of the rent rates. Maps incorporated in the study were acquired from U. S. Department of Commerce, Bureau of the Census maps of Nashville's census tracts.

Method of Analysis

An explanation of the residential distribution of Blacks is highly intricate, suggesting the need for some type of statistical methodology. While simple correlation analysis might lend some support to the relationships previously hypothesized, such an analytical procedure by itself is not

completely satisfactory. For a simple coefficient of correlation to be valid, the assumption that all other relevant factors are equal must be made. Since it is extremely unlikely that such is the case, a multivariate test model will be constructed to provide a more thorough testing of the hypotheses. Pertinent data will be tested by means of a stepwise regression for each of the years 1950, 1960, and 1970. The stepwise multiple regression model determines the order of significance that each variable exhibits in explaining the distribution. In stepwise regression, the sum of the interaction of the correlations explains a certain percentage of the variation in the dependent variable.

To complement the statistical techniques, a cartographic analysis is also employed. Maps of the distribution of Blacks in each of the years analyzed will show the spatial variations that are concomitant with residential correlations.

Summary

Chapter II has dealt with the selection of the study area and research design for testing the designated hypotheses. The limitations as well as advantages of each were described. The following chapter will be concerned with applying the selected statistical and cartographic methodologies to Nashville.

FOOTNOTES

¹In 1962, Nashville and Davidson County adopted a metropolitan form of government and became Nashville-Davidson. See Daniel R. Grant, "Nashville's Politicians and Metro," in Michael N. Danielson (ed.) Metropolitan Politics (Boston: Little, Brown, and Co., 1966), pp. 217-229.

²Most of the literature on Black ghetto distribution and expansion has dealt with Northern cities. See R. Hodgart, "The Process of Expansion of the Negro Ghetto in Cities of the Northeastern United States: A Case Study in Cleveland, Ohio," unpublished M.A. Thesis, (The Pennsylvania State University, 1968); R. L. Morrill, "The Negro Ghetto: Problems and Alternatives," Geographical Review, 55 (1965), pp. 339-61; and H. M. Rose, "Development of an Urban Subsystem: The Case of the Negro Ghetto," Annals of the Association of American Geographers, 60 (1970), pp. 1-17.

³See Planning Commission of Metropolitan Government of Nashville and Davidson County, Tennessee, "An Analysis of the Nashville Housing Market," (Nashville: Metropolitan Planning Commission, September, 1973).

⁴U. S. Bureau of the Census, U. S. Census of Population: 1950, Vol. III, Census Tract Statistics, Chapter 34, (Washington, D.C.: U. S. Government Printing Office, 1952); U. S. Bureau of the Census, U. S. Censuses of Population and Housing: 1960, Census Tracts, Final Report PHS (1)-99, (Washington, D. C.: U. S. Government Printing Office, 1961); U. S. Bureau of the Census, Census of Population and Housing: 1970 CENSUS TRACTS, Final Report PHS (1)-139, Nashville-Davidson, Tennessee, SMSA, (Washington, D. C.: U. S. Government Printing Office, 1972).

⁵U. S. Bureau of the Census, Census of Population and Housing: 1970, Evaluation and Research Program, PHC (E)-5, THE COVERAGE OF HOUSING IN THE 1970 CENSUS, (Washington, D.C.: U. S. Government Printing Office, 1973), p. 13.

⁶ibid., p. 18.

⁷U. S. Bureau of the Census, Measuring the Quality of Housing, An Appraisal of Census Statistics and Methods, Working Papers #25, (Washington, D. C.: Bureau of the Census, 1967).

⁸U. S. Bureau of the Census, Census of Housing: 1970, PLUMBING FACILITIES AND ESTIMATES OF DILAPIDATED HOUSING, Final Report HC (6), (Washington, D. C.: U. S. Government Printing Office, 1973), p. 8.

⁹ibid.

CHAPTER III

THE STATISTICAL AND CARTOGRAPHIC ANALYSES OF THE MODEL

Introduction

This chapter traces the origins and development of Nashville's Afro-American residential enclaves with the aid of quantitative and illustrative techniques. The methods described in this chapter are explained in a straightforward manner. However, the reader is advised to pay strict attention to the logical flow of the analysis. This study assumes an historical perspective; that is, for each decade an analysis of the statistical correlations and accompanying map will be made. With the 1950 conditions and distributions as a base, study of the 1960 and 1970 situations will clearly show social and locational changes that have taken place.

Black Residential Distribution in 1950

The spatial location of Nashville's Blacks is shown in Figure II. The illustration depicts the city limits plus the census tract immediately south of the Cumberland River at the top of the figure. In 1950, Blacks constituted about 33 percent of the total Nashville population.

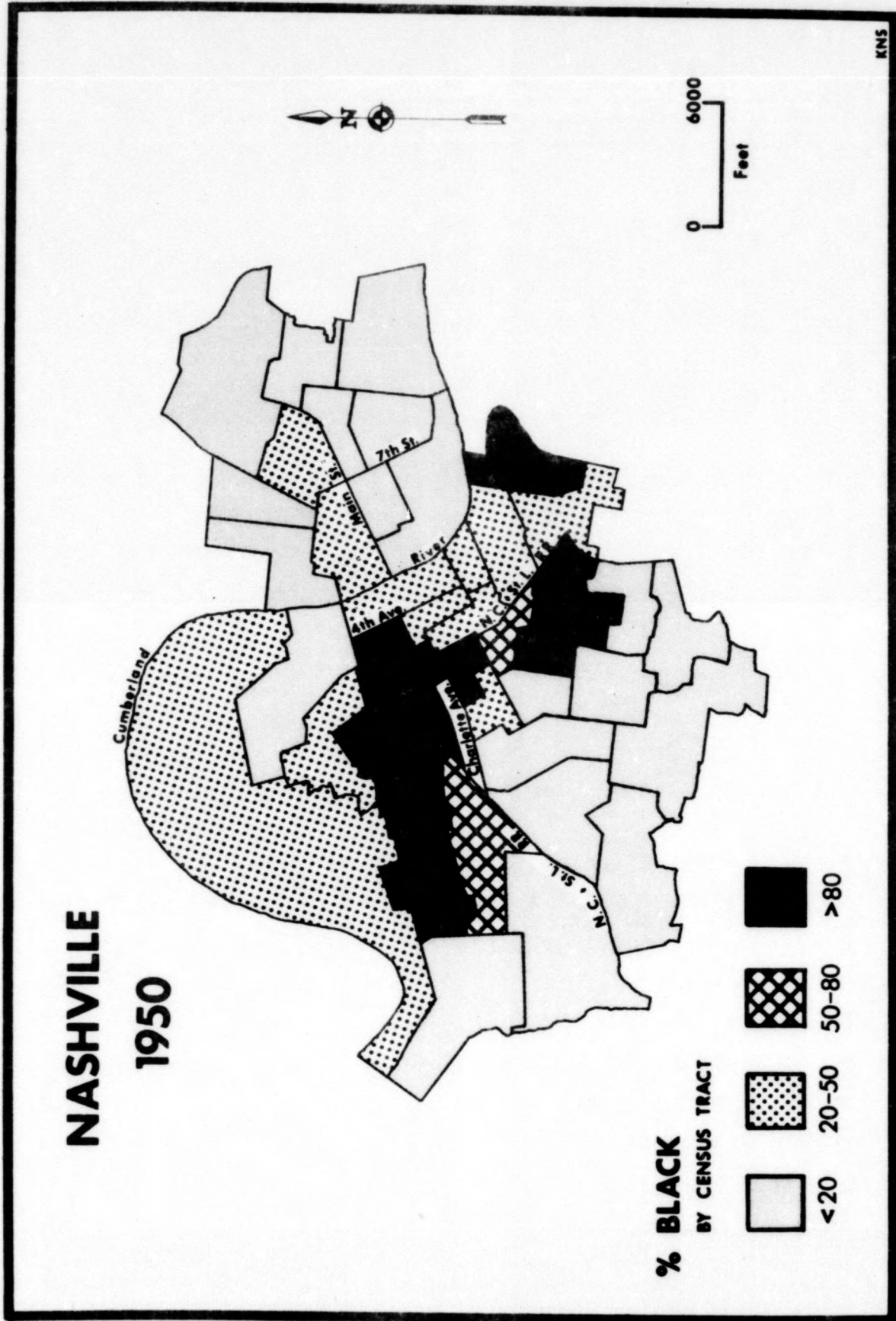


FIGURE 11

An analysis of the map clearly outlines a significant concentration of Blacks in the area north of Charlotte Avenue (Figures I and II). Commonly known as north Nashville, this area, which encompasses Fisk University, was a Black residential haven as early as 1865.¹ The Nashville, Chattanooga, and St. Louis Railroad (today the Louisville and Nashville Railroad) formed a land use barrier to the south of the north Nashville ghetto. The central business district lies directly to the east of the ghetto and the land to the north was largely vacant or industrial. North Nashville is generally regarded as the oldest housing area of the city.

The two other tracted areas of Nashville that contained Black populations greater than eighty percent apparently can be categorized as the scattered clusters alluded to in Chapter I. The first of these, located on the eastern edge of the city is known as Napier Park (Figures I and II). Its neighborhood is characterized by warehouses, railroad yards, and related river-front land use. The other cluster, known as Edgehill, is similarly bounded by the Nashville, Chattanooga, and St. Louis Railroad (Figures I and II). Thus in 1950, both the Napier Park and Edgehill neighborhoods were isolated due to the presence of land use barriers. It is interesting to note that most of the census tracts containing less than twenty percent Black in 1950 actually possessed less than one percent. An analysis of the hypotheses for 1950 set forth in the first chapter will provide further insight into conditions that existed at that time.

Analysis of the Hypotheses for 1950

Intensity of Black Occupancy is a Positive Function of Percentage of Substandard Dwelling Units

The coefficients listed in Table 1 indicate the simple relationship between each variable and every other variable included in the analysis. Percent of units substandard had a simple correlation value with Black occupancy of .598 which proved to be statistically significant (Table 1). An inspection of the map of Black occupancy (Figure II) shows concentrations in the older areas of the city, on the edge of the CBD, in areas of mixed land use, or along railroad or industrial corridors. In light of this empirical observation and the strength of the simple correlation the hypothesis is accepted.

Simple intercorrelations with percent substandard reveal a very strong positive association with percent overcrowded ($r = .896$) and an even stronger negative association with average monthly rent ($r = -.909$). The correlations between these independent variables are much higher statistically than with the Black variable and seem to imply that substandard, overcrowded, and average rent rate were nearly synonymous in Nashville in 1950.

Intensity of Black Occupancy is a Positive Function of Percentage of Overcrowded Units

Of the three variables entered in the correlation, units overcrowded projected the lowest simple correlation value. Nevertheless, this value ($r = .443$) is statistically significant. Simple intercorrelations between overcrowded and

TABLE 1
ZERO ORDER CORRELATION MATRIX *--1950

	Y	X ₁	X ₂	X ₃
Percent Black (Y)	1.000	.598	.443	-.687
Percent Substandard (X ₁)		1.000	.896	-.909
Percent Overcrowded (X ₂)			1.000	-.856
Average Monthly Rent (X ₃)				1.000
\bar{X}	33.28	53.66	22.19	26.21
S.D.	34.31	25.18	9.76	13.81

*All simple correlations were significant at the .01 level.
Source: Calculated by author.

the other independent variables indicate an extremely strong relationship between overcrowded units and both substandard units and average monthly rent ($r = -.856$). A work map of the overcrowding variable (not shown here) supports a strong correlation with the Black areas of the city. Because of these significant relationships and the emphasis placed upon this hypothesis in Mercer's study, the hypothesis is accepted.

Intensity of Black Occupancy is a Negative Function of the Average Monthly Rent Rate

Average monthly rent had the highest simple correlation with percent Black with a value of $-.687$ which proved statistically to be highly significant. Some of the Black census tracts had an average rent rate as low as \$15 in 1950, as compared to the Nashville average of \$26. In view of the strong statistical correlation involving the rent rate, as well as the spatial relationship as inspected from a work map, the hypothesis is accepted.

Analysis of the General Hypothesis

When all the variables were considered simultaneously for Nashville in a stepwise regression model, a multiple correlation of $(R) 0.75$ and a coefficient of determination of $(R^2) 0.56$ were obtained (Table 2). Thus, 56 percent of the total variation of the residential distribution of Blacks was accounted for. An examination of the validity of the variables used in the regression model will help to explain the distribution as it appeared in 1950 (Figure 11).

TABLE 2
 COEFFICIENTS OF MULTIPLE CORRELATION AND
 MULTIPLE DETERMINATION: STEPWISE REGRESSION MODEL--1950

Variable	R	R ²
X ₃ Average Monthly Rent	.68	46%
X ₂ Percent Overcrowded	.74	54%
X ₁ Percent Substandard	.75*	56%

*Significant at .01 level.
 Source: Calculated by author.

The first variable entered into the stepwise regression model is determined by the relative strength of the simple correlations. The rent rate variable (X₃), as the first variable advanced into the model, accounted for 46 percent of the total explained variance (Table 2).

Percent overcrowded was the second variable to enter into the multiple regression equation. It accounted for eight percent of explained variation and combined with the rent rate variable to explain 54 percent of the total variance (Table 2). Percent substandard accounted for only two percent of the total variation. This leads to a conclusion that in spite of its high simple correlation value of .598 the substandard variable does little to explain Nashville's distribution of Blacks not already explained by the other two variables.

The results of the multiple correlation were found to be

statistically highly significant and the general hypothesis is formally accepted. In fact, the correlations were so strong that the question arises as to whether the variables chosen had a sufficient degree of doubt. Multiple regression is an analysis that assumes there is no relationship between the independent variables. Yet with the high intercorrelations and the considerable degree of explanation (56 percent) of the dependent variable, it is possible that the hypotheses formulated tested relationships that obviously existed. An analysis of the residuals from regression, which measure the difference between the observed results and those expected by the regression equation, reveal that the extreme values were concentrated in the Black residential areas of Nashville. This suggests the possibility that there were different factors at work in the Black community than in the rest of the city.

Using the method employed by Meyer² and Brunn and Hoffman,³ it was decided to make a statistical analysis of the Black areas of the city separately. The small number of census tracts with a Black population greater than fifty percent negated the utilization of multiple correlation. Thus, a simple rank-order correlation is employed. Rank-order correlation is a quick and reasonably accurate method of assessing correlation. It requires only an ordinal scale and is generally utilized when the number of entries totals less than thirty. All that is necessary to run a rank-order correlation is to measure the total difference between the dependent var-

table's numerical ranks and any one of the independent variables' numerical ranks. The critical values for statistical significance are the same as for those in simple correlation.

Rank-Order Correlations for Black Tracts

The rank-order correlations between percent Black and the three independent variables are shown in Table 3. There

TABLE 3
RANK-ORDER CORRELATIONS FOR BLACK TRACTS--1950

Variable	Correlation
X ₁ Percent Substandard	.046
X ₂ Percent Overcrowded	-.092
X ₃ Average Monthly Rent	-.371

Source: Calculated by author.

is practically no correlation with either percent substandard or percent overcrowded units. While there is some negative relationship between percent Black and the rent rate, it is not statistically significant. These results point to a conclusion that there was little variation in housing quality in ghetto neighborhoods--regardless of whether the percent Black was 50 or 100. The hypotheses postulated are thus all formally rejected.

Black Residential Distribution in 1960

During the decade of 1950 - 1960, Nashville's Black

populace increased significantly, due mainly to natural increase and, to a smaller extent, in-migration. The city's Black population nine years and under increased by 55 percent during the ten year period. The map of 1960 shows that the census tract boundaries as well as the city limits remained approximately the same (Figure III). The major addition to the study area is the annexed tract east of Napier Park (Figures I, II, and III). In spite of the annexation of this large tract the Black population of Nashville was about 40 percent of the total in 1960.

The racial configuration of the city reflects both the Black increase and the White "flight to the suburbs." The north Nashville ghetto expanded into the area north of Centennial Boulevard (Figures II and III). To the southwest the Louisville and Nashville Railroad continued to act as an effective barrier to Black residential diffusion. The large tract northeast of the ghetto remained mostly industrial and vacant.

The Napier Park area continued to be an isolated cluster. At the same time, the Edgehill ghetto exhibited some diffusion into neighborhoods to the south. To the northeast of Edgehill, the L & N Railroad remained as a land-use barrier. For the first time, a tract in east Nashville exceeded 50 percent Black. Just north of Main Street, this neighborhood is commonly called Douglas Park (Figures I and III).

Analysis of the Hypotheses for 1960

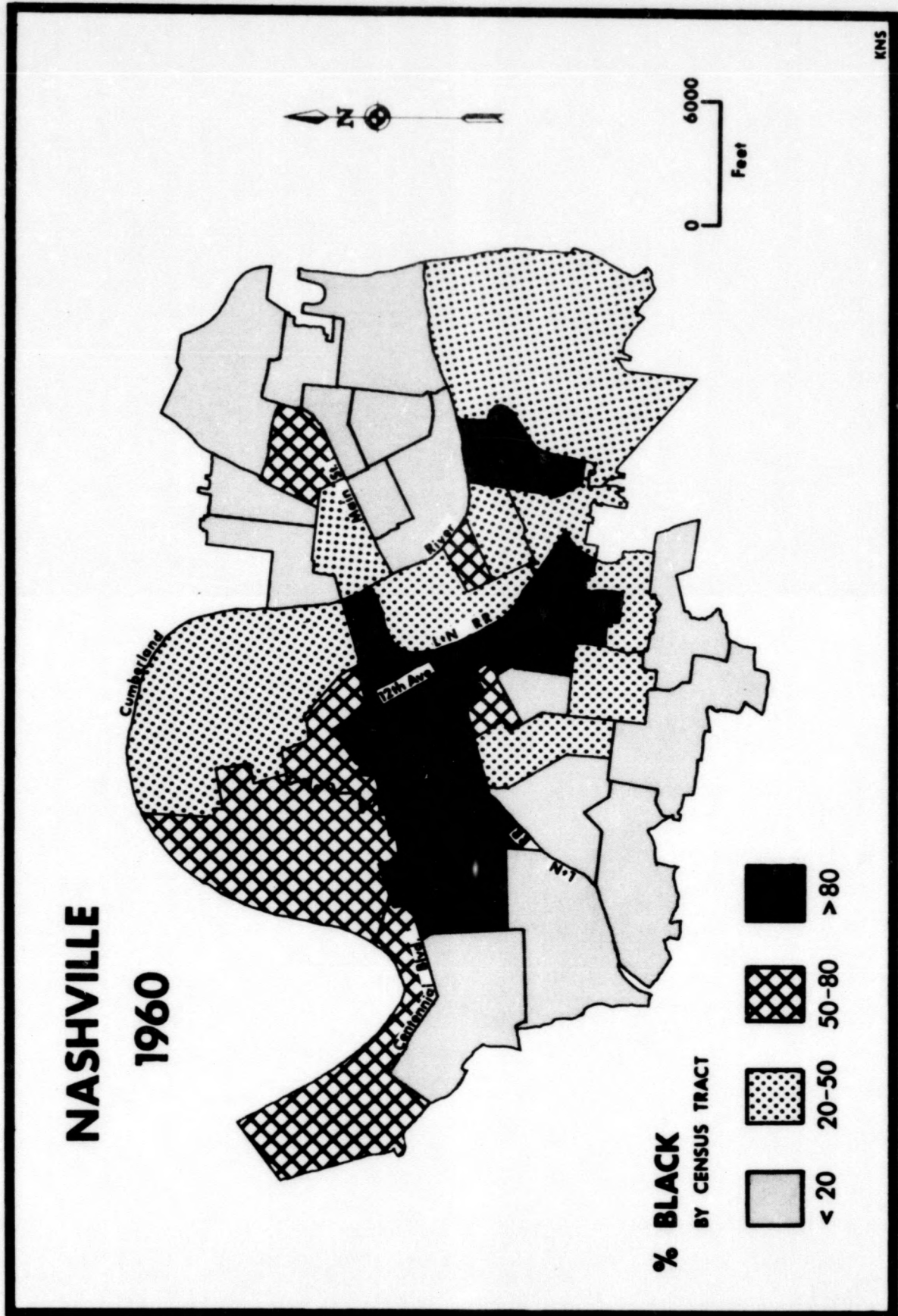


FIGURE III

TABLE 4
ZERO ORDER CORRELATION MATRIX *--1960

	Y	X ₁	X ₂	X ₃
Percent Black (Y)	1.000	.517	.418	-.608
Percent Substandard (X ₁)		1.000	.427	-.744
Percent Overcrowded (X ₂)			1.000	-.608
Average Monthly Rent (X ₃)				1.000
\bar{X}	40.38	39.46	18.87	42.43
S.D.	37.53	23.93	8.50	14.33

*All simple correlations were significant at the .01 level.
Source: Calculated by author.

Intensity of Black Occupancy is a Positive Function of Percentage of Substandard Dwelling Units

The coefficients listed in Table 4 indicate the simple correlations between each variable in the analysis. Percent substandard had a high statistical correlation value of .517. Both this value and the simple intercorrelations with the other variables are somewhat lower than in 1950 (Tables 1 and 4). One could reasonably speculate that structural conditions of Black households improved slightly during the ten year period. Nevertheless, the relationship between percent Black and substandard units is a persistent one, and a map of substandard units bears this out. As a result, the hypothesis is accepted.

Intensity of Black Occupancy is a Positive Function of Percentage of Overcrowded Units

As was the case in 1950, units overcrowded projected the lowest simple correlation value ($r = .418$). This value is, however, statistically significant. Simple intercorrelations with the substandard and rent rate variables are considerably lower than were those found for 1950 (Tables 1 and 4). Cartographic comparisons between percent Black and overcrowding continue to illustrate a similar distribution. In spite of the quantitative declines in the relationships, the hypothesis is accepted.

Intensity of Black Occupancy is a Negative Function of the Average Monthly Rent Rate

This relationship again produced the strongest statistical correlation ($r = -.608$). The implication naturally

follows that the purchasing power of Blacks is lower than that of Whites, at least in the area of housing. This hypothesis is formally accepted.

Analysis of the General Hypothesis

When all the variables were considered simultaneously for Nashville in 1960, a multiple correlation (R) of 0.62 and a coefficient of determination of (R^2) 0.38 were obtained (Table 5). Thus, 38 percent of the total variation of the residential distribution of Blacks was explained. This is a marked decline from the 56 percent explained in 1950 (Table 2). The rent rate variable (X_3), as the first variable entered into the model, accounted for 36 percent of the total explained variation (Table 5).

TABLE 5
COEFFICIENTS OF MULTIPLE CORRELATION AND
MULTIPLE DETERMINATION: STEPWISE REGRESSION MODEL--1960

Variable	R	R^2
X_3 Average Monthly Rent	.60	36%
X_1 Percent Substandard	.61	37%
X_2 Percent Overcrowded	.62*	38%

*Significant at .01 level.
Source: Calculated by author.

Together, percent substandard and percent overcrowded accounted for only two percent of the total variation. One

can conclude that these two variables explain only a minimal amount of the distribution of Blacks not already accounted for by the rent rate variable. The order in which these two variables were entered into the model are reversed from the 1950 stepwise regression (Tables 2 and 5). In Nashville in 1960, sheer economic differences appear to be the major agent influencing racial segregation. At any rate, the general hypothesis is formally accepted.

Rank-Order Correlations for Black Tracts

In census tracts possessing over 50 percent Black (Figure III), the overcrowded variable has a surprisingly high statistical correlation of .564 (Table 6). In 1950, the quantitative relationship between percent Black and overcrowded units was $-.092$ (Table 3). For the city of Nashville, the

TABLE 6
RANK-ORDER CORRELATIONS FOR BLACK TRACTS--1960

Variable	Correlation
X ₁ Percent Substandard	$-.093$
X ₂ Percent Overcrowded	$.564^*$
X ₃ Average Monthly Rent	$-.037$

*Significant at .05 level.
Source: Calculated by author.

overcrowded variable had the lowest simple correlation (Table 4). This apparent contradiction can be explained in part by

an examination of Figures II and III. The tracts over 80 percent Black remained virtually unchanged over the 1950 - 1960 decade. The large increase in the city's Black population was accommodated to some extent by diffusion into adjacent tracts. The remainder of the increase was accommodated by overcrowding units in neighborhoods already considered within the ghetto. In light of these statistical and cartographic conclusions, the overcrowding hypothesis for Black tracts is formally accepted; the others are rejected.

Black Residential Distribution in 1970

The Black population of Nashville continued to grow in the 1960 - 1970 decade. Following the implementation of the Metropolitan Government, the census tract boundaries were largely revamped (Figure IV). Despite the inclusion in the study area of several middle-income tracts on the eastern edge of the central city, the Black population increased to about 43 percent of the total.

During this time, the north Nashville ghetto became the Model City Area.⁴ The Model City Area (M.C.A.) consists of all the tracts greater than 80 percent Black in north Nashville plus the tract immediately north of Jefferson Street (Figure IV). A very significant development that affected residential distribution in Nashville in the 1960's (and certainly still affects it today) was the construction of Interstate Routes 265 and 40 through the M.C.A. (Figures I and IV). This construction brought about a higher incidence of deterioration of housing in the highway corridor area than

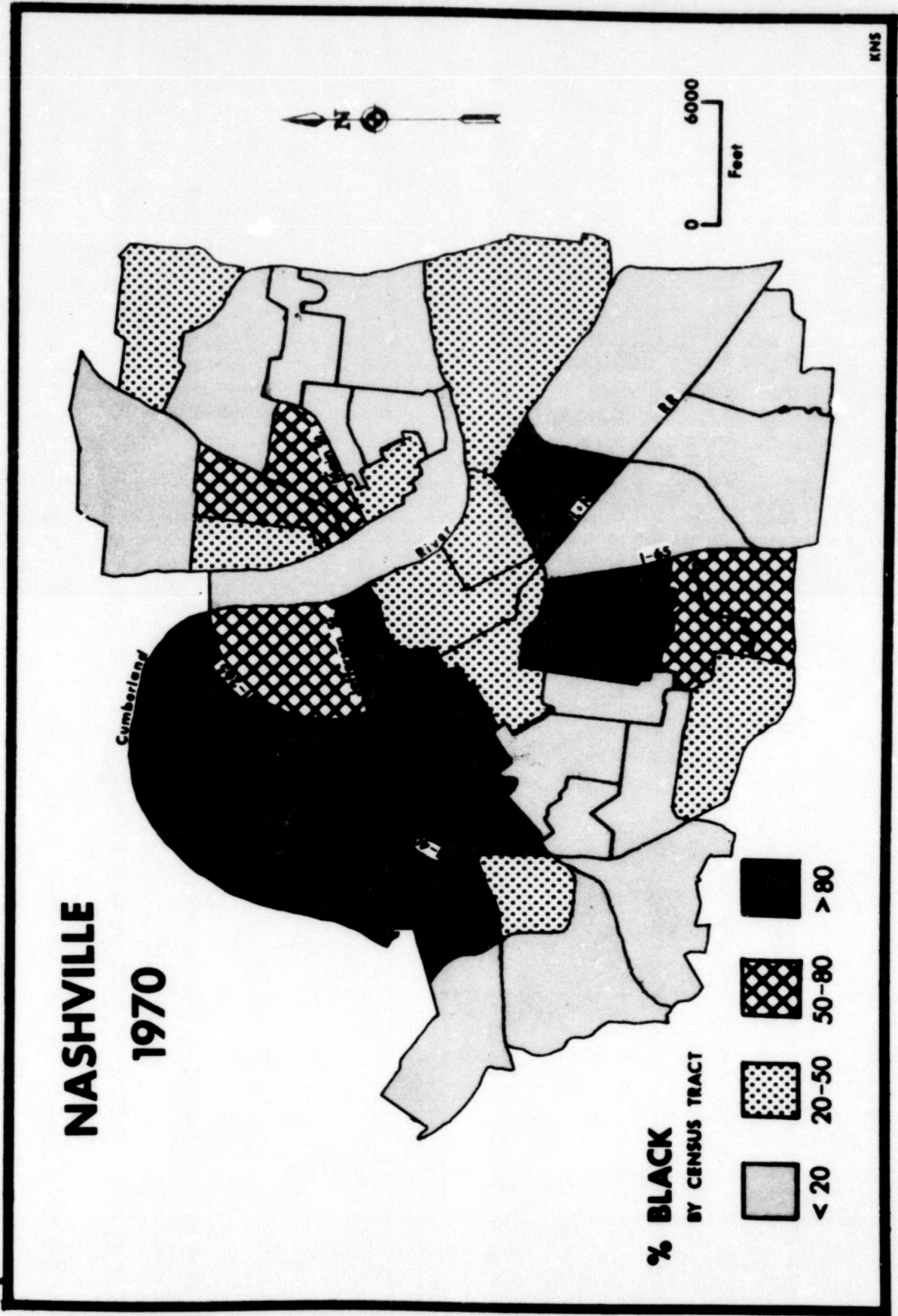


FIGURE IV

to the M.C.A. as a whole.⁵ In addition, the population of the M.C.A. declined by about 10 percent during the decade, largely as a result of the Interstate construction.⁶ Despite the Black succession into the northern part of the M.C.A., it is apparent that there was not enough space to relocate residents in north Nashville. In the two year period from 1966 to 1968, the number of occupied units decreased from 13,900 to 12,750.⁷

Black relocation apparently occurred in areas of the city already experiencing expansion. The two tracts to the south of Edgehill registered greater than 50 percent for the first time (Figures I and IV). The Douglas Park area of east Nashville also displayed an intensification. The Napier Park area, still fronted by the L & N Railroad, remained an isolated ghetto core. Meanwhile, the traditional White tracts remained that way, many still exhibiting less than one percent Afro-American population.

Analysis of the Hypotheses for 1970

Intensity of Black Occupancy is a Positive Function of Percentage of Substandard Dwelling Units

Table 7 indicates the simple correlations between each variable in the analysis. Percent substandard had a low statistical correlation of .181, which is not significant. This relationship mirrors a sharp decline from the 1960 correlation of .517. By 1970, substandard housing was no longer a striking characteristic that distinguished the Black community from the rest of Nashville. The simple intercorrela-

TABLE 7
ZERO ORDER CORRELATION MATRIX--1970

	Y	X ₁	X ₂	X ₃
Percent Black (Y)	1.000	.181	.606*	-.506*
Percent Substandard (X ₁)		1.000	.052	-.423
Percent Overcrowded (X ₂)			1.000	-.763
Average Monthly Rent (X ₃)				1.000
\bar{X}	42.80	7.14	12.05	69.61
S.D.	39.58	8.04	5.69	14.94

*Significant at the .01 level.
Source: Calculated by author.

tion between substandard and overcrowding is extremely weak ($r = .052$). Apparently the efforts of Model Cities and other agencies sharply improved Black housing quality, although the new definition of "substandard" may have altered this correlation to an indeterminable degree. In any event, the hypothesis is formally rejected.

Intensity of Black Occupancy is a Positive Function of Percentage of Overcrowded Units

For the first time in the three analyses, units overcrowded projected the highest simple correlation value ($r = .606$; see Tables 1, 4, and 7). The overcrowding variable also had a high negative intercorrelation value with the rent rate (Table 7). The impact of the highway construction in the M.C.A. appears to be the major agent in explaining the relationship between Black and overcrowded households. Accordingly, this hypothesis is accepted.

Intensity of Black Occupancy is a Negative Function of the Average Monthly Rent Rate

This relationship is once again significant ($r = -.506$), but the correlation has slowly weakened since 1950 (Tables 1, 4, and 7). The disparity between the average rental value of Black households and those of the rest of Nashville has narrowed somewhat through the course of this twenty year period. There is, nevertheless, evidence that Blacks generally rent less expensive housing, and the hypothesis is thus accepted.

Analysis of the General Hypothesis

When all the variables for Nashville in 1970 were con-

TABLE 8
 COEFFICIENTS OF MULTIPLE CORRELATION AND
 MULTIPLE DETERMINATION: STEPWISE REGRESSION MODEL--1970

Variable	R	R ²
X ₂ Percent Overcrowded	.60	36%
X ₁ Percent Substandard	.62	38%
X ₃ Average Monthly Rent	.63*	39%

*Significant at .01 level.
 Source: Calculated by author.

sidered simultaneously, a multiple correlation (R) of 0.63 and a coefficient of determination of (R²) 0.39 were obtained (Table 8). Thus, 39 percent of the total variation of the residential distribution of Blacks was accounted for. This degree of explanation remains approximately unchanged from 1960. The overcrowding variable (X₂), as the first variable entered into the model, accounted for 36 percent of the total explained variation (Table 8). Overcrowding has gone from least importance to most in the period under analysis.

The substandard and rent rate variables together accounted for only three percent of the total variation. These variables explain only to a small extent the distribution of Blacks not already accounted for by the overcrowded conditions. But because of the statistically significant value of R, the general hypothesis is accepted.

Rank-Order Correlations for Black Tracts

As in 1960, percent overcrowded was once again the only variable to have a statistically significant correlation in tracts over 50 percent Black (Table 9). Percent substandard

TABLE 9
RANK-ORDER CORRELATIONS FOR BLACK TRACTS--1970

Variable	Correlation
X ₁ Percent Substandard	-.363
X ₂ Percent Overcrowded	.545*
X ₃ Average Monthly Rent	-.227

*Significant at .05 level.
Source: Calculated by author.

actually had a negative correlation of ($r = -.363$). This phenomenon can be explained in part by the fact that multi-family public housing accounts for over 15 percent of the dwelling units in the M.C.A.⁸ The rent rate had a negative correlation as expected, but not to the degree needed to be statistically significant. Accordingly, only the overcrowded hypothesis is accepted for 1970 Black tracts.

Conclusion

The statistical and cartographic analyses described thus far in this chapter have been reasonably successful in accomplishing the purpose of this study. That purpose was to explain the temporal variations of the residential dis-

tribution of Blacks in Nashville. However, the quantitative correlations and map analyses have not provided satisfactory insight into the ghetto expansion process. For this reason, a departure from the above hypothesis-testing method of analysis is deemed necessary. The rationale for this departure follows.

In both 1960 and 1970, overcrowding has been shown as a method utilized in compensating for Black population increase. The effect of the Interstate highway construction through the M.C.A. obviously worsened this situation. The only other alternative to overcrowding is out-migration. Three areas of Nashville experienced noticeable increases in Black residences in the 1960 to 1970 decade: the northern edge of the M.C.A.; the area south of Edgehill; and east Nashville, in the vicinity of Douglas Park (Figures III and IV). The latter has been chosen for micro-study since it was not in the expansion path of a larger ghetto. A diffusion simulation model will be tested and the results will be compared to the actual 1960 - 1970 migration in order to gain insight into the process of residential succession. This model will be an attempt to determine whether migration is merely an incremental "nearest neighbor" process as the literature has suggested. It is hoped that the model will cast some light on other factors such as property values or accessibility as they relate to the expansion process.

Summary

This chapter has been concerned with the statistical

and cartographic analyses of Black residential distribution in Nashville from 1950 to 1970. On the whole, it has been illustrated that housing conditions have improved and that ghetto expansion has taken place during this temporal period. The next chapter will present a model that simulates this expansion in the small ghetto area of east Nashville in a further attempt to explain the diffusion process.

FOOTNOTES

¹Alrutheus Ambush Taylor, *The Negro in Tennessee, 1865-1880*, (Washington, D.C.: Associated Publishers, 1941).

²Meyer, *Spatial Variation of Black Urban Households...*

³Stanley D. Brunn and Wayne L. Hoffman, "Spatial Response of Negroes and Whites Toward Open Housing: The Flint Referendum," *Annals Association of American Geographers*, 60 (March, 1970), pp. 18-36.

⁴For an excellent summary of conditions in the Model City Area see *Model Cities in Perspective*, (Planning Commission; Metropolitan Government of Nashville-Davidson County, Tennessee, April, 1970).

⁵*A Study of the I-40 and I-265 Corridor Areas in North Nashville*, (Planning Commission; Metropolitan Government of Nashville-Davidson County, Tennessee, December, 1969), p. 56.

⁶*Model Cities in Perspective*, p. 11.

⁷*Ibid.*, p. 12.

⁸*A Study of the I-40 and I-265...*, p. 57.

CHAPTER IV

A DIFFUSION SIMULATION MODEL FOR EAST NASHVILLE

An Overview of Diffusion

Diffusion studies, particularly those concerned with the spread of phenomena--be it innovations, rumors, or ethnic patterns--are assumed to be necessary for understanding a major aspect of human life, namely change.¹ We speak today about technological change, social, economic and political changes, as well as changes that occur in the environment. Thus, a society can be said to have experienced change if its technology, institutions, customs or, in general, its way of life are different at one point of time than at another.

Much of the research on diffusion has been done by sociologists interested in communication flows. An abundance of empirical studies in rural sociology enabled scholars to achieve insight and more comprehensive views of what is involved in a diffusion process. The sociologists Katz, Levin, and Hamilton were able to arrive at what can be considered today as a classical definition of diffusion:

...The process of diffusion may be characterized as the (1) acceptance, (2) over time, (3) of some spe-

cific item--an idea or practice, (4) by individuals, groups or other adopting units, linked (5) to specific channels of communication, (6) to a social structure, and (7) to a given system of values, or culture.²

The definition given by Katz, Levin and Hamilton points to general elements that are involved in any diffusion process: adoption by a specific acceptance unit, the time element, and an item that spreads. It should be noted, however, that there is emphasis in the definition on spread within a society and reference is made to the role of a communication network in a diffusion process. Further, the definitions of diffusion in sociology indicate lack of direct interest in the impact or the significance of economic and spatial factors on diffusion.

Most of the pioneer work on modelling diffusion comes from Sweden, where the spread of many innovations has been examined in considerable detail by Hagerstrand. His analysis differed from the earlier studies by emphasizing the importance of spatial distribution. Hagerstrand points out that:

Analysis of the innovation diffusions in question is aimed at gaining an understanding of distributional changes between close points in time...³

The above quotation indicates explicitly that Hagerstrand's interest is centered around the diffusion of innovations in a specific context, the spatial one. Hagerstrand sees diffusion analysis as a way to explain distributional change.

Hagerstrand's contribution to the literature on diffusion can be summed up as follows: (1) the explicit incorporation

of distance in analyzing the spread of innovation, and (2) the introduction of a quantitative and probabilistic approach to the study of diffusion. It is the latter aspect that formed the basis for an applicable model for use in this study.

Hagerstrand's Monte Carlo Method

The first assumption that Hagerstrand made in modelling diffusion was that potential adopters were spread evenly over the land, and that a message or an innovation can move with equal ease in any direction.⁴ This condition is commonly known as an isotropic surface. The second assumption is that news about an innovation moves only by one person coming face-to-face contact with another and telling him about it. Communication, in other words, is by pair-wise telling; and as soon as a person hears the news the assumption is made that he will adopt the innovation.⁵

The final assumption Hagerstrand made is that the probability of a teller communicating with a receiver depends only on the distance between them.⁶ The probability of a message passing between two people is high when they are close together, and small when they are far apart. Each person is at the center of a communication field that is strong close to him but gets weaker as distance increases.

To operationalize these assumptions, Hagerstrand assumed that a mean information field (MIF) takes the form of a small, square grid of twenty-five cells, which can be superimposed over a map.⁷ To each cell is assigned some four-digit numbers

corresponding to the probability of the cell receiving a message from the center (Figure V). To power the model, four-digit, randomly chosen numbers are used. For example, if the numbers 0000 to 9999 were in a hat, and 2479 was drawn out, then we would know that the innovation had passed the message to the adjacent cell lying just to the west of the middle one (Figure V). Following adoption, the MIF continues to scan each of the cells of the map in turn, stopping over each innovator, and generating a new adopter of the innovation.

0-95	96-235	236-403	404-543	544-639
640-779	780-1060	1061-1627	1628-1928	1929-2069
2069-2236	2237-2783	2784-7214	7215-7761	7762-7929
7930-8069	8070-8370	8371-8917	8918-9218	9219-9358
9359-9454	9455-9594	9595-9762	9763-9902	9903-9999

Figure V.

Accumulated intervals for mean information field.

Source: Torsten Hagerstrand, "A Monte-Carlo Approach to Diffusion," European Journal of Sociology, Vol. 6 (1965) p. 56.

As the generation continues, a pattern of diffusion develops from the initial assignment of the first few innovators to the population cells. This is why this type of diffusion model is called a simulation model, for it simulates a process acting through time and over space. Note also that every time the model is run a slightly different result will occur; the

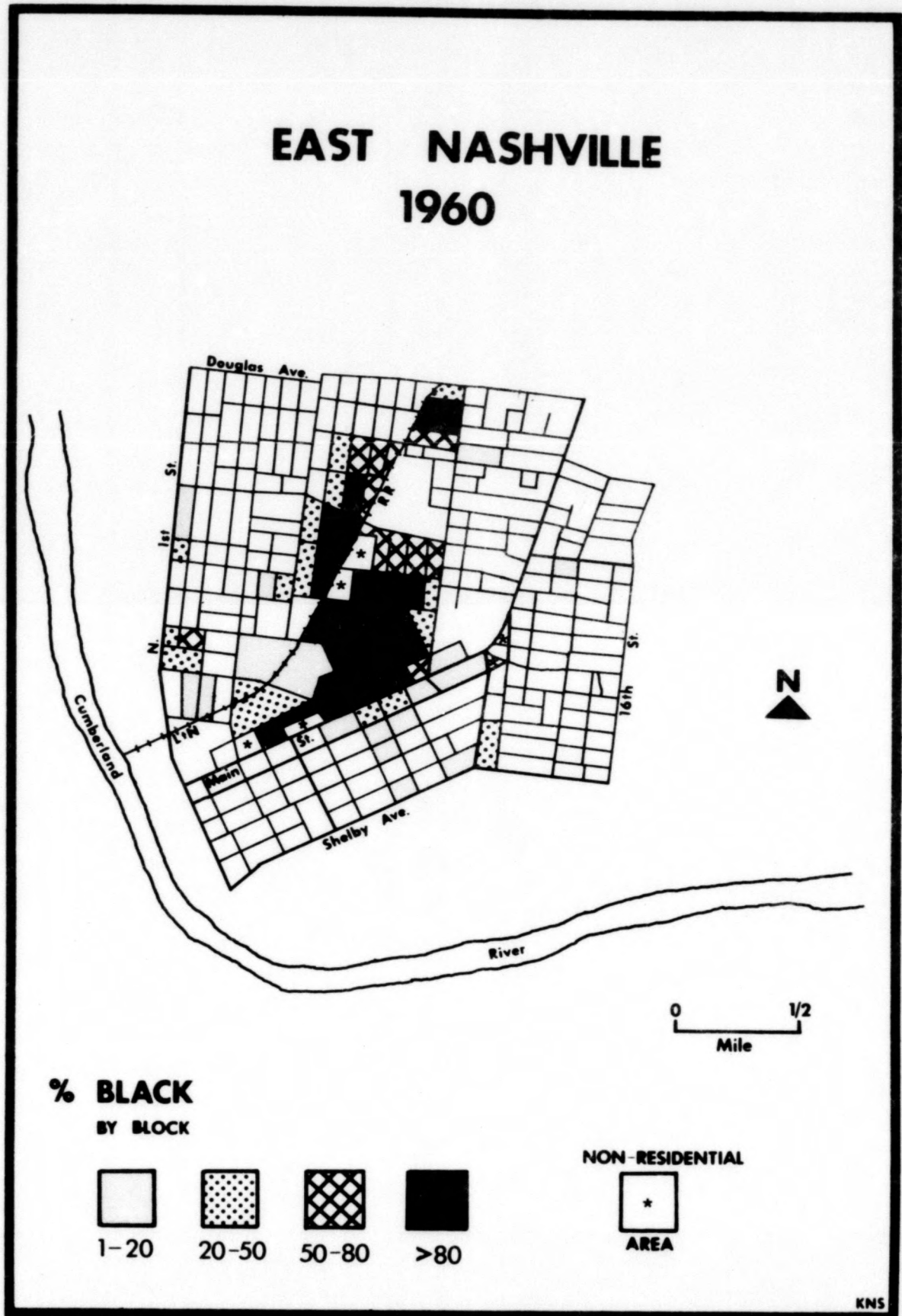
diffusion pattern from one run will not match another run exactly. This is because the model is probabilistic--or Monte Carlo--in nature.

The Model

As it stands, the Monte Carlo simulation model is not extremely realistic. Innovations do not diffuse at a geometric rate in the 2-4-8-16-32 fashion, but begin to slow down as saturation levels are reached. The model utilized in this study, a variation of Hagerstrand's, reflects an attempt to arrive at a realistic simulation of Black residential diffusion in east Nashville for the 1960 - 1970 decade. The study area contains 227 blocks, and is centered around the small ghetto north of Main Street, popularly known as the Douglas Park area (Figures I and VI).

Under ideal conditions one could easily perform spatial simulation exercises upon a regular lattice. Unfortunately, such is not the case for most areas of the surface of the earth, and east Nashville's street pattern is no exception. The model used here merely generalizes the operation of the MIF, rather than use the twenty-five values shown in Figure V.⁸ Each block unit area, its centroid coordinates, its household size limits, and the number of Black households originally within the block are read into the model as necessary data. In 1960, 1199 of the 7283 households in the study area were Black. Ten years later, the area contained 2011 Black households. So 812 acceptors are allowed in the simulation.

EAST NASHVILLE 1960



**% BLACK
BY BLOCK**



1-20



20-50



50-80



>80

NON-RESIDENTIAL



AREA

KNS

FIGURE VI

Before the simulation model was run, the inclusion of resistance barriers to diffusion was considered. In earlier studies, it was found that the assigning of a number of absorbing and permeable barriers slows down the course of a diffusion simulation, matching the process in the real world under similar conditions.⁹ The L & N Railroad (Figure VI), which acted as a considerable barrier in other areas of Nashville, if anything seems to have been attracting Black households. The households along either side of the tracks were generally more substandard and overcrowded than in the remainder of the study area. For this reason, a physical barrier was not included in the model.

On the other hand, in racial succession there is obviously a certain amount of psychological resistance, especially in blocks where the Black population is less than at a "tipping point." The psychological resistance option of the model regulates the number of tellings required before a move into a previously all-White block is accepted. This number of tellings is derived from a computer-powered Monte Carlo technique, and thus is not constant. Finally, in order to better generalize the diffusion process, the area means from three separate simulations were used in mapping the results of the test model.

Analysis of the Model

The actual Black residential expansion that took place during the decade is illustrated in Figure VII. Large numbers of Black households moved into the area northwest of the

EAST NASHVILLE 1970 ACTUAL

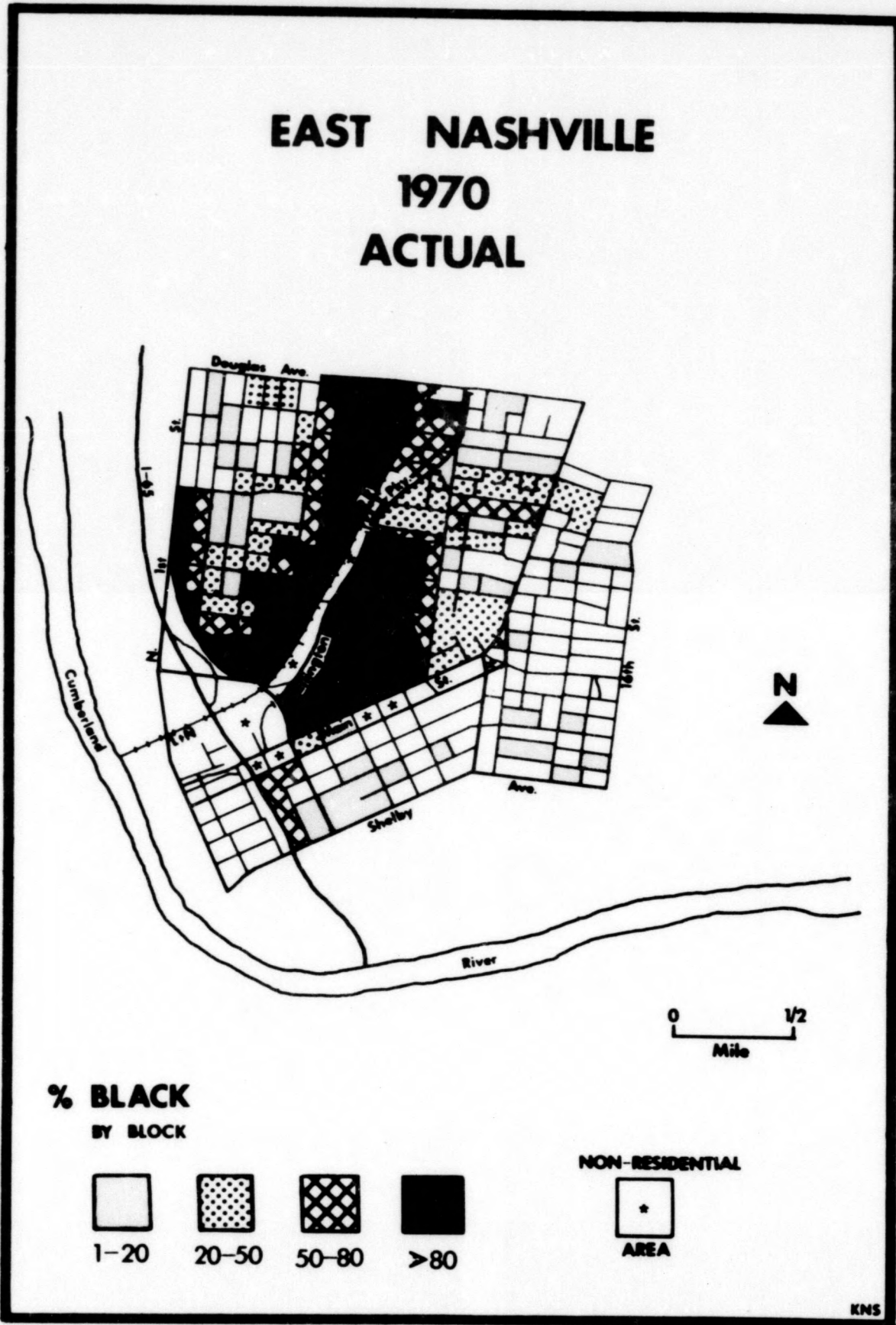


FIGURE VII

L & N Railroad. The blocks in the southeast portion reflected practically no increase. Apparently the highly commercial Main Street acted as an effective barrier to diffusion. The street pattern remained about the same as in 1960, except for the introduction of the Ellington Parkway and Interstate 65 (Figure VII).

The simulated results are shown in Figure VIII. Only mild diffusion occurred in the blocks northwest of the railroad tracks. Conversely, a sizable number of Black households moved into blocks south of Main Street in the simulation. The total number of high density Black blocks is somewhat lower in the simulation as compared to what actually occurred (Figures VII and VIII).

According to the most stringent test of absolute block-by-block conformity the model was not too successful. In the simulation (Figure VIII), the lowest percent category was designated as five instead of one because, even with the psychological resistance factor, diffusion advanced into nearly all of the blocks. Yet if the resistance had been increased considerably, the model might not have diffused into the blocks at the northern tip of the illustration, which increased during the decade from 0 to over 80 percent Black. Similarly, if a semi-permeable barrier had been introduced along Main Street, a more realistic simulation would have resulted.

The model, however, was not intended to account for the exact pattern. Sufficient information does not exist. The performance of the model was reasonably good in simulating

EAST NASHVILLE 1970 SIMULATED

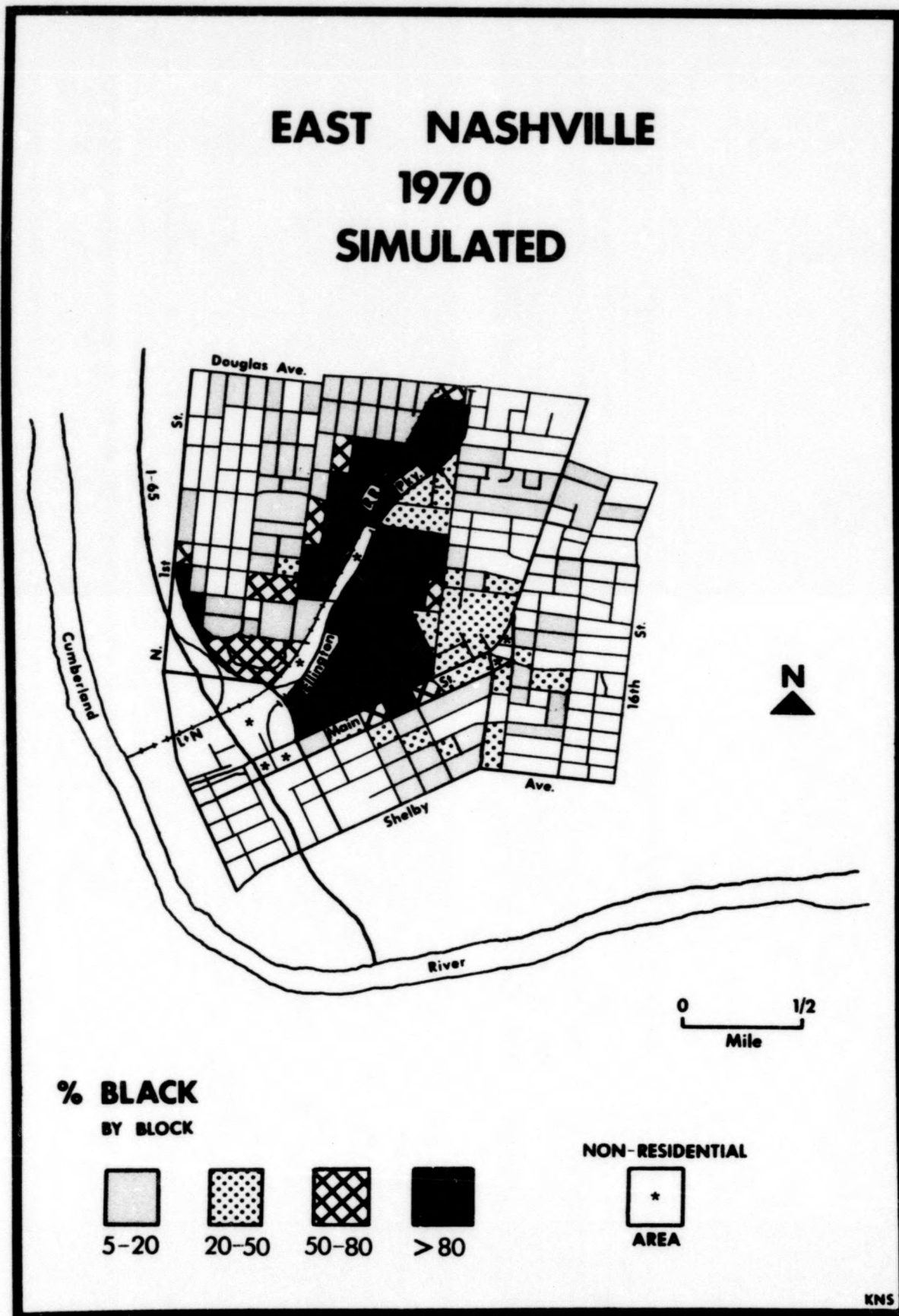


FIGURE VIII

the extent, solidity, and intensity of ghetto spread. The true test of theory is whether either the actual or the simulated results for 1970 could have occurred. Of course, there is always room for improvement, and one method of bettering the effectiveness of the model would be somehow to introduce an accessibility or least resistance factor which would incorporate property values and housing characteristics.

Summary

Chapter IV dealt with the modelling of diffusion of Blacks in east Nashville. A Monte Carlo method was employed, and simulated results were compared to the actual. This experiment was undertaken for the purpose of understanding the residential succession process. The model was fairly successful in proving that distance is the single most important factor in neighborhood expansion. Once overcrowding can no longer accommodate Black population increases, movements into new units must occur. These household advances have been shown to take place in areas adjacent to previously all-Black neighborhoods. Nevertheless, other factors such as value of housing and barriers (both physical and psychological) certainly affect household moves. In Nashville today, as the last two chapters have illustrated, residential diffusion is the result of population pressures rather than a flight from dilapidated housing conditions. The findings arrived at in Chapters III and IV indicate possibilities for further research as outlined in the next and final chapter.

FOOTNOTES

¹Two fine literature reviews on diffusion studies are included in Everett M. Rogers, Diffusion of Innovations, (New York: The Free Press, 1962); and Lawrence A. Brown, Diffusion Processes and Location: A Conceptual Framework and Bibliography, Bibliography Series No. 4 (Philadelphia, PA: Regional Science Research Institute, 1968).

²Elihu Katz, Martin L. Levin and Herbert Hamilton, "Traditions of Research on the Diffusion of Innovation," American Sociological Review, 28 (1963), p. 240.

³Torsten Hagerstrand, Innovation Diffusion as a Spatial Process, translated and with a postscript by Allen Pred (Chicago: University of Chicago Press, 1967), p. 6.

⁴Hagerstrand, "A Monte-Carlo Approach to Diffusion," European Journal of Sociology, 6 (1965), p. 54.

⁵Ibid.

⁶Ibid., p. 55.

⁷Ibid., p. 56.

⁸See John D. Stephens and Robert I. Wittick, "NONCELO: Hagerstrand's Simulation of Diffusion Over an Irregular Lattice," Technical Report 73-4 Computer Institute for Social Science Research, Michigan State University, East Lansing, Michigan (April, 1973).

⁹For example, see Robert S. Yuill, "A Simulation Study of Barrier Effects in Spatial Diffusion Problems," (Ann Arbor: Michigan Inter-University Community of Mathematical Geographers, Discussion paper no. 5, 1965).

CHAPTER V

SUMMARY AND CONCLUSIONS

The purpose of this study was to explain the temporal variations of the residential distribution of Blacks in Nashville, Tennessee. A review of the literature relating to the distribution of Blacks in other cities was conducted towards the purpose of formulating research hypotheses to be tested in Nashville.

The dependent variable was expressed in terms of percent Black per census tract while quantification of the three independent variables was based on either percentage or dollar values. The U. S. Census of Population and Housing for the years 1950, 1960, and 1970 were utilized as data sources. The universe consisted of at least 40 census tracts that approximated the Nashville corporate limits throughout the temporal period.

Three hypotheses were formulated, which, when combined, formed the general hypothesis;

Hypothesis 1. That intensity of Black occupancy is a positive function of percentage of substandard dwelling units.

Hypothesis 2. That intensity of Black occupancy is a positive function of percentage of overcrowded units.

Hypothesis 3. That intensity of Black occupancy is a negative function of the average monthly rent rate.

General Hypothesis: That the variables selected and set forth in hypotheses one through three explain a high percentage of the total variation of the residential distribution of Blacks.

The methods of analysis included simple correlation, stepwise regression, and accompanying cartographic displays. The general hypothesis was accepted for all three time periods. For the city of Nashville, the simple correlations were accepted in every case except the substandard hypothesis, which was rejected for 1970. Rank-order correlations were utilized within the predominantly Black areas of the city, and the overcrowding hypothesis was accepted for 1960 and 1970. The other hypotheses were rejected.

During this period of Black population increase, residential expansion took place concomitant with overcrowding. Three areas of the city exhibited ghetto growth: the northern edge of what is presently the Model Cities Area; the southern fringe of the Edgehill neighborhood; and east Nashville, in the vicinity of Douglas Park. The latter was chosen as a study area in which to simulate residential diffusion in the 1960 - 1970 decade.

The diffusion model was set up following some of Hagerstrand's probabilistic methods. The simulation was far from accurate; being guilty of too much spreading and not enough concentration. Nevertheless, the pattern simulated in the

model was reasonably close to what actually happened.

Weaknesses of the Study

The result of the statistical tests conducted indicated that additional variables should have been entered into the regression equation. The hypotheses of the study were chosen in light of the review of literature. Variables such as value of owner-occupied housing, income, education, and certainly others might have further explained the distribution. The fact that one variable usually accounted for most of the variation also indicates that the variables chosen to a large degree explained the same thing.

Another weakness of the study arises from the small number of areas used in the correlation. Since block statistics were not available for 1950, the larger political unit of census tracts had to suffice. Block statistics would have provided a much greater number of enumeration areas for analysis, and statistically less tenuous conclusions. Similarly the availability of better statistics from the 1960 census may have resulted in a more realistic diffusion model.

Areas for Further Research

It is hoped that this study has brought to light one essential conclusion: that while still not on a par with Whites, conditions in Black neighborhoods have improved dramatically. For example, 1970 national figures show that Black family incomes increased between 1960 and 1970 by 99.6 percent, compared to sixty-nine percent for Whites. As this income

growth has taken place, Black home ownership increased in the decade by over a million units, or forty-seven percent (compared with twenty percent for Whites), while the number of substandard housing units occupied by Blacks decreased by 800,000 units, or by thirty-nine percent. In recent years, most of the studies on ghetto conditions have focused on popular "problems" that became the objects of liberal academia's reactive response to social conditions in the late 1950's. Indeed, most of these studies follow well-travelled ruts.

What is necessary in future research is insight into the changing conditions and locations of the ghetto--the consequences of increasing affluence and ghetto expansion that occurred, alongside more assertive cultural pluralism, for the new Black middle-class majority. Of considerable consequence as well are the results of increasing isolation of a welfare-supported underclass in zones of population decline and housing abandonment both for that underclass and for the central cities in which it is concentrated. Also essential is careful evaluation of the successes and failures of Federal programs in the 1960's--the opening of job and educational opportunities, the reduction of traditional constraints maintaining duality in housing markets, the consequences of the drive for integration in the public schools, and the failure of attempts to increase residential integration materially. In any event, it is hoped that further study will assist in formulating goals and policies to ameliorate the critical and intense problems of central cities.

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