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A DISTANCE-BASED ANALYSIS OF URBAN SEGREGATION IN THE AMERICAN SOUTHWEST

The University of Oklahoma PH.D. 1983

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GRADUATE COLLEGE

A DISTANCE-BASED ANALYSIS OF URBAN SEGREGATION IN THE AMERICAN SOUTHWEST

A DISSERTATION

SUBMITTED TO THE GRADUATE FACULTY

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DENNIS J. HREBEC

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A DISTANCE-BASED ANALYSIS OF URBAN SEGREGATION

IN THE AMERICAN SOUTHWEST

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CHAPTER I

THE RESEARCH PROBLEM AND ITS CONTEXT

Residential areas of cities can be distinguished in numerous ways. An urban residential area may be recognized as distinct in terms of the structure, age, location, ownership, architecture, political strength, and economic and social characteristics of its inhabitants. Residential areas are divided into neighborhoods depending upon the presence or absence of selected characteristics. Delimiting neighborhoods based on selected traits is referred to as residential differentiation, and when ethnicity is used as a delimiting element, such research is termed residential segregation. The degree of segregation, its accurate measurement, the processes involved in shaping the existing segregation, and the impact of segregation on future planning and growth are topics of major and recurring interest in the social sciences.

The investigation of the dimensions of residential differentiation has produced two distinct approaches to analyzing the significance of neighborhood variation. One is a subjective cognitive approach, which involves concepts concerning the living environment, such as "reputation, respectability, security, beauty, and harmony with nature" (Timms 1976, 22). The second involves more objective and

statistical measurement. This approach is more ordinal in nature and is composed of various types of social rank, social status, economic status and ethnicity.

The subjective approach is very useful when research is directed toward evaluating residential choice, environmental preferences, and the fluctuation or persistence of urban residential patterns. However, data for residential attitudes are difficult to obtain, vary greatly between individuals and between cities, and do not lend themselves well to large-scale research efforts. The alternative to subjective opinion is objective assessment. Statistical measurement cannot define a social environment as neighborhood residents perceive it, but a statistical tool that would record the mathematical levels of residential mixing would be valuable for temporal and inter-city comparisons. The ideal statistic would be one that is easy to calculate, assesses residential mixing accurately, and is readily interpretable. The conceptual implications of such an index are simple, but considerable difficulty has been encountered in achieving a real world application. Harsh controversies over accuracy, appropriateness, and application have rendered the interpretation of index results difficult and questionable.

Research on the residential segregation of minorities has been primarily applied to Blacks, and to a lesser extent to Mexican-Americans. In the early 1900s, seventy percent of the Black population resided in rural areas, mostly in the South. By the 1970s, seventy percent resided in urban areas, largely in the North. The rural to

urban migration and the migration of Blacks to areas outside the South has been well documented (Hart 1960; Johnson and Campbell 1981). Like the European ethnic groups before them, the Black population took up residence in the interior of cities in the economically poorest housing (Liberson 1963, 127). However, unlike the Polish, Irish, Italian and other Europeans the Black population has not been absorbed into the city and has not vacated the poor economic housing for better living areas (Ward 1982, 258). Much of the urban research over the last decade has been spent searching for the causal factors that seem to have confined Blacks to designated areas of the city.

Mexican-Americans have migrated to urban areas of the Southwest in large numbers only in recent decades. Mexican-American migration has been more dispersed than the heavy urban concentration of Blacks, but it lacks the urban-to-suburban movement characteristic of the white population (Moore and Mittlebach 1966, 8). Although both minority groups have been studied separately, little research has been done on residential differentiation between the two large minorities and the white population where all occupy significant portions of the city.

The problem investigated in this research is the analysis of residential segregation between three population groups in the urbanized areas of five Southwestern states: Arizona, California, Colorado, New Mexico, and Texas. The objectives of this study are: (1) to select a statistical index that will accurately measure the degree of residential segregation between whites versus Blacks, whites versus Mexican-Americans, and Blacks versus Mexican-Americans, (2) to compare the three

groups and the total amount of segregation between urbanized areas, (3) to determine changes in segregation from 1960 to 1970, and (4) to relate the degree of segregation to other socio-economic variables.

The Importance of Residential Segregation Analysis

The rationale for investigating urban residential segregation resides in the theory that residential differentiation is an important element in the explanation of urban phenomena (Suttles 1972, 20). Residential differentiation represents a significant contextual variable for research involving social area analysis, factorial ecology, and urban social behavior. Neighborhood residential differentiation affects community attitudes on educational achievement, social relationships, social stratification, and employment stratification.

The perceptions of urban life that are conveyed by and associated with residential segregation become strongly coercive when they predetermine and prestructure urban images (Timms 1976, 19). Many people perceive that spatial separation of population groups contributes to a number of social problems, and that social segregation restricts the development of social and academic skills. The absence of residential segregation and the heterogeneity that results are often viewed as social goals. The United States National Advisory Commission on Civil Disorders considered residential segregation a causal factor in social instability (National Advisory Commission on Civil Disorders 1968, 5). The Supreme Court decisions that upheld school busing

programs were attempts to deal with inequalities in segregated schools, a result of residential segregation.

Residential segregation is the physical and spatial result of accumulated economic, ethnic, social, and cultural differentiation. Although a single characteristic may be sufficient to create residential segregation, more often several socio-economic differences are highly correlated with residential location. A useful result of residential segregation research is the identification of socio-economic characteristics that are associated with minority residential differentiation. If residential mixing is a desired social goal of urban government, then identification of the factors causing differentiation will aid planners in reducing urban residential segregation.

Evolution of Residential Segregation Research

Residential segregation analysis has its roots in the Chicago School of Sociology, where classical human ecology flourished from the 1920s to the 1940s. In a series of publications dealing with the city of Chicago, human ecologists produced both theory and concepts dealing with residential segregation. Central to their analysis was the concept of the "natural area." Zorbaugh defined this concept.

> The structure of the individual city, ...is built upon this framework of transportation, business organization and industry, park and boulevard systems, and topographical features. All these break the city up into numerous smaller areas, which we may call natural areas, in that they are the unplanned natural product of the city's growth.... From the mobile competing stream of the city's population each natural area of the city

> tends to collect the particular individuals predestined to it. These individuals, in turn, give to the area a peculiar character. And as a result of this segregation, the natural areas of the city tend to become distinct cultural areas as well." (Zorbaugh, 1926; reprinted in Theodorson 1961, 46-47).

The Chicago publications focused upon: (1) individuals and groups, such as The Gang (Thrasher 1956) and The Hobo (Anderson 1923), that were considered representative of particular natural areas; (2) the distribution of abnormal social behaviors in Suicide (Cavon 1928), and Juvenile Delinquency and Urban Areas (Shaw 1942); and Mental Disorders; and (3) dealt with natural areas as a whole in The Gold Coast and Slum (Zorbaugh 1929) and The Ghetto (Wirth 1956).

The classical approach utilized the biological analogies of invasion and succession to explain the evolution of the urban communty (McKenzie 1968, 31). The concept of impersonal competition and rational economics dominated the decision-making processes. Park defined the importance of competition in Human Communities:

> Competition, which is the fundamental organizing principle in the plant and animal community, plays a scarcely less important role in the human community. In the plant and animal community it has tended to bring about (1) an orderly distribution of the population, and (2) a differentiation of the species within the habitat.
>
> The same principles operate in the case of human population, with the exception that in the latter case the habitat is the economic region and competition achieves and maintains a relatively stable equilibrium." (Park 1952, 119).

The importance of rational economics and impersonal competition in organizing urban behavior specified economic segregation as the determining factor of population distribution. McKenzie stated the following:

> Every area of segregation is the result of the operation of a combination of forces of selection. There is usually, however, one attribute of selection that is more dominant than the others, and which becomes the determining factor of the particular segregation. Economic segregation is the most primary and general form. It results from economic competition and determines the basic units of the ecological distribution. (McKenzie, 1926; reprinted in Theodorson 1961, 35).

According to the Chicago School, economic competition affected the distribution of urban land values. The areas with the highest land values were normally located in the center of the city, and they determined the relative location of major social and business institutions. The close connection between the central business district and urban land values was even more systematized by the later work of neo-classical ecologists (Bassett and Short 1980, 27). Transportation costs, land values, and time of travel all combined to determine the relationship between city structure and the central business district (Alonso 1960; Muth 1969). The concentric zone theory (Burgess 1925) and the city sector model (Hoyt 1939) depended upon the economic determinism of classical ecological theory for the motivation of inter-city migration in urban areas.

Difficulties in classical ecological theory arose in the concept of the natural area, biological analogies, and in the dependence on competitive economic determinism. The natural area definition became ambiguous even among the Chicago ecologists (Timms 1971, 7). Attributes of natural areas could include cultural, ethnic, economic, political, or physical dimensions. Critics of the term, such as Suttles, described the inability of the natural area to fit varied residential groups (Suttles 1972, 8). Extensive criticism by Alihan (1938), Gettys (1940),

and others induced Park to attempt to clarify the terminology by equating the natural area to areas of population segregation, and by reserving the term "neighborhood" for the smallest social and political organizations (Park 1952, 18). The addition of the new term did little to clarify the confusion of the natural area term, and both terms became increasingly ambiguous.

Criticism of the shortcomings of traditional ecological theory increased until the 1950s, when the traditional approach was abandoned. Although the biological analogies of the early ecologists were basically models, numerous references to plant and animal communities created a perceived overemphasis on the biological concepts of competition, dominance, and succession. Dependence on biological economics and economic determinism did not allow explanations of residential differentiation to be affected by non-economic cultural factors.

Social Values Approach

The development of the social values appproach began with the criticism that classical ecological theory did not recognize non-economic cultural factors. Firey (1945) used a case study of Boston to determine that the persistence of spatial patterns in the central city could not be explained by the classical approach. Firey suggested that space had additional qualities:

> that of being at times a symbol for certain values that have become associated with a certain spatial area,... locational activities are not only economizing agents but may also bear sentiments which can significantly influence locational process. (Firey 1945, 140).

Hollingshead (1947) suggested that the classical approach did not explain spatial mobility or population movement. He stated:

> To get at and evaluate such data, the migrant must be studied in a sociocultural context if we are to discover 'the pushes and pulls' in migration....It would appear that these are social, cultural, and personal, rather than 'impersonal,' 'subsocial,' and 'competitive,' as ecologists have been prone to assume. (Hollingshead 1947, 199)

Jonassen (1949) and Myers (1950) reached similar conclusions, with Myers stating:

> In conclusion, it is apparent that ecological dispersion cannot be understood solely in terms of 'biotic,' 'subsocial,' 'natural,' 'impersonal,' or 'strictly economic' factors. Men are not only physical beings motivated by biotic forces, but are human beings as well, motivated by culturally determined drives and values. Competition is not impersonal, but, on the contrary, quite personal and deliberate (Myers 1950, 372).

Kolb (1954) argued that universalistic-achievement values, not economics, dominate the activities of urban residents (Kolb 1954, 40).

The social values approach was important because it included human behavior and non-economic cultural factors in the analysis of urban spatial patterns. However, it did not constitute a complete perspective of residential differentiation. Rather, the classical ecological approach and the social values approach are independent, do not conflict, and each may be applied to different aspects of the same residential system.

The social values theories are subject to criticism concerning the relationship of social values to social structure and in the definition of social values. A direct relationship between social

values and urban social structure cannot be demonstrated easily. Shils (1957) observed only fragmentary and intermittent connections between the value system of a cultural society and the actions of individuals. He stated, "Man is much more concerned with what is present and concrete than with what is remote and abstract" (Shils 1957, 130). The lack of a direct relationship and the intervening variables between values and structure thus preclude the application of the social values approach to realistic prediction.

Definitional difficulties arise when interpreting the existence and meaning of social values. When the economic determinism of the more classical approaches failed, the term value often seemed to be a convenient label to classify subjective judgments. Willhelm (1962) demonstrated that economic variables themselves may be classified as values (Willhelm 1962, 200). Sjoberg (1965) was concerned that "an excessive concern with values can lead one to emphasize the differences among cities in various cultures rather than the similarities" (Sjoberg 1965, 174). His research on pre-industrial cities asserted that all cities display similar basic urban forms, and that it is these similarities that should be delimited rather than unique differences (Sjoberg 1960, 5).

As a contribution to the study of residential differentiation, the social values approach correctly emphasizes the importance of human motivation in location decision-making. The classical and social value approaches give perspective to general ecological principles, but because they deal with somewhat abstract concepts, they provide little

explanation of the processes of residential differentiation. The discovery of these processes was to await a more social-psychological perspective where location activities are concerned about the decision-making behavior of individuals.

Social Area Analysis and Factorial Ecology

The technique of social area analysis was designed to apply a comparative system of analysis to the structural and organizational problems of society and their relationships to human behavior. The procedure was originally developed by Shevky and Williams (1949), modified by Bell (1953), and later defined in greater detail by Shevky and Bell (1955). Social area analysis allowed the authors to measure the relative position of census tract populations against a scale of three indexes, and provided it a means of classifying census tracts into social areas based on index scores (Shevky and Williams 1949, 72).

Relying upon economic conclusions written by Colin Clark (1940), Shevky and Williams investigated important economic trends that affect the social structure of society and devised indexes of social rank, urbanization and segregation. The social rank index was composed of three variables: occupational status, educational status and rent. Urbanization was represented by the three variables of fertility, the proportion of women in the labor force, and the physical characteristics of neighborhoods. Segregation was composed of one item, "the number of persons in highly isolated population groups in relation to the total population" (Shevky and Williams 1949, 35). This original research

spawned a series of papers that presented and revised the operational techniques and theory of social area analysis (Bell 1958; Van Arsdol, Camilleri, and Schmid, October 1958; McElrath 1965; McElrath 1968). Empirical testing of the social area analysis model was initiated by Bell (1955). Bell used factor analysis to assess the validity of Shevky-Williams constructs on the two cities of Los Angeles and San Francisco. Both cities were found to validate the social area analysis typology (Bell 1955, 52).

Hawley and Duncan (1957) claimed that Shevky and Bell provided no justification for relating social differentiation to spatial differentiation at the census tract level, and they criticized the theoretical validity of developing social area analysis constructs and the techniques of dimensioning the constructs themselves. Hawley and Duncan stated:

> Shevky and Bell make much of their efforts at "construct formation" (efforts, incidentally, that look like ex post facto rationalization for their choice of indexes) and their development of a "theoretical orientation." But one searches in vain among these materials for a statement explaining why residential areas should differ one from the other or be internally homogeneous. (Hawley and Duncan 1957, 339-340).

An extension of Bell's factor analysis test was conducted by Van Arsdol, Jr., Camilleri and Schmid (June, 1958), who measured ten medium-sized cities, six of which conformed to the Shevky-Williams model. In the four cities that did not conform, it was observed that variation in the internal structure of the social rank, urbanization, and segregation factors could be traced to different social environments in the cities (Van Arsdol, Camilleri, and Schmid, June 1958, 283). The

inability of the social area analysis model to predict the social dimensions of four of the ten cities indicated that preselection of social constructs was not a desirable aspect of the model. Since empirical testing of Shevky constructs utilized factor analysis to isolate patterns among many socio-economic variables, it was a logical extension to use factor analysis on many variables instead of Shevky's preselected constructs. The result has been an evolution from the original social area analysis assumptions into factorial ecology where socio-economic characteristics are selected by factor analysis (Ottensmann , 1975, 111). Nevertheless, empirical research using the factorial ecology refinement, such as Murdie's (1969) study of metropolitan Toronto, has generally isolated the three social area dimensions originally suggested by Shevky and Williams. According to Berry a correlation between the dimensions of the Shevky model and some of the classic spatial models can be observed:

> Moreover, it becomes increasingly evident that each of these dimensions captures the essential features of one of the classical spatial models: socioeconomic status (Hoyt); family status (Burgess); ethnic status and "segregation" studies (Firey). (Berry 1977, 123)

Contemporary Ecological Inquiry

The evolution of classical human ecology to contemporary ecological inquiry has been a transition where emphasis on competition has been replaced by a concern for interdependence. The redefinition of human ecology was initiated by the writings of Quinn (1939) and Hawley

(1944). The function of interdependence in the human community was established by Hawley (1950). Ecological research was presented as the study of the form and development of community structure, and the human community was viewed as the smallest social system in which all properties of society are found. Community structure was a system of functional interdependencies that is a result of collective adaptation of a population to its environment (Hawley 1950, 206).

Ecological research is often macroscale in its approach. The collective participation of a population group incorporates the ecological assumption that social systems exist as entities and contain structural characteristics that can be examined separately from the individual characteristics of population members. The structure of organized activity is thus viewed as transcending the behavior of individuals, and can be analyzed without respect to individual roles. An empirical expression of this organizational structure is observable in bureaucracies and other associations where replacement of individuals by other persons of different characteristics does not disrupt the pattern of structured activity. Berry observed:

> The central problem of contemporary ecological inquiry is understanding how a population organizes itself in adapting to a constantly changing yet restricting environment. Adaptation is considered to be a collective phenomenon, resulting from the population developing a functionally integrated organization through the accumulative and frequently repetitive actions of large numbers of individuals. (Berry 1977, 12).

Residential Segregation Analysis

The examination of the spatial patterns of residential differentiation has been a principal focus of ecological research. According to Beshers (1962), several related corollaries characterize research on residential differentiation: (1) The definition of social structure requires that behavioral consequences govern the existence of social structure, (2) Residential location is the result of social structure, and (3) The socio-economic characteristics of a person determine his residential location. Beshers advocated the construction of urban maps to depict any regularities that may be revealed in the aggregate urban social structure (Beshers 1962, 88).

Researchers who undertake social area and multivariate analysis and residential segregation analysis perceive the same data from two different viewpoints. Social and multivariate analysts examine the ways in which component areas of the city differ with respect to socio-economic characteristics. Residential segregation analysts are concerned with the ways that various population groups are spatially distributed (Johnston, 1976, 196). Two approaches to explaining residential segregation have been pursued by researchers. One approach focuses on the socio-economic differentials between ethnic groups and the majority population (Lieberson and Fuguitt 1967; Duncan and Duncan 1968; Darrock and Marston 1971; Guest and Weed 1976; Massey 1979, 1981). This research suggests that for most ethnic populations, religious groups, and occupational groups, the urban residential differentiation that is observed is largely determined by the socio-economic and status

characteristics of the specific groups. Ecological theory presupposes that ethnic groups should be progressively less segregated in society as socio-economic advancement occurs. Park is usually cited as supplying the classic statement of the relationships between residential segregation and socio-economic characteristics.

> It is because social relations are so frequently and so inevitably correlated with spatial relations; because physical distances so frequently are, or seem to be, the indexes of social distances, that statistics have any significance whatever for sociology. (Park 1952, 8)

The residential distributions that fit the criteria of socio-economic advancement equals progressive integration, are referred to as reflecting the socio-economic or social class model of residential segregation analysis (Darrock and Marston 1971, 492).

The alternative to the social class model, the ethnic model, was established when ensuing research demonstrated that for Blacks, residential segregation was not significantly affected by differences in any socio-economic characteristic except ethnicity. In a Chicago study, Taeuber and Taeuber (1964) empirically tested the influence of ethnicity and other socio-economic characteristics on various minority populations. They observed that for immigrant groups in general, improving socio-economic status has historically resulted in a decrease in residential segregation. Increasing socio-economic status of the Black population has been paralleled by a unique corresponding increase in residential segregation (Taeuber and Taeuber 1964, 378). Subsequent to this study, Black ethnic status was distinguished from socio-economic status, and the ethnic model was utilized almost exclusively for Black

residential segregation (Taeuber 1968; Farley 1970; Kantrowitz 1973; Bleda 1978). The assumption basic to research studies employing the model is that Black ethnic groups are significantly different from other immigrant and ethnic groups in the origination, pattern and persistence of residential segregation.

Although the immigration and migration of Mexican-Americans has occurred under vastly different historical circumstances than Blacks, the ethnic model has been recently applied to the segregation of Mexican-Americans. Both Blacks and Mexican-Americans have become associated with residential segregation that is maintained at high levels despite increases in the status and economic variables that previously enabled European immigrants to move out of segregated residences (Ward 1982, 264). The experiences of Black and Mexican-American minorities has indicated that the constraints that initially confined minorities to selected areas of the city are still operating or have been replaced by other factors. One of the functions of research concerning residential segregation has been to ascertain empirically the relative changes in minority segregation and the correlation of that segregation to socio-economic variables. A demonstrated need in the pursuit of such research is the large-scale application of a segregation index that could accurately compare temporal data for many cities and depict trends in ethnic residential segregation.

CHAPTER II

METHODS OF ANALYSIS AND AREAL UNIT SELECTION

Development of Segregation Indices

Considerable controversy has developed since segregation indices were first applied to residential segregation analysis. Jahn, Schmid and Schrag (1947) produced the first comprehensive article dealing with the construction and application of segregation indices. They stated, "More than twenty logically sound and computationally feasible indexes have been formulated" (Jahn, Schmid, and Schrag 1947, 293), and presented four specific examples. However, the indexes were statistically very similar. This similarity was recognized by Hornseth (1947), who stated that the four indexes "are for practical purposes identical measures. The subtle distinctions between them have no correlates in the sociological problem of segregation." (Hornseth 1947, 604).

Jahn (1948) replied to Hornseth, suggesting that although the indexes were similar in construction, they were not simple functions of each other. He stated: "the comparative advantage of any one index over the others will depend largely upon the particular problem at hand" (Jahn 1948, 216). A criterion of prediction and reproducibility was

suggested as an aid in determining the proper index to apply to a particular set of data. Jahn (1950) followed these comments with an article describing how the criterion of reproducibility could be applied in the testing of a segregation index (1950, 101).

In a reply to both Jahn, Schmid, and Schrag (1947) and Hornseth (1947), Williams (1948) attempted to clarify and simplify the selection process of choosing a problem-specific segregation index. This reply analyzed the various published criteria of index selection, and with additions and deletions assembled the criteria into a comprehensive list. This list was applied to existing indexes to test the appropriateness of each statistic. Williams concluded that several indexes are equally appropriate, depending on the specific problem to be tested, but favored an index based on chi-square because it "is satisfactory with respect to comparability, generality, and under certain assumptions, sampling theory." (Williams 1948, 303)

Shevky and Williams (1949) introduced the isolation index, which measured the number of times that a group concentration was greater than the proportion of the group in the area population. Subsequently, several indexes were produced by various authors. Robinson (1950) used the binomial variable "eta," Cowgill and Cowgill (1951) presented an index adapted for use on block statistics, Duncan (1953) redefined the Gini index, and Bell (1954) revised the isolation index. Duncan and Duncan (1955) examined all the previously published indexes, summarized their components, and stated, "This paper shows all of these can be regarded as functions of a single geometrical construct,

the 'segregation curve.'" (1955, 210). The article described the mathematical relationships between indexes and the properties that made interpretation of each statistic difficult. Commenting upon a specific index "D," the index of dissimilarity, Duncan and Duncan stated:

> "for this universe of cities, there is little information in any of the indexes beyond that contained in the index D, and the nonwhite population, q." (Duncan and Duncan, 1955, 214)

This article demonstrated the relative superiority of the index of dissimilarity over previously published indexes in terms of accuracy and application. Subsequently, the index of dissimilarity was popularized by Taueber and Taueber (1965) and in later studies.

Although the index of dissimilarity is generally considered the most useful measurement statistic of residential segregation, difficulties with inherent assumptions and inadequacies were recognized, and some early attempts were made to correct the measure by standardizing the index (Leasure and Sterns 1968). Cortese, Falk and Cohen (1976) published an article attacking the inferior attributes of the index of dissimilarity, and they suggested an improved "standard score" of the index. This article initiated a series of comments and criticisms dealing with the calculation and application of the index of dissimilarity and the techniques and utility of standardizing the index. Jakubs (1978) introduced a distance-based index that eliminated some of the objections to areal indexes and added a spatial perspective to the measurement of residential segregation. Morgan (March 1983) introduced a modified distance-based index that attempts to standardize the geographical shapes of minority areas.

Factors Affecting Index Selection

The difficulty in producing a satisfactory index of segregation is contained in the problem of creating a real world solution to theoretical assumptions and ideals. Ideally, an index to measure segregation should be a statistic that (1) could be applied to any size city with varying numbers, sizes, and populations of areal units; (2) would not be susceptible to variations caused by differences in city populations, percentage of minorities, or numbers of minorities; (3) could be utilized to compare the degree of segregation that exists between cities and over time periods; and (4) would be relatively easy to calculate with the results readily interpretable.

Three indexes were researched for potential use as the index of segregation for this study: the index of dissimilarity (Duncan and Duncan 1955); the standardized index of dissimilarity (Cortese, Falk, and Cohen 1976); and the distance based index (Jakubs 1978). Each was examined for accuracy and appropriateness, and each was compared to the ideal index criteria for usefulness of application.

The Index of Dissimilarity

The index of dissimilarity is the best known and most utilized segregation index. Often referred to as the "Taueber Index" or "Duncan

Index," this measure is defined by the following formula:

$$D = \frac{1}{2} \Sigma \left| \frac{M_i}{M} - \frac{N_i}{N} \right| \qquad (1)$$

where:

D = Index of Dissimilarity

M_i = Minority population in any tract i

M = total minority population in the city

N_i = non-minority population in any tract i

N = total non-minority population in the city

As introduced by Jahn (1947), the index originally had a range of 0 to 1, but it is often multipled by 100 to extend the range from 0 to 100.

Among the attributes of D are that: (1) it is easy to calculate, (2) it has a definite range of 0 to 1, (3) it is dimensionless, (4) it is easy to comprehend, and (5) it is clear in application. The disadvantages of D reside in the interpretation of the index when applied to cities with varying population and areal unit characterisitcs. The most frequent objections are that it: (1) is based on a concept of evenness as opposed to randomness; (2) is affected by differences in the proportion of minorities in a city, the population size of areal units, and the numbers of areal units; and (3) contains misleading assumptions because the calculation of the index involves measuring the number of minorities that must be relocated to achieve zero level segregation.

The index of dissimilarity is a point pattern index embracing two concepts: (1) The zero level of segregation, where the percentage of minority population contained in each areal unit is equal; and (2) The maximally-segregated pattern, where each areal unit is occupied exclusively by either the minority or nonminority population group. Given a population distribution within a set of areal units, to achieve zero level segregation it would be necessary to relocate minority populations from over-represented to under-represented areas. The number of population relocations are tabulated for the segregation level to achieve zero. In a similar manner population relocations are measured to achieve zero level segregation from the contrived maximally segregated pattern. The ratio of these two measurements creates the index of dissimilarity (Jakubs 1978, 2).

Several objections to "D" reside in these two concepts. If segregation in a city is to be measured as zero, it is necessary for the minority to be evenly distributed among the areal units. If the absence of segregation is defined as:

> whether a person was Negro or white made no difference in his choice of residence, and that his race was not related to any other factors affecting residential location (for instance, income level) (Taueber and Taueber 1965, 29).

then one would logically conclude that a <u>random</u> pattern would result from the absence of segregation. Under an assumption of randomness, it is possible for a minority population to occupy one or more areal units exclusively. Since the index of dissimilarity does not recognize any pattern as zero-level segregation if it deviates from an even one, the

index will not accurately depict the level of segregation for an area where segregation is a result of random occurrence (Winship 1977, 1062).

Additional criticisms have been directed at the process by which population relocations are conducted to achieve zero-level segregation (Zelder 1970b; Cortese, Falk, Cohen 1976; Winship 1977). One population group is usually held constant, while the other is moved from over-represented to under-represented areal units. The movement was often viewed as a problem because replacement of the relocated minority was not considered appropriately. Jakubs (1979) has disproven some of these criticisms by demonstrating that "D" is unaffected whether movement is defined as a one-way relocation of a single group, or a locational exchange between two groups (1979, 317).

Perhaps the most serious objection to the use of D is its susceptibility to different levels of aggregation, and its variation when measuring cities with different proportions of minorities. Concerning aggregation, there are two apparent extremes of measurement. One extreme occurs when only one person is allocated to each areal unit, and the opposite occurs when all persons reside in a single areal unit. The index of dissimilarity would consider the first extreme as the maximally segregated pattern with a value of 1, and the second as zero-level segregation. Points between the two extremes would represent different aggregation levels, and would record different values along a continuum between the two extreme ranges of the index.

The consequences of measuring two groups of data with differing levels of aggregation would cause the index of dissimilarity to record a higher segregation value for the data base with the larger number of areal units. Tests on real data aggregated from small to large areal units have verified the bias associated with the difficulty of scale. Woods(1976) found that although "D" increased substantially after aggregation, the increases were not linear or predictable, and the relative rankings of indices would change from one aggregation level to the next (1976, 172).

Duncan and Duncan (1955), in the article that established the index of dissimilarity, recognized that the proportion of minorities in a city affected the accuracy of "D" when the numbers of minorities were relatively small and the number of areal units relatively large. They stated a concern for the influence of the percent minority (q), its relationship to the segregation curve, and the lack of a criterion to judge the variations in indexes. "Lacking such a criterion it is perhaps doubtful whether a meaningful comparison can be made of the degrees of segregation of two cities with greatly different q's" (Duncan and Duncan 1955, 216).

Cortese, Falk, and Cohen (1976) produced a table of values demonstrating that low minority proportions, compounded by small populations per areal unit, can produce drastic inaccuracies in "D" (1976, 632). Morgan (1982; March 1983) and Johnston (1981) evaluated the compositional effects of minority proportions and the instability of population distributions upon D. Morgan concluded:

> "D is generally sensitive to changes in population composition. By extension, cross-sectional comparisons of D over a set of cities are also bedevilled by compositional effects since the degree of segregation at time(tn) is a function of the degree of differentiation(tn-1) and the type of residential succession associated with compositional change...researchers must be very cautious in interpreting the results of analyses employing D (Morgan, March 1983, 388).

Other articles have been more critical of the accumulative inaccuracies of "D."

> "The suggestion that the "t" index (really the Taeubers' index) has a 'ready reasonableness, and ease of measure' and is 'unambiguous' does not constitute an impressive set of arguments. Whatever the apparent reasonableness and lack of ambiguity, the Taeuber index is defective and does not even correspond to its verbal description." (Zelder 1972, 151).

> "recent controversy has revolved around misuses of D, the affects of which are more extreme than previously believed." (Falk, Cortese, and Cohen 1978, 713).

> "the index of dissimilarity has faults that are irreparable and which made it unusable as a measure of segregation." (Winship 1978, 717)

The difficulties surrounding the index of dissimilarity are probably not so much a result of the original formulations and assumptions of the index. Rather, the use of D has grown beyond the utility for which it was originally intended.

Standardized Indexes of Segregation

Several indices have been proposed by various authors attempting to solve the inaccuracies of the index of dissimilarity (Leasure and Sterns 1968; Zelder 1970a; Zelder 1970b; Reiner 1972; Cortese, Falk, and Cohen 1976; Winship 1977). Of the indexes that were

applicable to this research, the standardized index of dissimilarity (Cortese, Falk, and Cohen 1976) appeared most promising.

The concept of randomness was substituted for evenness, and a standard score of D was produced as an improved measure of segregation. The standard score "Z" was defined as:

$$Z = \frac{D - \mu D}{\sigma D} \qquad (2)$$

where:

Z = standard score of D

D = index of dissimilarity

μD = the expected value of D

σD = the variance of D

The formula to derive Z was attained by using the hypergeometric probability distribution to select random residents from the areal units of the city. However, even with high-speed computers the calculation of hypergeometric probabilities for persons in a city of over 50,000 population is not realistically possible. It was suggested that when both populations and numbers of areal units were both large, the binomial or normal probability distributions could be substituted for the hypergeometric (Cortese, Falk, and Cohen 1976, 637). However, tests on real data demonstrated that when the index was approximated by the normal distribution, it was unable to accurately measure the census tracts that contained small numbers of minorities.

Distance Based Index

The need for an index that incorporates the spatial pattern of cities has been recognized in segregation research. Duncan and Duncan were concerned about scattered clusters of nonwhite population that would not be differentiated from the major cluster when using point pattern indexes.

> "whatever variables of ecological organization and change are related to the degree of segregation must also be affected by the spatial pattern of segregation." (Duncan and Duncan 1955, 215)

Jakubs (1978) presented a spatial segregation index that incorporates distance directly into the measurement of segregation. Jakubs contends that the assessment of segregation in point patterns is inherently spatial, but previous solutions to measurement were nonspatial (Jakubs 1978, 1).

Jakubs' distance-based index is conceptually similar to the index of dissimilarity. The basic difference is how the relocation of persons is measured to achieve a zero-level of segregation. Where D accumulated the number of persons to be relocated, the distance-based index defines relocation in terms of the minimum aggregate distance each person must move to complete a zero-level segregation pattern (Jakubs 1978, 5).

Areal units with an over-representation of white population are defined as:

$$O_i = W_i - T_i\ (W/T) \tag{3}$$

where:

O_i = areal unit i with an overrepresentation of whites

W_i = white population of unit i

T_i = total population of unit i

W = white population of the city

T = total population of the city

Areal units with an under-representation of white population are defined as:

$$U_j = T_j\ (W/T) - W_j \tag{4}$$

where:

U_j = areal unit j with an under-representation of white population

To achieve zero-level segregation, the white population must be relocated from over-represented units (O_i) to under-represented units (U_j), moving the minimum possible distance. The minimum effort of movement is defined by:

$$Z = \sum_i \sum_j X_{ij}\ C_{ij} \tag{5}$$

where:

Z = minimum aggregate distance

X_{ij} = number of white persons moving from unit i to j

C_{ij} = distance from unit i to j (cost in person-miles)

subject to:

$$\sum_i X_{ij} = U_j \text{ for all j areal units} \quad (6)$$

$$\sum_j X_{ij} = O_i \text{ for all i areal units} \quad (7)$$

$$X_{ij} \geq 0 \text{ for all unit pairs (Jakubs 1978, 6)} \quad (8)$$

These formulations represent the transportation problem of linear programming. Minority relocation is the same as for the white population except in the reverse direction. "Z" is calculated for the actual population distribution and for the maximally-segregated distribution, and the distance-based index (DBI) is defined as the ratio of the actual and maximized distance calculations. Thus,

$$DBI = \frac{Z}{Z'} \quad (9)$$

where:

Z' = minimum aggregate distances required to change the maximal segregation pattern to zero-level segregation.

Z = minimum aggregate distances required to change the actual settlement pattern to zero-level segregation.

The process of identifying the maximally segregated pattern is considerably more complex for the distance-based index than for the index of dissimilarity. The two areal units that are farthest apart are

initially selected as the core units for white or minority relocation. These areas are filled with the appropriate populations until the unit capacity is reached. Adjacent tracts are then selected and the process is repeated until all units have been selected. The result renders the city in a completely segregated pattern, with one portion of the city being exclusively occupied by minorities and the opposite remaining portion being occupied exclusively by whites (Jakubs 1978, 9).

Three problems confront the use of the distance-based segregation index: (1) level of aggregation or scale, (2) proportion of minorities in the city, and (3) shape and size of the city being studied. The problem of level of aggregation is adequately dealt with by two opposing statistical tendencies. This can be observed by considering a group of 100 areal units. If the units are aggregated to only twenty-five areal units, the smaller number of units would decrease the index, while the distance of each move would become greater, thus increasing the index. Although these opposing effects are not statistically equal, the result is an index less susceptible to changing levels of aggregation (Jakubs 1978, 10).

Some variation in the distance-based index is caused by differences in the proportion minority and by differences in the size and shape of the geographic region. Analysis of test data demonstrates that variations do occur, but the variation is small and decreases as the population size of the areal unit becomes large (Jakubs 1981, 134). For this particular study, which uses compact, contiguous urbanized areas, and has on the average large census-tract populations, the

variation in index values caused by differences in proportion of minority or by differences in the size or shape of the geographic region were considered insignificant.

Statistical Measures and Methods Used in the Analysis of Data

There were three indexes of segregation originally considered for inclusion in this research: the index of dissimilarity; the standardized index of dissimilarity; and the distance-based index. The distance-based index was found to have the widest potential application and the highest utility. This index is selected as the primary measure of segregation and is correlated with other tabulated variables. The index of dissimilarity is included as a secondary measure because of its historical popularity and as a comparison value. The standardized index of dissimilarity was rejected because of the inherent inaccuracies when measuring cities containing small minority populations in the areal units.

A second level of analysis is exploratory. A matrix of simple correlations (Pearson r) was calculated on all possible combinations of segregation indexes and a set of socio-economic variables. Variables exhibiting high correlations were selected for additional examination and analysis. Those variables exhibiting low correlation values were discarded.

The third level of analysis involves multiple-regression analysis. Input for this analysis will consist of variables selected by the exploratory analysis of simple correlation. Functionally, multiple-

regression will be utilized to determine the degree that independent variables, individually and together, can predict residential segregation.

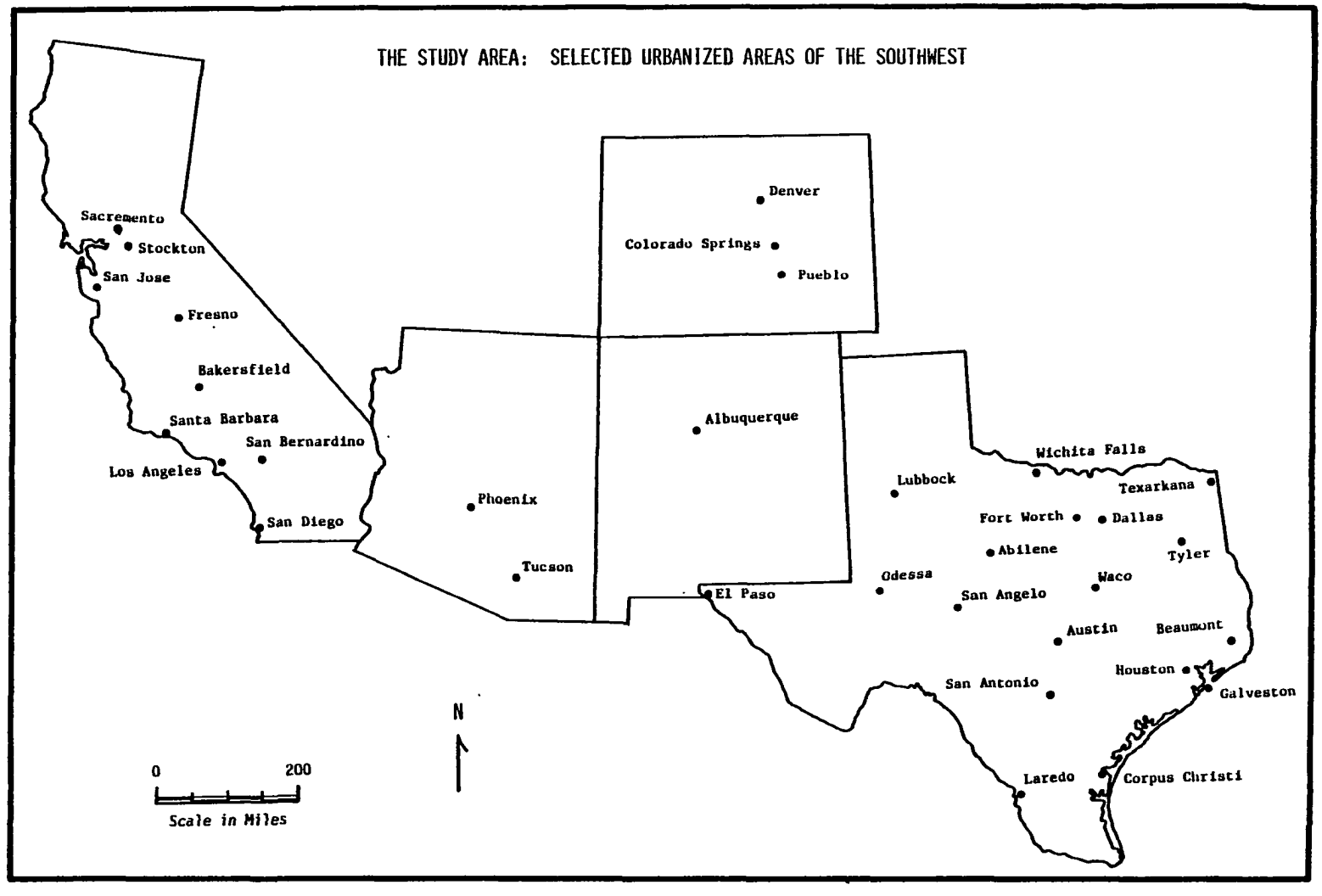
Areas for Analysis

Thirty-four urbanized areas within the states of Arizona, California, Colorado, New Mexico, and Texas were chosen for analysis (Figure 1).

These areas were selected for investigation because: (1) they contain both Black and Mexican-American minority populations; (2) the Southwest is a rapidly expanding area of industrial and population growth; and (3) significant in-migration into the region by Blacks, Mexican-Americans and whites has occurred.

Urbanized areas were chosen instead of corporate city boundaries or Standard Metropolitan Statistical Areas because fewer computational or analytical problems were encountered. Corporate city boundaries seldom coincide with the residential areas of a city. Standard Metropolitian Statistical Areas by definition include the county area in which the city is located, and thus exhibit frequent overbounding. Since the residential segregation of minority groups investigated in this research focuses upon urban segregation, overbounding of population areas has the potential of inducing measurement inaccuracies.

Figure 1


THE STUDY AREA: SELECTED URBANIZED AREAS OF THE SOUTHWEST
Denver
Colorado Springs
Pueblo
Sacramento
Stockton
San Jose
Fresno
Bakersfield
Santa Barbara
San Bernardino
Los Angeles
San Diego
Albuquerque
Phoenix
Tucson
El Paso
Wichita Falls
Lubbock
Texarkana
Fort Worth
Dallas
Abilene
Tyler
Odessa
Waco
San Angelo
Austin
Beaumont
Houston
Galveston
San Antonio
Laredo
Corpus Christi
N
0
200
Scale in Miles

The urbanized areas were initially defined according to the section of the Census of Population definition that specifies that areas containing a population density of 1000 persons per square mile or more were to be included in urbanized areas (U.S. Bureau of the Census 1960, Vol. 1, Part 1, p. xxvi). The urbanized area boundary is usually synonymous with tracted areas that change rapidly from small tracts to large tracts. The selected tract area was then modified by adding or deleting adjacent tracts until a compact contiguous area was delimited.

After the selection process was completed, San Francisco and Los Angeles were observed to be anomalies, compared to other cities in the study area. Each has large areas of low density population in large census tracts separating high density small tract areas. In San Francisco, San Francisco Bay is devoid of population. It separates the urbanized area, and it is a dominant physical barrier. Large census tracts and low population densities in Los Angeles occur as hills and ridges that traverse the urbanized areas of the city. For these two cities, it was necessary to reduce the expanse of the urbanized area by eliminating outlying urban fringe areas to form a contiguous urbanized core.

Complete data and relatively stable areas permitted the use of two census dates, 1960 and 1970. Data prior to 1960 are not readily available, since few cities in the Southwest were included as Standard Metropolitan Statistical Areas, and they were not subdivided by tracts.

Data for 1980 are not yet available in all the areas necessary for calculations to be completed.

Factors Affecting the Analysis of Areal Units

The selection of the areal unit as the smallest increment for measurement has several effects on the interpretation and calculation of statistical results. At a particular level of aggregation, the areal unit functions not only as a collection of data at a specific statistical level, but also as a member of a set of similar areal units. Comparisons of areal units involve ideals where each unit has uniquely defined boundaries which are established independent of the conclusions of the researcher. If areal unit boundaries meet this criterion, it may be assumed that a comparison of areal unit statistics is meaningful and relatively unambiguous. If a comparison of areal unit data over a time span is desired, then it is optimal that the boundaries of the areal units do not change radically over that span (Duncan, Cuzzort and Duncan 1961, 50).

When considering areal units as portions of a city, the units are statistically regarded as homogeneous bounded portions of the whole. The larger the areal unit is in relation to the whole area, the less homogeneous the unit. The measurement potential of each areal unit is a function of the distribution of the data throughout the total area and the position of any specific unit within that area. According to Timms:

> The criterion of homogeneity is not that all of the people inhabiting a given area be the same, but that the

> probability of their being of a particular characteristic should be alike in all parts of the area. (Timms 1971, 42)

The difficulties of analyzing areal distributions independent of the bias generated by imposed subdivisions were recognized by Wright (1937). The coarseness or fineness of the grid boundaries and the regularity or irregularity of areal unit sizes all affect statistical results. Wright concluded that although approximate areal coefficients have been developed that utilize area unit data, definitive areal coefficients must involve the measurement of distance (Wright 1937, 205). Obviously the best solution, but rarely a practical one, is to design the areal subdivisions so that they correspond precisely to the statistical calculations involved.

Areal Unit Selection

Most research involving residential segregation selects one of two areal unit levels, census tracts or census blocks. Considerable discussion concerning the relative advantages or disadvantages of tracts versus blocks has occurred. Most of the discord has arisen when statistical indices will vary according to the coarseness or fineness of the data grid (Cowgill and Cowgill 1951; Duncan and Duncan 1955; Bell 1954). For the purposes of this investigation, census tracts were considered more advantageous than census blocks. This decision was based on three problems confronting the use of census blocks but absent in census tracts. The first problem pertains to the availability of census data. Census blocks for 1960 report only statistics for whites and nonwhites. Blacks are included as a portion of nonwhites. Census

tracts for 1960 report individual race statistics for whites, Blacks, and other races, and the summing of the latter two equals the nonwhite category of census blocks. In most urbanized areas the small number of foreign population included in nonwhites would not significantly diminish the accuracy of the data. However, this research includes the urbanized areas of California, which contain large numbers of foreign populations. The potential inaccuracies that could result from using the nonwhite population category in the primary data base was considered undesirable.

The second problem was the lack of a readily obtainable x-y coordinate system for census blocks. Such a system was already established for most 1960 and 1970 tracts. The greater numbers of census blocks would have increased the difficulty of establishing such a system.

The third problem concerns the large numbers of blocks contained in the largest cities. The statistical techniques involved require the use of high-speed computers for data manipulation and calculation. The time involved in the calculation of index values increased exponentially as the number of area units increased, and practical time constraints limited the number of areal units to less than one thousand. Although large cities could probably be divided into sections or reduced to urban cores, the availability of census tracts was a more desirable option.

Close observation of tract data reveal that tract populations, even in urbanized city centers, range from 1,000 to more than 10,000. The lack of uniformity can be attributed to differences in urban population densities, land use, economics, city growth, topography, and political decision-making. The local administrative decisions delimiting tract boundaries reflect the importance of various combinations of socio-economic and physical characteristics of the city. At boundary margins, where similar land uses exist on either side of the dividing line, there may occur overlapping of census tract areas. Problems of overlapping areas have influenced administrative decision-makers to align tract boundaries with physical barriers and other highly visible urban features (U. S. Bureau of the Census, Census Tract Manual 1966, 33). This assists the census taker in recognizing ground level boundaries and the extent of his territory, but compounds the problems of homogeneity (Myers 1954; Mabry 1958; and Form 1954).

A concern of Cowgill and Cowgill (1951) was that census tract boundaries can enclose or divide ethnic population groups, thus affecting statistical summaries. This concern is substantiated when tracts are delimited initially. Although tract boundaries that are aligned with severe physical barriers are sometimes denoted as containing ethnic populations, neighborhoods migrate, expand and contract without regard to census tract boundaries. If census tract boundaries are maintained, then sequential studies at later time periods should eliminate or reduce this concern.

Difficulties are encountered in the changing, adding to, and splitting up of census tracts from one census year to the next. In some cases it is possible through census information to reconstruct tracts to maintain consistency, but in some cities specific tracts cannot be reconstructed because of complex changes that have occurred between census years.

The problems associated with homogeneity may well be overstated; the usage and purpose of the final comparisons are fully as important. If the statistics to be generated from tract data are means or proportions, then the minimization of within-area variance is statistically important. However, if correlations are to be produced between tract variables, then minimization of between-area co-variance would be optimum. An analysis of data that is aggregated from tract level reports would be independent of within-area variation (Timms 1971, 41).

CHAPTER III

POPULATION COMPOSITION OF SOUTHWESTERN CITIES

Mexican-Americans, along with American Indians, occupy a unique position as compared to that of other minorities in the United States. They were established in settlements prior to the arrival of Anglo-European stock. The migration of Mexican-Americans to the Southwest is a movement that began in the seventeenth century, and continues to the present time. With the exception of eastern Texas, Blacks have only recently migrated to the Southwest. The differences in the residential distribution of Blacks and Mexican-Americans is partly a function of the migration histories of the two groups, cultural differences, and how the original dispersals have influenced recent migrations.

Historical Perspectives

Three periods of population movement characterize the Spanish-speaking minority. The first period includes Spanish migration prior to the Treaty of Guadalupe Hidalgo in 1848. At the end of this period it is estimated that 80,000 Spanish-speaking persons resided in the present-day southwestern states: 56,000 in New Mexico and Colorado, 9,000 in California, 14,000 in Texas, and 1,000 in Arizona (Nostrand 1975, 384; McWilliams 1971, 50). These residents became United States citizens by conquest as opposed to immigration.

The Mexican Revolution which began in 1909 initiated the second wave of migration. During this preiod, the "push" factors included: (1) the conflict of the Revolution; (2) an expanding Mexican population; and (3) the lack of economic opportunity in Mexico. With the advent of World War I, the "push" factors of Mexican political and economic instability were reinforced by the "pull" of emergency American labor demands. Domestic labor shortages opened up employment in agriculture, railroad maintenance, and mining. The increase in Mexican migration in the 1920s occurred when immigration from other sources was declining. During the period 1925-1929 Mexicans accounted for sixteen percent of all immigrants. In 1928, Mexican immigration declined abruptly as economic conditions in the United States deteriorated.

During World War II Mexican immigration was comparatively low. Despite plentiful jobs, substantial numbers of Mexicans were not attracted to the United States because of the increased prosperity in Mexico and the possibility of being drafted into the United States armed forces. By 1950, growing disparity in economic conditions between the United States and Mexico initiated the last wave of migration. This wave has accelerated through the 1960s and continues to the present time.

The relationship between the historical migration of Mexican-Americans and residential segregation is associated with the chronologically different waves of immigration the distinctive cultural identities that accompanied those waves, and the later urbanization process in the Southwest. The early settlements by Mexicans were

organized around "plaza" areas which served cultural and economic functions for the residents. Later waves of Mexican immigrants were often considered inferior by the already-established Spanish-Americans and were economically and culturally distinct. The greater the geographical distance from the United-States-Mexico border, the greater the likelihood of encountering cultural differences. Pronounced differences resulted in the establishment of separate residential areas for incoming migrants and in residential segregation between the Spanish-speaking groups (Moore and Mittleback 1966, 17). Mexican labor camps represent another type of residential area associated with Mexican-Americans. These districts were formerly semi-permanent housing areas designed to accommodate seasonal migrant laborers. The areas were usually located outside urban areas, and some eventually evolved into permanent housing areas.

As urbanization of the Southwest expanded rapidly in the 1960s, former "plaza" areas, economically-depressed Mexican-American ghettos, historical upper class Spanish neighborhoods, and former agricultural labor camps all were absorbed by the expansion of urban growth. Urbanized areas that contain various historical "pockets" of Mexican-American concentrations would normally be expected to display lower residential segregation values as a result of a more dispersed pattern of settlement.

The migration of Blacks contrasts sharply with the migration of Mexican-Americans. The first Blacks migrating to the Southwest were imported as slaves into eastern Texas in the early 1800s to work as

agricultural field hands in the westward expansion of the cotton belt. Blacks have migrated to the remainder of the Southwest primarily since the 1930s. Economic and social depression in the South provided "push" factors, and Blacks perceived that better conditions were available in areas outside the South. Black migrants to Pacific coast cities defined a major migration stream by the 1940s. Blacks moved to the West primarily from the trans-Mississippi South and population was drawn from Texas, Louisiana, and to a lesser extent Arkansas and Oklahoma.

Considerable Black migration to the Southwest occurred in the 1940's. The "push" factors of southern economic and social conditions were reinforced by the "pull" factors of wartime employment needs in defense industries. Immigration from overseas countries was limited by the war, and migrant labor from Mexico was not attracted in large numbers. The perceived opportunities for socio-economic advancement attracted Blacks to the West in increasing numbers, and gains in Black employment in defense industries showed significant increases by 1944. Yearly increases of one hundred to two hundred percent occurred in the Black population of several West Coast cities during the war years, but most of the Black population in the West was concentrated in San Francisco and Los Angeles (Johnson and Campbell 1981, 104). As a result of the intense migration of the 1940s, the Black population reached significant numbers in the Southwest. However, Blacks still constituted less than four percent of the population of the Southwest, far less than the proportions of other regions.

During the decades of the 1950s and 1960s, the urban areas of the Southwest attracted the largest proportion of Blacks in the United States. Blacks became highly urbanized as a result of migration from rural areas of the South to the interior of large urban areas. The recent but intensive migration of Blacks has contributed to the high density of Black population areas. Unlike Mexican-Americans, Blacks migrated despite despression years, job availability, or housing availability. The early intense movement plus high continuing migration have prevented increasing economic prosperity from affecting more than a small proportion of the Black population. In some areas not enough time has elapsed for economic prosperity to affect the residential distribution of Blacks. In others, continuing economic disparity between whites and Blacks will generally prevent Blacks from attaining the residential mobility of whites.

The historical migrations of Blacks have implications for residential segregation. Theories of population growth and residential change suggests several possible occurrances for the redistribution of minority residences. The theory most applicable to the Southwest concerns migration patterns where minorities are migrating into the city center in large numbers, and whites are relocating to suburbs on the periphery of the city. The lack of economic choice usually forces migrating minorities to occupy the poorest housing in an urban area. Continuing in-migration of population increases the density of persons in the poor housing areas until housing pressure reaches a threshold point. Residential invasion and succession then occurs where the

population in the core area begins to expand into bordering neighborhoods as housing becomes available (Taueber and Taueber 1965, 123).

This situation did occur in the study area in specific cities, but it was dependent upon the absolute numerical in-migration of Blacks and the size of the Black core area. Exceptions to a generalized model of succession were numerous. The catalyst that initiated residential succession was in-migration. If the Black core area was able to absorb the incoming population, then succession was low. Conversely, if in-migration was high and the core area relatively small then residential invasion or succession became evident in several tracts. The exceptions were that invasion and succession in one or more tracts adjacent to the Black core area occurred in some cities even where small net in-migration or net out-migration occurred.

The effects of Black migration upon residential segregation are less in most cities than would normally be expected for other minorities. Decreases in an index of residential segregation are dependent upon the mixing of Black and other residences within census tracts and the scattering of tracts that are exclusively Black throughout the city. The maintenance of predominantly all-Black housing areas by residential succession regardless of the amount of expansion limits residential mixing and helps to maintain residential differences.

Changes in Population Compostition 1960-1970

The thirty-four urbanized areas comprising the study area exhibited a wide range of differences in the absolute and relative

population compositions of minorities. Total populations in the southwestern urbanized areas for 1960 varied from 50,000 to over one million persons, with individual minority populations ranging from approximately 100 to over 200,000 (Table 1). In 1970, urbanized area populations showed substantial gains in minority populations and total population for most cities (Table 2). Urbanized areas that had large proportions of a particular population group in 1960 usually had attracted large net increases of that group by 1970.

Conversely, if a group was not well represented in an urbanized area, the area usually recorded small increases for the decade or net out-migration. These continuing trends indicate that the factors that attracted or repelled particular groups prior to the 1960s continued to operate during the 1960s.

Seven of the urbanized areas in the study area exhibited absolute declines in total population from 1960 to 1970 (Table 3). All of these are smaller Texas cities, which as a group demonstrated nontypical patterns of population composition and migration. Within these areas the principal causes of population loss were the out-migration of whites and low in-migration of Mexican-Americans. The net out-migration of Blacks was often associated with smaller Texas urbanized areas, but such declines were too small to be significant in determining overall city loss.

Small Texas cities contained all of the extremes of population composition in the Southwest. Laredo reported the smallest Black

TABLE 1

POPULATION COMPOSITIONS FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960

City	White	Black	Mexican-American	Total
Abilene	74,664	4,122	4,254	83,166
Albuquerque	159,147	4,370	56,589	222,562
Austin	129,447	22,826	21,709	174,298
Bakersfield	76,193	11,010	11,064	99,142
Beaumont	82,313	34,883	1,858	119,175
Colorado Springs	90,008	3,202	4,444	98,122
Corpus Christi	98,504	9,156	59,859	167,690
Dallas	602,165	129,835	30,390	764,503
Denver	564,356	30,738	47,094	647,888
El Paso	143,518	5,944	125,745	276,687
Fort Worth	331,760	56,384	17,011	405,701
Fresno	157,078	14,119	20,474	193,529
Galveston	40,220	18,227	7,969	66,566
Houston	488,616	176,438	59,573	726,953
Laredo	10,607	157	49,803	60,632
Los Angeles	946,975	248,052	102,324	1,360,235
Lubbock	106,621	10,287	11,643	128,691
Odessa	74,489	4,793	6,250	85,588
Phoenix	327,076	12,131	32,601	376,060
Pueblo	69,964	2,098	17,642	90,026
Sacramento	174,997	13,387	17,328	218,724
San Angelo	45,873	2,929	8,173	57,049
San Antonio	329,174	42,951	244,986	618,944
San Bernardino	96,523	8,821	24,636	131,616
San Diego	516,811	34,217	41,308	602,245
San Francisco	593,355	74,506	54,402	784,155
San Jose	328,182	2,580	54,090	394,207
Santa Barbara	52,849	1,523	8,928	64,348
Stockton	83,151	10,204	16,374	121,379
Texarkana	36,523	13,238	218	50,006
Tucson	167,730	6,688	39,889	217,156
Tyler	40,357	13,032	360	53,779
Waco	91,796	19,461	6,347	117,763
Wichita Falls	84,201	7,791	3,122	95,348

Source: U. S. Bureau of the Census, 1960.

TABLE 2

POPULATION COMPOSITION OF SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1970

City	White	Black	Mexican-American	Total
Abilene	67,694	3,823	7,783	79,503
Albuquerque	165,733	6,497	108,959	285,795
Austin	155,621	28,872	37,921	223,332
Bakersfield	119,851	14,325	25,258	161,394
Beaumont	45,951	33,561	2,946	82,588
Colorado Springs	127,003	7,187	13,870	149,640
Corpus Christi	91,641	10,013	80,392	182,641
Dallas	832,048	209,315	80,374	1,129,757
Denver	648,066	48,516	104,383	811,687
El Paso	124,765	7,439	184,873	319,491
Fort Worth	393,969	78,091	36,953	510,984
Fresno	183,356	17,839	46,887	254,242
Galveston	22,298	16,369	8,973	48,108
Houston	957,145	338,981	170,936	1,477,210
Laredo	6,291	121	58,930	65,341
Los Angeles	737,621	369,976	220,703	1,419,589
Lubbock	122,491	7,527	26,616	161,267
Odessa	61,893	4,537	11,535	78,136
Phoenix	613,297	28,381	99,379	752,683
Pueblo	66,266	1,976	30,361	98,860
Sacramento	457,383	33,061	52,567	566,878
San Angelo	40,169	2,628	10,497	53,440
San Antonio	314,418	53,038	347,207	720,057
San Bernardino	88,399	13,072	34,593	139,458
San Diego	733,319	53,396	119,305	934,564
San Francisco	592,531	106,262	137,386	947,061
San Jose	631,663	13,070	151,456	829,499
Santa Barbara	82,991	1,445	15,525	102,657
Stockton	95,814	14,218	31,834	154,505
Texarkana	39,715	14,503	516	54,843
Tucson	209,733	8,502	65,138	287,653
Tyler	40,589	14,100	1,380	56,166
Waco	83,153	20,149	9,541	113,113
Wichita Falls	68,418	7,065	5,513	81,392

Source: U. S. Bureau of the Census, 1970.

TABLE 3

CHANGE IN POPULATION COMPOSITION OF SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 - 1970

City	White	Black	Mexican-American	Total
Abilene	-6,970	-299	3,529	-3,663
Albuquerque	6,586	2,127	52,370	63,233
Austin	26,174	6,046	16,212	49,034
Bakersfield	43,658	3,315	14,194	62,252
Beaumont	-36,362	-1,322	1,088	-36,587
Colorado Springs	36,995	3,985	9,426	51,518
Corpus Christi	-6,863	857	20,533	14,951
Dallas	229,883	79,480	49,984	365,254
Denver	83,710	17,778	57,289	163,799
El Paso	-18,753	1,495	59,128	42,804
Fort Worth	62,209	21,707	19,942	105,283
Fresno	26,278	3,720	26,413	60,713
Galveston	-17,922	-1,858	1,004	-18,458
Houston	468,529	162,543	111,363	750,257
Laredo	-4,316	-36	9,127	4,709
Los Angeles	-209,354	121,924	118,379	59,354
Lubbock	15,870	-2,760	14,973	32,576
Odessa	-12,596	-256	5,285	-7,452
Phoenix	286,221	16,250	66,778	376,623
Pueblo	-3,698	-122	12,719	8,834
Sacramento	282,386	19,674	35,239	348,154
San Angelo	-5,704	-301	2,324	-3,609
San Antonio	-14,756	10,087	102,221	101,113
San Bernardino	-8,124	4,251	9,957	7,842
San Diego	216,508	19,179	77,997	332,319
San Francisco	-824	31,756	82,984	162,906
San Jose	303,481	10,490	97,366	435,292
Santa Barbara	30,142	-78	6,597	38,309
Stockton	12,663	4,014	15,460	33,126
Texarkana	3,192	1,265	298	4,837
Tucson	42,003	1,814	25,249	70,497
Tyler	232	1,068	1,020	2,387
Waco	-8,643	688	3,194	-4,650
Wichita Falls	-15,783	-726	2,391	-13,956

Source: Author's calculations.

population (121), the lowest Black percentage (.07%), the smallest white population (6291), the lowest white percentage (9.6%), and the highest Mexican-American percentage (90.2%) (Table 4). Texarkana contained the smallest Mexican-American population (516) and the lowest Mexican-American percentage (0.9%). Abilene reported the highest white percentage (85.1%) and Beaumont the highest Black percentage (40.6%). The urbanized areas of Laredo and Texarkana exhibit the most atypical compositon patterns, since they are, for all practical purposes, composed of only two population groups. Any index of segregation is composed of the statistical contributions of each person in a city toward the compilation of small-range index number. As populations become smaller, the relative weight of contribution of each person increases. The small populations of Blacks in Laredo and Mexican-Americans in Texarkana make the location of each of these persons very important in the calculation of segregation indexes.

The differences in the population composition in small Texas cities may be attributed to the different ethnic groups that dominant various sections of the state and the lack of an even attractiveness of the cities. Each of the three groups is most heavily represented in a specific portion of the state: Blacks in the east, Mexican-Americans in the south, and whites in the north. Austin, which is located approximately midway between all three groups, has the most balanced population composition. The population composition of urbanized areas in any direction away from Austin reflects increasing proportions of two

TABLE 4

PERCENT OF POPULATION COMPOSITION OF SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1970

City	White	Black	Mexican-American	Other
Abilene	85.1	4.8	9.8	0.3
Albuquerque	58.0	2.3	38.1	1.6
Austin	69.7	12.9	17.0	0.4
Bakersfield	74.3	8.9	15.6	1.2
Beaumont	55.6	40.6	3.6	0.2
Colorado Springs	84.9	4.8	9.3	1.1
Corpus Christi	50.2	5.5	44.0	0.3
Dallas	73.6	18.5	7.1	0.7
Denver	79.8	6.0	12.9	1.3
El Paso	39.1	2.3	57.9	0.8
Fort Worth	77.1	15.3	7.2	0.4
Fresno	72.1	7.0	18.4	2.4
Galveston	46.3	34.0	18.7	1.0
Houston	64.8	22.9	11.6	0.7
Laredo	9.6	0.2	90.2	0.1
Los Angeles	52.0	26.1	15.5	6.4
Lubbock	76.0	4.7	16.5	2.9
Odessa	79.2	5.8	14.8	0.2
Phoenix	81.5	3.8	13.2	1.5
Pueblo	67.0	2.0	30.7	0.3
Sacramento	80.7	5.8	9.3	4.2
San Angelo	75.2	4.9	19.6	0.3
San Antonio	43.7	7.4	48.2	0.7
San Bernardino	63.4	9.4	24.8	2.4
San Diego	78.5	5.7	12.8	3.1
San Francisco	62.6	11.2	14.5	11.7
San Jose	76.1	1.6	18.3	4.0
Santa Barbara	80.8	1.4	15.1	2.6
Stockton	62.0	9.2	20.6	8.2
Texarkana	72.4	26.4	0.9	0.2
Tucson	72.9	3.0	22.6	1.5
Tyler	72.3	25.1	2.5	0.2
Waco	73.5	17.8	8.4	0.2
Wichita Falls	84.1	8.7	6.8	0.5

Source: Author's calculations.

groups and the decline of the third. Whites and Mexican-Americans are expecially dominant within the cores of their areas.

Between 1960 and 1970, the white population had the highest variation of population change of the three groups. Large absolute declines were reported for Los Angeles and several Texas cities as opposed to large increases in others. The absolute decline of whites in fifteen of the thirty-four urbanized areas is the result of two generalized migrations by white persons. One is a national movement by white persons from inner city locations within the urbanized area to surburban residences outside the urbanized area (Frey 1978). The other involves a migration of persons from specific urbanized areas to residences outside the Standard Metropolitan Statistical Area for the city involved. The latter occurrance is confined primarily to smaller Texas cities and it is suspected that those SMSA's are losing whites to the larger, high-growth regional centers such as Houston and Dallas.

The white population was dominant in thirty of the thirty-four Southwest urbanized areas in 1970. However, minority populations grew at a faster rate in all urbanized areas of the Southwest (Table 5). Only in Sacramento and Texarkana did whites maintain migration growth rates equal to minority rates. Both of these cities were at the northern edges of the study area, the maximum distance from Mexican-American migrant source areas, and both were smaller cities that were apparently less attractive to Blacks than the regional centers.

TABLE 5

PERCENT CHANGE IN POPULATION COMPOSITION OF SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 - 1970

City	White	Black	Mexican-American	Other
Abilene	-4.6	-0.1	4.7	0.1
Albuquerque	-13.5	0.3	12.7	0.5
Austin	-4.6	-0.2	4.5	0.2
Bakersfield	-2.6	-2.2	4.5	0.3
Beaumont	-13.4	11.4	2.0	0.1
Colorado Springs	-6.9	1.5	4.7	0.6
Corpus Christi	-8.6	0.0	8.3	0.2
Dallas	-5.1	1.5	3.1	0.4
Denver	-7.3	1.2	5.6	0.4
El Paso	-12.8	0.2	12.4	0.2
Fort Worth	-4.7	1.4	3.0	0.3
Fresno	-9.0	-0.3	7.9	1.5
Galveston	-14.1	6.6	6.7	0.7
Houston	-2.4	-1.3	3.4	0.4
Laredo	-7.9	-0.1	8.0	0.0
Los Angeles	-17.7	7.8	8.0	1.8
Lubbock	-6.9	-3.3	7.5	2.8
Odessa	-7.8	0.2	7.5	0.2
Phoenix	-5.5	0.5	4.5	0.4
Pueblo	-10.7	-0.3	11.1	-0.1
Sacramento	0.7	-0.3	1.4	-1.7
San Angelo	-5.2	-0.2	5.3	0.1
San Antonio	-9.5	0.4	8.6	0.5
San Bernardino	-9.9	2.7	6.1	1.2
San Diego	-7.3	0.0	5.9	1.4
San Francisco	-13.1	1.7	7.6	3.8
San Jose	-7.1	0.9	4.5	1.6
Santa Barbara	-1.3	-1.0	1.2	1.0
Stockton	-6.5	0.8	7.1	-1.4
Texarkana	-0.6	-0.0	0.5	0.1
Tucson	-4.3	-0.1	4.3	0.2
Tyler	-2.8	0.9	1.8	0.1
Waco	-4.4	1.3	3.0	0.1
Wichita Falls	-4.2	0.5	3.5	0.2

Source: Author's calculations.

The migration patterns for Blacks in the Southwest during the 1960s was similiar to those of the previous decade. Small cities and rural areas in southeastern Texas, Louisiana, and Arkansas provided most of areas of origin for migrating Blacks. Cities that had received large numbers of migrating Blacks prior to 1960 continued to be attractive for Blacks during the 1960s. Houston and Los Angeles were the most attractive cities, and together received more Blacks than the sum of the remaining southwestern urbanized areas.

The relationship of Black migration to changes in the population composition of urbanized areas is not straightforward. Some cities showed significant gains in the population composition when there was actual numerical declines in the Black population. The most extreme example was Beaumont, Texas. From 1960 to 1970, Beaumont had a decrease of 1322 Black persons. During the same period the white population decreased by 36,362 persons. The remaining populations then showed an increase of 11.37% in the Black proportion in the urbanized area.

Blacks had the least amount of change in population composition of the three groups, and the most significant changes were effected by large out-migrations of whites in cities that contained sizable Black percentages. The migrations of Blacks viewed on a city-wide scale were usually small when compared to the large pre-existing white population and the large in-migrations of Mexican-Americans. In addition Blacks usually migrated to large urbanized areas which already contained sizable Black populations, thus lessening total migration change.

The Mexican-American population proved to be the most rapidly expanding population in the Southwest. All urbanized areas showed gains in both absolute and proportional values. Like the other groups, Mexican-Americans were most attracted to urbanized areas that already contained high proportions of their own group. Unlike the Black population, Mexican-Americans migrated to urbanized areas of all sizes that were considered favorable to Spanish culture and thus more "comfortable" to Spanish speaking migrants. San Antonio exerts considerable influence on migrants in Texas because of its large size and high proportion of Mexican-Americans. The city serves to channelize the migratory labor routes that originate predominantly in southern Texas (Corwin and Fogel 1978, 271).

The disparity of wages within the United States has been the motive force behind Mexican-American migrations. Wage disparities usually increase as the distance from the Mexican border increases, prompting greater migration into the interior of the United States. Hansen (1973) determined that Mexican-American high school students in Texas had high migration potentials when wage differentials were present (1973, 103).

The influence of migration patterns on Southwest urbanized areas and the consequent impact upon residential segregation appears to be substantial. The in-migration of Mexican-Americans and the out-migrations of whites were responsible for most of the changes in the population composition of urban areas. With the exception of smaller Texas cities, most cities in the Southwest experienced high growth in

the 1960s as a result of heavy in-migration of all three population groups. The effects of this growth on residential segregation are a function of the individual cities residential patterns, urban processes, and the socio-economic characteristics of its inhabitants.

CHAPTER IV

PATTERNS OF RESIDENTIAL SEGREGATION IN SOUTHWESTERN CITIES

The differences in the arrangement of urban concentrations of whites, Blacks, and Mexican-Americans greatly affect the analysis of residential segregation patterns. Mexican-Americans often live in dispersed clusters and the extent to which this population is segregated is measured more effectively by a spatial rather than a non-spatial segregation index. The distance-based index (DBI) is a point pattern index that incorporates straight line distances into the measurement of residential segregation. The index ranges from 0 to 1 where 0 indicates no segregation and 1 indicates complete segregation, and is calculated between the three population groups of whites versus Blacks, whites versus Mexican-Americans, and Blacks versus Mexican-Americans. Only two population groups enter into the calculation of the index at one time, the third population group is ignored.

The segregation indicies for the urbanized areas in the study area reveal large variations in the residential segregation between the individual urbanized areas, and between the three groups of whites versus Blacks, whites versus Mexican-Americans, and Blacks versus Mexican-Americans in 1960 and 1970 (Tables 6 and 7).

Some of the inter-city variations and 1960 to 1970 segregation shifts

TABLE 6

DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960

City	White versus Black	White Versus Mexican American	Black Versus Mexican-American
Abilene	.599	.347	.861
Albuquerque	.386	.467	.251
Austin	.485	.421	.545
Bakersfield	.491	.291	.580
Beaumont	.359	.208	.214
Colorado Springs	.387	.213	.612
Corpus Christi	.399	.366	.365
Dallas	.453	.318	.644
Denver	.469	.265	.635
El Paso	.203	.216	.154
Fort Worth	.381	.247	.478
Fresno	.856	.420	.731
Galveston	.386	.098	.440
Houston	.450	.318	.379
Laredo	.180	.070	.170
Los Angeles	.600	.302	.515
Lubbock	.978	.501	.922
Odessa	.651	.575	.465
Phoenix	.451	.347	.380
Pueblo	.532	.215	.547
Sacramento	.247	.158	.224
San Angelo	.541	.236	.875
San Antonio	.455	.319	.814
San Bernardino	.443	.373	.387
San Diego	.315	.180	.435
San Francisco	.347	.208	.372
San Jose	.455	.244	.272
Santa Barbara	.358	.268	.362
Stockton	.490	.332	.266
Texarkana	.351	.460	.499
Tucson	.354	.414	.338
Tyler	.668	.163	.791
Waco	.411	.176	.430
Wichita Falls	.649	.413	.747

Source: Author's calculations.

TABLE 7

DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1970

City	White Versus Black	White Versus Mexican American	Black Versus Mexican-American
Abilene	.444	.245	.675
Albuquerque	.285	.373	.232
Austin	.565	.361	.624
Bakersfield	.471	.274	.578
Beaumont	.346	.144	.270
Colorado Springs	.324	.195	.350
Corpus Christi	.518	.395	.354
Dallas	.633	.221	.728
Denver	.492	.233	.719
El Paso	.149	.264	.248
Fort Worth	.448	.241	.539
Fresno	.848	.312	.628
Galveston	.474	.118	.471
Houston	.446	.247	.458
Laredo	.257	.118	.254
Los Angeles	.378	.236	.395
Lubbock	.547	.366	.486
Odessa	.826	.451	.506
Phoenix	.456	.215	.411
Pueblo	.309	.185	.289
Sacramento	.334	.223	.248
San Angelo	.417	.292	.543
San Antonio	.469	.358	.685
San Bernardino	.523	.356	.539
San Diego	.380	.197	.400
San Francisco	.244	.135	.345
San Jose	.414	.303	.177
Santa Barbara	.176	.176	.112
Stockton	.666	.388	.388
Texarkana	.330	.241	.274
Tucson	.282	.368	.214
Tyler	.684	.191	.692
Waco	.511	.156	.629
Wichita Falls	.602	.245	.905

Source: Author's calculations.

may be partially the result of changes in the Bureau of the Census definitions for minority groups, discrepacies in the reporting of data (Appendix A), the restructuring of census tract boundaries, or natural population increase (Farley 1976). However, most of the changes are caused by inter or intra-urban migrations by whites, Blacks or Mexican-Americans.

There are some difficulties in accurately assessing the residential segregation of small urban areas. The most extreme example is Laredo, Texas. In 1970, the Laredo, Texas urbanized area contained only 121 Blacks. The white-Black distance-based segregation index was .7, indicating practically no residential segregation. The calculations were made after omitting census tract 16, which contained a military base and 214 Blacks. If the calculations had included that one tract, the segregation index for Laredo would have been .48, a difference of .41.

Laredo is an extreme example, because it contains few absolute numbers of Blacks, but it demonstrates the difficulty of interpreting the segregation index for small cities where a slightly different data base can alter the value of statistical measures. Caution should also be applied to the index interpretation for cities of less than 100,000 that differ in segregation by small amounts. Such cities may be ranked and compared, but the researcher should be aware that for practical purposes they should be considered almost identical in segregation. they should be considered almost identical in segregation. As the city populations become larger, the index becomes more accurate since

variation in a few areal units will affect larger cities proportionately less than smaller ones.

White versus Black Segregation

Historically, Blacks have been the most segregated minority group in United States cities. This study confirms this generalized observation for the urbanized areas of the Southwest. Blacks were more segregated from whites than Mexican-Americans were from whites in both 1960 and 1970. Although urban residential patterns changed substantially over the decade of the 1960s, most cities still reported high levels of Black versus white segregation in 1970.

Inter-city segregation indexes for both 1960 and 1970 exhibit large variations. The index scores range from almost no segregation (less then .15) to almost complete segregation (greater than .9). A comparison of the ranked scores for 1960 and 1970 indicates that although the range of values is similiar, the range begins and ends at slightly lower levels of segregation. This observation suggests that in general residential segregation is declining.

The observations of extreme variation and a slight segregation decline are supported by the means and standard deviations of the data (Table 8). Although the average 1960 segregation index of .464 declined to .449 for 1970, the high variability of the values indicates that clear-cut trends in white-Black segregation are not evident. Segregation declined in eighteen urbanized areas, but it increased in sixteen, and the high standard deviations provide evidence of the high

variability. The average decline can be attributed to the large segregation decreases that occurred in a few cities and the lack of equivalently large increases among the sixteen urbanized areas having ascending values.

TABLE 8

MEANS AND STANDARD DEVIATIONS FOR THE DISTANCE-BASED INDEX FOR 1960 AND 1970

	1960		1970	
	Mean	Standard Deviation	Mean	Standard Deviation
White versus Black	.464	.164	.449	.164
White versus Mexican-American	.299	.117	.260	.88
Black versus Mexican-American	.491	.213	.452	.191

Source: Author's calculations.

Increases or decreases in segregation for individual cities from 1960 to 1970 are almost as variable as the 1960 or 1970 scores between cities (Table 9). The most extreme change of any city occurred in Lubbock, Texas, where white versus Black segregation decreased from .98 in 1960 to .55 in 1970, a decline of .43.

All of the extreme changes in segregation were mapped and the associated tract data were carefully examined to determine the population shifts that caused radical changes. In the case of Lubbock, two factors were identified as major causes of change. The first factor concerned the reorganization of census tract boundaries. In 1960, the

TABLE 9

CHANGES IN DISTANCE-BASED INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 - 1970

City	White versus Black	White versus Mexican American	Black versus Mexican-American
Abilene	-.155	-.102	-.186
Albuquerque	-.100	-.093	-.018
Austin	.080	-.061	.079
Bakersfield	-.021	-.017	-.001
Beaumont	-.013	-.064	.056
Colorado Springs	-.063	-.018	-.263
Corpus Christi	.119	.030	-.011
Dallas	.180	-.096	.084
Denver	.023	-.032	.083
El Paso	-.054	.048	.094
Fort Worth	.067	-.005	.061
Fresno	-.008	-.108	-.102
Galveston	.088	.020	.031
Houston	-.004	-.071	.079
Laredo	.077	.048	.084
Los Angeles	-.222	-.066	-.120
Lubbock	-.431	-.135	-.437
Odessa	.175	-.123	.041
Phoenix	.005	-.133	.031
Pueblo	-.224	-.031	-.258
Sacramento	.087	.065	.023
San Angelo	-.124	.056	-.332
San Antonio	.013	.039	-.129
San Bernardino	.080	-.017	.153
San Diego	.065	.016	-.035
San Francisco	-.103	-.073	-.028
San Jose	-.040	.059	-.095
Santa Barbara	-.182	-.092	-.251
Stockton	.177	.056	.123
Texarkana	-.021	-.219	-.226
Tucson	-.072	-.046	-.124
Tyler	.016	.028	-.098
Waco	.100	-.020	.198
Wichita Falls	-.046	-.168	.159

Source: Author's calculations.

urbanized area of Lubbock contained 10,287 Blacks, of whom 9,648 resided in tract 12. This was the obvious cause of the high segregation value for 1960. By 1970, several alternations were observed in the arrangement of tract boundaries. In tract 12 a multiple subdivision had occurred that allocated a small section of the original tract to two adjacent tracts, tract 7 and tract 13. The large remaining portion of the tract was additionally divided into two tracts labeled 12.01 and 12.02. This had the effect of parceling out the Black population of a single tract in 1960 to four tracts in 1970.

The second factor involved the redistribution of portions of the Black population. Blacks had established new residences in tracts that had no boundary changes, but were adjacent to the former tract 12. The redistributions were large enough to significantly affect the spatial pattern and added complexities to the tract boundary changes. Reconstruction of the orginal 1960 tract prior to 1970 index calculations was not attempted for two reasons: (1) the complexity of the changes prevented the accurate merging of the split populations, and (2) the subdivision of tract 12 was only one portion of the total change. Many cities experienced a redefining of census tract boundaries; however, only in Lubbock were the boundary shifts detrimental to the accuracy of segregation measurement.

Although the overall change in white-Black segregation from 1960-1970 indicated a slight decline, strong generalized conclusions concerning segregation trends between the two groups cannot be substantiated. This indicates that residential segregation in cities

appears responsive to historical distributions, recent migrations, and local urban conditions and varies greatly as a result to those responses. Larger urbanized areas appear to be more consistent than smaller ones in their responses to in-migration, residential succession and segregation change. Smaller urbanized areas appear to vary widely because the occurrence of extreme values are less readily absorbed by the smaller data base. Researchers have often voiced generalized opinions that urban segregation has been or will be declining. In the Southwest white-Black segregation may in fact be declining overall, but the high variation of individual urbanized areas makes such an assertion tentative.

White versus Mexican-American Segregation

The segregation of whites from Mexican-Americans is less severe and less variable than than the segregation between whites and Blacks. Segregation values range from less than .10, indicating practically no segregation, to .50. The range of segregation, although moderately high for a few cities, is approximately one-half of the range of white-Black segregation.

Blacks are generally more segregated from whites than Mexican-Americans are from whites for both time periods. However, in four cities in 1960 and three cities in 1970, Mexican-Americans were the more segregated group. In 1960, Albuquerque, El Paso, Texarkana, and Tucson were the only cities that had higher segregation levels for whites versus Mexican-Americans than whites versus Blacks. In 1970, except for Texarkana, these same cities repeated this situation indicating some

consistency in the urban distributions that produced the reversed patterns. Texarkana can be discounted because it has few Mexican-Americans in the urbanized area. These observations are consistent with the conclusions reached by Moore and Mittelbach (1966), who found that in all Southwest cities for 1960, Blacks were more segregated from whites than Mexican-Americans were from whites. These differences in the three cities probably reflect the difficulty of measuring residential segregation when urban data bases and indexes are different. Moore and Mittelbach used central cities and the non-spatial index of dissimilarity compared to urbanized areas and the spatial distance-based index used in this study.

The change in white versus Mexican-American segregation from 1960 to 1970 indicated a fairly consistent decline for most cities. This consistency in decline is evident in the means and standard deviations of segregation change (Table 10). Twenty-three cities in the study area declined in segregation while eleven displayed minor increases. Although eleven cities had increased in segregation between 1960 and 1970, five of these cities already had very low segregation values in 1960. This emphasized a tendency of city values to move from the extremes of the range toward the center. Cities exhibiting low segregation scores for 1960 were most likely to increase for 1970; conversely, cities possessing high scores usually decreased. These tendencies were evident among all segregation groups, but were strongest for whites versus Mexican-Americans.

TABLE 10

MEANS AND STANDARD DEVIATIONS OF SEGREGATION CHANGE, 1960 TO 1970

	Mean	Standard Deviation
White versus Black	-.16	.129
White versus Mexican-American	-.39	.073
Black versus Mexican American	-.39	.152

Source: Author's calculations.

The segregation of Mexican-Americans from the other population groups revolves around historical situations as well as recent migrations. The stratification of the Mexican population by a caste system was in force in the Southwest when it was first being settled. The upper classes were usually dominated by white Spanish descendents, the middle classes by mestizos, and the lower classes by Indians. The upper classes were as contemptuous of the Indian and mestizo, as were the Anglo settlers. To be distinguished from the lower classes and to avoid discrimination from the Anglo residents, the upper classes often referred to themselves as "Spanish" (Nostrand 1973, 397). The old Spanish upper class was less segregated as a group, and in many cities they could mingle with the resident Anglos as social equals and their children could go to Anglo schools (Grebler, Moore, and Guzman 1970, 323).

Although the rigid boundaries between classes were beginning to dissolve as a result of ethnic mobility and community change, the persistence of the social-class system continued until the 1930s. In

Texas several cities maintained relatively different attitudes towards Mexican-Americans. In San Antonio and Corpus Christi segregation was high, where an old Spanish group was prominent in the former but lacking in the latter (Grebler, Moore and Guzman 1970, 324). In San Antonio the Spanish upper class and the Anglos were socially distinct from the lower classes. Since the majority of the Mexican-American population were considered members of the lower class, segregation was high and the old Spanish group helped to reinforce the separation. Corpus Christi contained no distinguishable old Spanish group, but upper class Mexican-Americans possessed privileges unavailable to the lower classes.

The segregation of these two cities stands in contrast to cities such as Laredo. Laredo was composed of a very large Mexican-American upper class whose sheer size prevented the type of social distinctions that had occurred in San Antonio, Corpus Christi, and other Texas cities(Grebler, Moore, and Guzman 1970, 346). The continuing high segregation for Austin, Corpus Christi, and San Antonio, and the the low segregation for Laredo may be linked to the type of historical social stratification that was present in many Texas cities.

Black Versus Mexican-American Segregation

The results of segregation index calculations indicate that Blacks and Mexican-Americans were more segregated from each other than they are from the white population for both 1960 and 1970. These distance-based calculations contrast with the findings of Moore and Mittelbach (1966) and Massey (1979). They determined that Mexican-Americans versus Blacks were more segregated than Mexican-Americans

versus whites, but less so than whites versus Blacks.

An examination of census tract data and selected maps revealed that some tracts were occupied by equal numbers of Blacks and Mexican-Americans, but the majority of tracts contained predominantly one group or the other. The factor that figured prominently in Black versus Mexican-American segregation was the greater relative dispersal of Mexican-Americans. Mexican-Americans were more dispersed throughout the city resulting in many tracts that had sizeable populations of Mexican-Americans, but few or no Blacks.

The segregation of Mexican-Americans versus Blacks closely parallels the segregation of whites versus Blacks. The range, mean, standard deviation, and direction of change from 1960 to 1970 are all similiar, although the amount of change is slightly different. The standard deviation of Mexican-American versus Black segregation is the highest of the three groups. This is the result of a larger range of values and a greater number of values at the upper end of the range. In each of these cases, the mean segregation level was noticeably related to the standard deviation for that mean. For all three groups, the segregation indexes for the low end of the range consistently began at approximately the same level, thus the extent of the range, the size of the mean, and the standard deviation were all primarily determined by the highest segregation scores.

Black versus Mexican-American segregation is more strongly affected by the degree of white versus Black segregation than by white

versus Mexican-American segregation. Since white versus Black segregation is usually higher that white versus Mexican-American segregation, Mexican-Americans will inevitably reside in more tracts and in greater numbers in those tracts than Blacks. As a result intercorrelations exist between three statistical values: (1) white versus Black segregation, (2) Black versus Mexican-American segregation, and (3) the difference between the white versus Black and the white versus Mexican-American segregations (Table 11).

The results of distance-based calculations indicate that Blacks are residentially segregated from Mexican-Americans. However, whether this segregation is because Mexican-Americans and Blacks decline to reside together, or whether it is an indirect result of segregation with the white population, is not readily answerable. Only in Odessa in 1960 were both Blacks and Mexican-Americans highly segregated from whites. In this single case Blacks and Mexican-Americans appeared to reside in the same limited number of tracts to a greater degree than in cities where segregation differences between whites versus Blacks and whites versus Mexican-Americans are more pronounced. The cause of segregation between Blacks and Mexican-Americans could perhaps best be answered by field work in individual cities, or following the examination of maps depicting block data, where the amount of minority mixing in the same neighborhood could be ascertained.

Comparison of the Distance-Based and Dissimilarity Indexes

The use of the index of dissimilarity to measure segregation has been an important element in the development of residential

TABLE 11

SIMPLE LINEAR CORRELATION MATRIX COMPARING THE SEGREGATION OF SUBPOPULATIONS FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 AND 1970

1960

(Items correspond to row numbers)

		(1)	(2)	(3)	(4)
(1)	White versus Black	1.00	.53	.74	.75
(2)	White versus Mexican-American		1.00	.26	-.09
(3)	Black versus Mexican-American			1.00	.67
(4)	Differences between (1) and (2)				1.00

1970

(Items correspond to row numbers)

		(1)	(2)	(3)	(4)
(1)	White versus Black	1.00	.43	.69	.83
(2)	White versus Mexican-American		1.00	.09	-.03
(3)	Black versus Mexican-American			1.00	.68
(4)	Differences between (1) and (2)				1.00

Source: Author's calculations.

segregation analysis. Therefore a description of the results of the index of dissimilarity is included to facilitate comparisons with the distance-based index. The index of dissimilarity was calculated on the same data bases as was the distance-based index for all thirty-four urbanized areas (Table 12).

In observing the values for the index of dissimilarity versus those for the distance-based index: (1) the dissimilarity index has a smaller range of values, (2) the values are higher and more uniform, and (3) the population increases from 1960 to 1970 appear to significantly inflate the value of the index.

The mean index values for the segregation groups for 1960 and 1970 are ranked similarly to the distance-based index. Observations of the values for urbanized areas exhibit high variations for the individual values (Table 13). The differences between the indexes can be attributed to greater statistical variation in the index of dissimilarity, and the measurement of spatial patterns by the distance-based index.

The dissimilarity index increases in value as the number of areal units increases. Since the numbers of areal units increase as the population of an urbanized area increases, a high correlation is thus expected between the population size of a city and the corresponding segregation index. Variations are caused by the different assumptions of each index. Both measures are point pattern indexes, but the distance-based index calculates distances between the data points while

TABLE 12

THE INDEX OF DISIMILARITY CALCULATED FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 AND 1970

City	1960			1970		
	White versus Black	White versus Mex.-Amer.	Black versus Mex.-Amer.	White versus Black	White versus Mex.-Amer.	Black versus Mex.-Amer.
Abilene	.876	.582	.564	.675	.467	.640
Albuquerque	.756	.539	.572	.574	.465	.490
Austin	.717	.616	.631	.806	.527	.603
Bakersfield	.841	.561	.508	.889	.546	.663
Beaumont	.666	.450	.597	.641	.252	.543
Colorado Springs	.768	.375	.591	.612	.369	.460
Corpus Christi	.873	.683	.507	.900	.605	.571
Dallas	.905	.658	.754	.941	.433	.826
Denver	.870	.593	.688	.872	.516	.775
El Paso	.772	.512	.593	.511	.512	.544
Fort Worth	.861	.554	.785	.871	.479	.794
Fresno	.897	.437	.590	.813	.382	.695
Galveston	.668	.312	.471	.637	.209	.587
Houston	.810	.633	.700	.835	.462	.758
Laredo	.589	.385	.420	.461	.342	.572
Los Angeles	.831	.503	.661	.882	.498	.742
Lubbock	.932	.658	.875	.840	.606	.657
Odessa	.886	.736	.298	.910	.633	.415
Phoenix	.861	.543	.532	.820	.472	.623
Pueblo	.496	.374	.421	.559	.392	.465
Sacramento	.612	.290	.445	.681	.343	.534
San Angelo	.782	.440	.553	.780	.429	.545
San Antonio	.823	.647	.772	.810	.618	.775
San Bernardino	.811	.597	.427	.801	.530	.519
San Diego	.832	.414	.568	.806	.344	.659
San Francisco	.721	.371	.667	.711	.373	.672
San Jose	.699	.383	.469	.593	.415	.326
Santa Barbara	.729	.456	.365	.348	.310	.285
Stockton	.776	.534	.299	.821	.477	.397
Texarkana	.439	.370	.378	.504	.403	.408
Tucson	.805	.621	.623	.678	.552	.575
Tyler	.770	.305	.765	.791	.319	.804
Waco	.695	.567	.553	.748	.408	.649
Wichita Falls	.905	.667	.492	.892	.346	.766
mean values	.772	.511	.562	.736	.442	.598

Source: Author's calculations.

TABLE 13

DIFFERENCES BETWEEN THE INDEX OF DISSIMILARITY AND THE DISTANCE BASED INDEX, 1960 AND 1970

City	1960			1970		
	White versus Black	White versus Mex.-Amer.	Black versus Mex.-Amer.	White versus Black	White versus Mex.-Amer.	Black versus Mex.-Amer.
Abilene	.277	.236	-.300	.076	.120	-.220
Albuquerque	.370	.072	.321	.189	-.002	.239
Austin	.232	.195	.085	.321	.106	.057
Bakersfield	.350	.270	-.072	.398	.255	.083
Beaumont	.306	.242	.382	.282	.044	.329
Colorado Springs	.381	.162	-.021	.225	.156	-.150
Corpus Christi	.475	.318	.142	.502	.239	.205
Dallas	.452	.340	.110	.487	.116	.182
Denver	.402	.328	.052	.403	.251	.139
El Paso	.569	.295	.438	.308	.296	.390
Fort Worth	.480	.307	.306	.490	.233	.316
Fresno	.042	.017	-.140	-.042	-.038	-.036
Galveston	.282	.214	.032	.251	.111	.147
Houston	.361	.315	.321	.385	.144	.379
Laredo	.409	.315	.249	.282	.271	.402
Los Angeles	.231	.201	.146	.282	.197	.227
Lubbock	.046	.157	-.047	-.140	.105	-.270
Odessa	.235	.162	-.170	.259	.059	-.050
Phoenix	.410	.196	.152	.369	.124	.243
Pueblo	.036	.158	-.130	.027	.176	-.083
Sacramento	.364	.132	.221	.434	.185	.309
San Angelo	.241	.204	-.320	.239	.193	-.330
San Antonio	.368	.328	-.042	.354	.299	-.039
San Bernardino	.367	.224	.040	.358	.157	.132
San Diego	.517	.234	.132	.491	.164	.224
San Francisco	.374	.163	.294	.363	.165	.299
San Jose	.244	.139	.197	.139	.172	.054
Santa Barbara	.371	.188	.003	-.010	.042	-.077
Stockton	.286	.203	.034	.331	.145	.131
Texarkana	.088	-.089	-.120	.153	-.057	-.091
Tucson	.451	.206	.285	.324	.137	.237
Tyler	.102	.143	-.026	.123	.156	.013
Waco	.285	.391	.123	.337	.232	.219
Wichita Falls	.256	.254	-.250	.243	-.067	.019

Source: Author's calculations.

TABLE 14

INDEX OF DISSIMILARITY CORRELATION MATRIX FOR SUBPOPULATIONS OF SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 AND 1970

1960

(Items correspond to row numbers)

		(1)	(2)	(3)
(1)	White versus Black	1.00	.67	.44
(2)	White versus Mexican-American		1.00	.21
(3)	Black versus Mexican-American			1.00

1970

(Items correspond to row numbers)

		(1)	(2)	(3)
(1)	White versus Black	1.00	.48	.64
(2)	White versus Mexican-American		1.00	.11
(3)	Black versus Mexican-American			1.00

Source: Author's calculations.

TABLE 15

CORRELATIONS BETWEEN THE INDEX OF DISSIMILARITY AND THE DISTANCE-BASED INDEX FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 AND 1970

	1960	1970
White versus Black	.50	.72
White versus Mexican-American	.68	.80
Black versus Mexican-American	.45	.72

Source: Author's calculations.

the index of dissimilarity treats all data points identically. Therefore urban areas containing concentrations of minorities located in suburban areas would receive a relatively lower distance-based score compared to an index of dissimilarity score.

A correlation matrix of dissimilarity indexes produces a reversed pattern of associations for 1960 and 1970 (Table 14). In 1960, whites versus Blacks were highly correlated with whites versus Mexican-Americans, but in 1970 whites versus Blacks were highly correlated with Blacks versus Mexican-Americans. It seems unlikely that these patterns should become reversed in a single decade. The distance-based index depicted correlations for both years similiar to the 1970 results for the index of dissimilarity.

Correlation of the three indexes of dissimilarity with the corresponding distance-based index produced varying results (Table 15). The 1960 correlations seem poor since the indexes are measuring the same phenomenon and have identical data bases. The 1970 correlations are much improved and explain the reversed patterns expressed in Table 14. It appears from the observations that the distance-based index does have advantages over the index of dissimilarity. The distance-based index is more sensitive to urban residential patterns and is more consistent when measuring the degree of segregation between the same population groups for 1960 and 1970. Simulations produced by Jakubs (1978) have demonstrated that the index of dissimilarity has a higher variance than the distance-based index. This higher variability appears to be expressed in the temporal comparisons of data measured in this study.

CHAPTER V

CORRELATES OF RESIDENTIAL SEGREGATION AND MINORITY DISPERSAL

The calculation and comparison of segregation indexes is only one step in the analysis of residential segregation patterns. The fact that minority residential segregation exists does little to explain the causes of residential segregation or to predict future segregation trends. This portion of the analysis will endeavor to isolate variables that are significantly associated with residential segregation, and when considered individually and together contribute a portion of the explanation for variations in urban residential patterns.

Two theories deal with the potential dispersal of minority groups and the reduction of residential segregation. One view contends that the movement of minorities (especially Blacks) into new areas proceeds as an extension of the inner city (Birch 1970; Rabinowitz 1977). Mobile persons with relatively high incomes are the source of the demand for better housing in non-ghetto areas. Dispersals are accomplished by movement into non-minority housing areas adjacent to minority areas. The second view asserts that minority dispersals are positively related to increases in income, status, and other socio-economic variables. As minorities achieve socio-economic parity with

whites, they have the opportunity to select more dispersed housing in higher status residential areas.

The relationship of minority residential segregation to other socio-economic variables has been established in previous studies (Taueber and Taueber 1965; Moore and Mittelbach 1966; Rabinovitz and Siembieda 1977; Frey 1978). Four categories of variables or factors have been previously isolated. These categories are (1) status, (2) culture, (3) demographic, and (4) economic. The status factors are represented by the following variables: (1) the educational level of a particular group, and (2) the percentage of minorities employed in white collar or blue collar work positions. The cultural factors are defined by: (1) The discrimination of a dominant population against a sub-population, termed racial or ethnic discrimination, and (2) the cohesiveness or cultural identity of a sub-population, termed a "taste for segregation". Demographic factors include: (1) the size and proportion of a subpopulation in an urbanized area, (2) the net migration rate and population growth from natural increase, and (3) the size and density characteristics of the city. Economic factors include: (1) the incomes of the population groups, (2) the cost and the supply of available housing, and (3) the labor market and the industrial base of the city. The preliminary analysis of variables was purely exploratory. The purpose was to select those variables that were strongly associated with the three types of identified segregations, and to discard those variables with poor associations. This process was accomplished by constructing a correlation matrix of variables and selecting variables

that were significantly correlated with any of the three types of segregation indicies.

Status Factors

The status factors proved to be easy to develop but difficult to apply to urban residential segregation. Intercorrelations were observed between education, income, and segregation variables (Table 16).

Although education variables delimited minorities as a city-wide group, increases in minority education levels were correlated with decreases in urban residential segregation. It is notable that, in the Southwest for 1970, Blacks attained a higher median education level than Mexican-Americans, but received a lower median income. The proportion of Blacks in white collar occupations was significantly correlated with income (.66) and education (.67). A similiar Mexican-American correlation was not significant for income (.30), and was less related for education (.47). This indicates that Mexican-Americans had better access to higher paying jobs, or were seeking jobs in different job markets.

Differentiation based on status has been documented by Frey (1978) and Farley (1976). Frey reported that during the 1960s, white movement to the suburbs was dominated by high school and college graguates. The importance of minority characteristics in initiating status migrations varied according to the level of status investigated and related urban variables. Upper-status white migrants were influenced by racial composition and city versus suburb expenditures on

TABLE 16

LINEAR CORRELATION MATRIX COMPARING EDUCATION VARIABLES WITH SEGREGATION AND ECONOMIC VARIABLES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1970

	BLACK		MEXICAN-AMERICAN	
	Median School Years Completed	Percent Graduating High School	Median School Years Completed	Percent Graduating High School
Black Median Family Income	.76	.75		
Mexican-American Median Family Income			.78	.76
Ratio of White to Black Income	-.75	-.74		
Ratio of White to Mexican-American Income			-.70	-.61
Ratio of Black to Mexican-American Income	-.58	-.52		
White versus Black Segregation	-.56	-.58		
White versus Mexican-American Segregation			-.35	-.42
Black versus Mexican-American Segregation	-.38	-.44	-.31	-.37

Source: Author's calculations.

education, while lower status whites were less affected by social considerations and more affected by city growth variables. The study of subpopulations that had migration potential as opposed to static subpopulations was important in identifying the patterns of movement. Farley discovered great variation in the patterns of suburban migration among various cities, but produced two conclusions: (1) the most consistent status selective patterns occurred among older northern metropolitan areas, and (2) changes in urban policy that would make suburbs more attractive to subpopulations would affect the aggregate migration change of the city only slightly within a single decade (Farley 1976, 7).

Cultural Factors

There has been some controversy in the literature concerning whether the separation of minorities is accomplished by (1) exclusion by the dominant population, (2) minorities excluding themselves by choice, or (3) a combination of both mechanisms. Historical discrimination by the dominant population has been well documented (Taueber and Taueber 1965; Fellows 1972; Davis and Donaldson 1975). Present-day research has questioned the singular role of dominant population actions in maintaining segregation patterns (Rose 1976). Most researchers acknowledge the existence of two processes in metropolitan areas. One process involves white flight to suburban areas and the continuing efforts of real estate agents and housing contractors to maintain all white suburbs. The second recognizes the rapid urbanization of minorities that has resulted in the emergence of an urban Black culture

and the continuance of Mexican-American cultural identities in urban locations (Rose 1976, 182).

Analysis of the influence of group culture on residential segregation involves assessing variables related to family tradition for Mexican-Americans and urban culture for Blacks. No variables available in this study could satisfactorily account for Mexican-American or Black cultural identity. Variables such as familism (the number of persons per household) or occupancy (housing units with more than one person per room) are highly correlated with income, and succeed only in identifying minorities as a group.

The variables that would be needed for analysis are those that will measure the perceptions of minorities with respect to ethnicity. An effort along these lines was made by Rose (1981), who sampled black professionals in several cities. Rose concluded that black professionals preferred to live in neighborhoods that were ten to twenty-nine percent Black regardless of the racial composition of their present neighborhoods (1981, 134). This has implications for the urbanized areas of the Southwest. Less than one-third of the these areas have a Black proportion of ten percent or more. If Blacks in the Southwest have preferences similiar to the Black professionals in Rose's study, then residential segregation would continue because there would be too few Blacks to reside in proportions of ten percent in all of the census tracts.

Demographic Factors

Many variables were available that could be termed "demographic". The more important were the size, proportion, and net change of the urban subpopulations. Few of these variables were significantly correlated with residential segregation (Appendix B). The lack of association between demographic factors and segregation variables may be a function of the widely differing characteristics of the cities in the study. The more interesting results were not concerned with segregation, but were observed in the association of demographic variables with economic variables. Notably, high correlations were observed between the proportions of minorities in a city and the disparities between the median incomes of population groups. The higher the percentages of Blacks or Mexican-Americans in a city, the higher the probability that the incomes for that group would be lower and that income disparities between groups would be greater (Table 17). These statistics are difficult to interpret. Blacks and Mexican-Americans are not represented in greater proportion in either large or small cities, but percentages of minorities seem to increase the probability of economic disadvantages.

Economic Factors

Two general types of variables were significantly associated with residential segregation: (1) the incomes of the white and minority populations, and (2) the differences between these incomes. Generally, an increase in minority incomes or a decrease in income disparities between groups were associated with declines in residential segregation.

TABLE 17

CORRELATIONS OF INCOME VARIABLES WITH THE PERCENTAGE OF MINORITIES FOR SELECTED URBANIZED AREAS IN THE SOUTHWEST, 1960 AND 1970

1960	Percentage of Minorities			
	1960		1970	
	Black	Mexican-American	Black	Mexican-American
Black Income	-.51		-.23	
Mexican-American Income		-.44		-.41
Difference between white and Black incomes	.67		.65	
Difference between white and Mexican-Americans		.42		.68

Source: Author's calculations.

However, the correlations between the income variables for groups and comparative indexes of residential segregation were not consistent in both time periods (Table 18).

These correlations indicate that the associations of income and income disparity only partially influence residential segregation. This supports the findings of Rabinovitz (1977) and Frey (1978), who determined that increases in the competitive economic position of minorities are not being reflected by suburban minority migrations, and the dispersal of minorities to the suburbs is the only practical process by which residential segregation can be reduced.

TABLE 18

CORRELATIONS OF INCOME VARIABLES WITH SELECTED DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960 AND 1970

1960

	Distance-Based Segregation Indexes		
	White versus Black	White versus Mexican American	Black versus Mexican-American
Black Income	-.17		-.36
Mexican-American Income		-.24	-.43
Difference between white and Mexican American incomes		.50	
Difference between white and Black incomes	-.004		.05

1970

	Distance-Based Segregation Indexes		
	White versus Black	White versus Mexican-American	Black versus Mexican-American
Black Income	-.43		-.49
Mexican-American Income		-.27	-.24
Difference between white and Mexican American incomes		.14	
Difference between white and Black incomes	.48		.38

Source: Author's calculations.

Final Analysis

The final analysis consisted of selecting the variables that were significantly correlated with the three types of distance-based segregation indexes. The purpose of the analysis was to test the strength of the variables to determine which variables best predict each segregation type. The statistical technique used was multiple regression analysis. The variables that were selected by the stepwise procedure and utilized to compile the multiple regression coefficients were highly intercorrelated. Intercorrelations accumulate a false bias in the analysis by violating the assumption of interdependency of variables. The type of variables that comprised the intercorrelated set of "predictors" were primarily economic and status variables. When the intercorrelated variables were removed from the analysis procedure, a substantial reduction occurred in the multiple coefficient of determination. Multiple correlation analysis was inconclusive in delimiting a set of variables that were related to white versus Black and white versus Mexican-American segregation, but was more conclusive concerning Black versus Mexican-American segregation (Table 19, 20, 21). The analysis of Black versus Mexican-American segregation was the only equation where a multi-variable model was useful in predicting residential segregation. In this model two status, one demographic, and two cultural variables produced a coefficient of determination that explains 62 percent of the variance in the distance-based index.

Variables from the four categories of status, cultural, demographic, and economic were included in model equations for the three

TABLE 19

STEPWISE MULTIPLE REGRESSION FOR DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST

Dependent Variable - White Versus Black Segregation

Variable	b	Standard Error	F	Significance
Step 1				
Percent Black Completing High School	-.0080	.0020	15.95	.0004
R = .334				
F = 15.95				
Significance = .0004				
Step 2				
Percent White Population	.0024	.0014	2.78	.106
Percent Black Completing High School	-.0077	.002	15.69	.0004
R2 = .388				
F = 9.81				
Significance = .0005				
Step 3				
Percent White Population	.003	.0015	3.94	.056
Percent Black Completing High School	-.0049	.0030	2.69	.111
Ratio of White and Black Median Family Income	.170	.1407	1.46	.237
R2 = .416				
F = 7.12				
Significance = .0009				

Source: Author's calculations.

TABLE 20

STEPWISE MULTIPLE REGRESSION FOR DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST

Dependent Variable - White Versus Mexican-American Segregation

Variable	b	Standard Error	F	Significance
Step 1				
Mexican-American Mean Persons per Household	.1241	.04653	7.11	.0119
R2 = .182				
F = 7.11				
Significance = .0119				
Step 2				
Percent Mexican-Americans Completing High School	-.0051	.0017	9.23	.005
Percent Total White-Collar Workers	.0039	.0028	1.98	.169
R2 = .223				
F = 4.62				
Significance = .018				
Step 3				
Percent Mexican-Americans Completing High School	-.0067	.0021	10.04	.004
Percent Total White-Collar Workers	.0045	.0028	2.58	.119
Ratio of White to Mexican-American Median Family Incomes	-.1083	.0885	1.50	.231
R2 = .266				
F = 3.63				
Significance = .024				

Source: Author's calculations.

TABLE 21

STEPWISE MULTIPLE REGRESSION FOR DISTANCE-BASED SEGREGATION INDEXES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST

Dependent Variable - Black Versus Mexican-American Segregation

Variable	b	Standard Error	F	Significance
Step 1				
Median Black Family Income	-.00008	.00002	10.35	.003
R = .244				
F = 10.35				
Significance = .003				
Step 2				
White Population	.00001	.00001	6.42	.017
Median Black Family Income	.00011	.00003	18.49	.0002
R2 = .374				
F = 9.26				
Significance = .0007				
Step 3				
White Population	.00001	.1538	6.83	.014
Median Black Family Income	.00002	.4523	20.10	.0001
Mean Black Persons per Household	.1477	.0785	3.49	.072
R2 = .439				
F = 7.83				
Significance = .0005				
Step 4				
Percent Mexican-American	-.0036	.0017	4.70	.039
Ratio of Black to Mexican-American Median Family Income	.3425	.1659	4.26	.048
Black Mean Persons per Household	-.6786	.1413	23.06	.0001
Mexican-American Mean Persons per Household	.4827	.0852	32.06	.0001
R2 = .620				
F = 11.83				
Significance = .0001				

Source: Author's calculations.

types of residential segregation. Status variables were useful in predicting the segregation of whites from Blacks and Mexican-Americans. Cultural variables were useful in predicting the segregation of Mexican-Americans from whites and blacks. Economic variables were useful in predicting the segregation of Blacks from whites and Mexican-Americans.

Status variables are important explanations for models involving whites. The movement of whites from inner cities to the suburban locations was a factor in the maintainence of white versus black segregation, and much of this migration was suspected to involve higher status white-collar workers. Mexican-Americans had better representation in white-collar jobs despite higher education levels for Blacks. White collar jobs resulted in greater earnings and increased mobility for Mexican-Americans as opposed to Blacks, and contributed to the decline of white versus Mexican-American segregation and the maintainence of Black versus Mexican-American segregation.

The cultural variable appeared to be important in defining Mexican-Americans. The mean number of Mexican-American persons per room was significantly correlated to increases in white versus Mexican-American segregation (.42), and Black versus Mexican-American segregation (.34). However, these correlations are suspect since persons per household was highly correlated with education level (.79) and income (-.61). One interpretation is that increased persons per household for Mexican-Americans is a response to decreased incomes and a shortage of housing, combined with large extended families.

Demographic variables were the least useful in predicting residential segregation. Percent white and total white population of urbanized areas entered into the steps of the equation for white versus Black and Black versus Mexican-American segregation, but neither were significant additions to the analysis. Changes in the population composition and absolute minority populations between 1960 and 1970 were expected to have impact on residential segregation. Nevertheless, no significant correlations were observed for any temporal demographic variables.

It was anticipated that minorities incomes would be important in the decision-making process of residential selection and the dispersal of minorities. In the urbanized areas of the Southwest, disparities between incomes also assume important roles for all types of segregation. Increases in minority incomes, from 1960 to 1970, relative to white income was .1 percent for Blacks and 3 percent for Mexican-Americans. For segregation to be reduced, minority incomes must be absorbed by sequential ownership through the residential filtering process. The high growth rates of Southwest urban areas in the 1960s were expected to promote filtering, and minorities would have better opportunities for residential dispersal than previous decades. Increases in Mexican-American incomes appears to have partly induced declines in residential segregation; Black incomes and Black segregation were relatively unchanged.

The capabilities of socio-economic and demographic variables to predict segregation appears most useful for Black versus Mexican-

American segregation. The unaccounted variance in residential segregation is obviously due to factors not included in this analysis. The factors most likely to provide explanations are variables that are associated with population groups that dominate specific census tracts. In these cases the identification of the spatial location of the tracts and their associated population characteristics are required for analysis. Another possibility has been postulated by Kantrowitz (1973), and concerns the inertia of residential patterns and social segregation. This view asserts that segregation has become an entrenched fact of large cities and is maintained by the immense scale of interactions. As Frey (1978) suggests, even if all obstacles to integration were removed, the number of ilndividual migrations needed is so large that decades would elapse before significant changes could be effected in residential segregation.

CHAPTER VI

SUMMARY AND CONCLUSIONS

This research has analyzed residential segregation in a threefold manner. The first portion of the study tested three available indexes of segregation. In those trials the distance-based index was selected as the superior statistic in terms of feasibility, sensitivity, and applicability.

The second part of this research involved the application of the distance-based index to three population groups in selected urbanized areas of the Southwest. Segregation scores were calculated for whites versus Blacks, whites versus Mexican-Americans, and Blacks versus Mexican-Americans in thirty-four urbanized areas. The resulting segregation values were examined for the degree of segregation and were ranked and compared cross-secionally and temporally for the years 1960 and 1970.

The last portion of the study proposed to relate the existing segregation of the urban Southwest to other socio-economic variables. An exploratory analysis composed of correlation coefficients was utilized to initially select variables for further analysis. These variables were analyzed by multiple regression analysis (stepwise) to

identify which variable or variables were most related to residential segregation.

Summary

The Segregation Index and the Study Area. This research represents an extensive real world test of the distance-based index. The functioning of the index as a statistic for measuring residential segregation provides increased sensitivity to spatial patterns, and accumulates less variance when measuring data for cross-sectional and temporal comparisons. Objections to the use of the index focus on the larger amount of data required, and the complex manipulation processes necessary for distance measurement. At present the speed limitations of computers restrict the practical use of the process to areas that have less than 1,000 observation units. Higher-speed computers may reduce or eliminate this limitation.

The thirty-four urbanized areas studied in the Southwest proved to be highly variable in terms of socio-economic and demographic characteristics. Historical residential patterns are important elements in present-day population compositions and locations. The high in-migrations of Blacks and Mexican-Americans significantly altered the population composition of Sunbelt cities during the 1960s.

Residential Segregation. The Black population was observed to be more segregated from whites than were Mexican versus Americans in 1960 and 1970. The changes from 1960 to 1970 for whites versus Blacks were highly variable. A slight decline was noted in average segregation

values, although there was an almost equal number of increasing and decreasing cities. The high variation precludes a firm conclusion regarding trends in white-Black segregation.

White versus Mexican-American segregation was found to be approximately one-half the severity of white versus Black segregation for both time periods. Trends in residential segregation from 1960 to 1970 exhibited a fairly consistent decline. Only six of the thirty-four urbanized areas were observed to have notable increases in segregation, versus twenty-three declines. The remaining five cities depicted minor increases, but these were the least segregated urbanized areas in 1960.

Black versus Mexican-American segregation was highly correlated with white versus Black segregation. As a result, it shared the high values, the high variability, and the slight decline characteristic of the latter segregation. That Blacks are generally segregated from Mexican-Americans is presumably the result of greater Mexican-American dispersals in the urbanized areas.

Correlates of Segregation. The exploratory analysis of four categories of socio-economic and demographic variables utilized a product-moment correlation matrix. The technique yielded few items that were significantly correlated with residential segregation. Economic and status variables had the highest coefficients and were strongly intercorrelated with each other and with other variables. Minority education levels, minority incomes and the inequalities between white and minority incomes were identified as being the best predictor

variables in the exploratory analysis.

The results of the exploratory search and selection were analyzed using multiple regression analysis (stepwise). However, the results from multiple regression were weakened because of the high intercorrelation of income variables (multicollinearity). The analysis delimited only Black versus Mexican-American segregation as a multivariable model that was useful in predicting residential segregation. The model explained 62 percent of the variance associated with Black versus Mexican-American segregation. The white versus Black segregation model explained 42 percent, and the white versus Mexican-American explained only 27 percent.

The best predictors for residential segregation were: Education and income variables for white versus Black segregation, cultural variables for white versus Mexican-American, and income and cultural variables for Black versus Mexican-American.

Conclusions

That residential segregation in the Southwest has not significantly declined for Blacks has been established. Mexican-American segregation has decreased, although the large declines predicted in some studies are not apparent. A notable facet of this research is the high variability of southwestern urbanized areas in terms of the net migrations and population composition of individual cities. It is likely that these variations have reduced the explanation power of the analysis, but constitute an important aspect of segregation

research.

The socio-economic characteristics of minorities exhibited variations not expected prior to actual data-gathering. Part of the variation is caused by the advancement of a limited number of minorities possessing greater mobility due to increased status and economic purchasing power. The advancement of the competitive position of Mexican-Americans is likely to produce significant decline in segregation over a long time span. The continued lack of advancement for Blacks will maintain segregation at high levels. Short time periods of one decade or less are not expected to show sizeable segregation changes, even in high growth areas such as the Southwest.

The Future

This research has produced both positive and negative findings. As it seems in all research, fewer questions were answered than the number of new questions raised. Findings in this study disagree with those in some previous research but reinforce in others.

The use of the distance-based index has added a new dimension to residential segregation analysis. It is more sensitive than other indicies in its ability to make temporal and cross-sectional comparisons. The comparative ability of the index, where applicable, reduces the variance of segregation index measurements. The spatial patterns of minority residences can now be included in segregation measurement where formerly such distributions were of necessity ignored.

This study has limitations primarily in the age, type, and accuracy of the data collected. Future work using more recent data, perhaps concerning fewer but more intensively studied cities, would be a logical next step. Recent information suggests that the growth of the Sunbelt has reached it peak, and the effects of a growth slowdown on minority migration and residential segregation are not predictable. Comparative analysis is available for segregation measurement, and the continued application of the distance-based index to segregation questions should provide some of the answers to trends in residential segregation.

APPENDIX A

COMPARABILITY OF MINORITY POPULATION DATA 1960 TO 1970

There are some slight differences in the manner in which minority populations were defined and reported in 1960 and 1970. Race is reported for three categories white, Negro and other races White persons were counted based on responses from individuals as their race and included only those persons who designated themselves as white.

The category of Negro included all persons who designated themselves as Black. Persons of mixed Black and white descent, and mixed Black and Indian descent, were also counted as Black unless in the latter case the Indian ancestry was clearly dominant.

In 1960, persons of Spanish ancestry reported only persons of the white race or white head of households having Spanish surnames. Persons of the white race having a Spanish surname comprised 98 percent of persons of all races having a Spanish surname. In 1970, persons of any race having a Spanish surname were reported. As a subgroup white persons comprised 97 percent of this total. Thus between 1960 and 1970, the numbers of persons of Spanish surname for the census tracts in the study area increased on the average by 2 percent based on the change of definition. The use of Spanish-surnames does not directly identify

persons who consider themselves Mexican-Americans, some persons who are culturally Mexican-American do not have Spanish su: .nes. Conversely, there are persons who have Spanish surnames that are not Mexican-Americans. The adjustments for these variations are difficult to perform on real data. Estimates concerning the correct identification of Mexican-Americans using 1960 census data were conducted by Mittelbach and Marshall (1970). They found that the estimation of Mexican-Americans included largely offsetting items, but concluded that a population estimate for Mexican-Americans in 1960 was 3.5 percent less than the census figure for white persons of Spanish surname.

Census figures themselves are estimates of the population. Not only is the underemuneration of minorities a significant problem, but differences were observed between population data available on census tapes and the same data category in printed census documents. In most cases an item on census tape appeared to be undercounted compared to the same item in printed documents. These variations were observed for 1970 census documents, comparisons between 1960 census documents appeared to be identical.

APPENDIX B

SIMPLE LINEAR CORRELATIONS COMPARING THE THREE DISTANCE-BASED INDEXES WITH SOCIO-ECONOMIC AND DEMOGRAPHIC VARIABLES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1960

	Segregation Variables		
	White Versus Black	White Versus Mexican-American	Black Versus Mexican-American
Status Variables			
Percent of Civilian Population Employed	.21	.17	.40
Percent Employed in Construction	.13	.53	-.05
Percent Employed in Manufacturing	-.14	-.36	-.25
Percent Employed in Services	-.20	.16	-.08
Economic Variables			
Median White Family Income	-.26	-.29	-.51
Median Black Family Income	-.17	-.26	-.36
Median Mexican-American Family Income	-.31	-.24	-.43
Ratio between White and Black Median Family Incomes	-.01	.03	.05
Ratio between White and Mexican-American Median Family Incomes	.50	.50	.42
Ratio between Black and Mexican-American Median Family Incomes	-.36	-.33	-.27
Percent Housing Available	-.20	.16	-.08
Gross Rent	-.02	.07	-.15
Demographic Variables			
Total Population	-.05	-.06	-.02
White Population	-.03	-.06	-.01
Black Population	.05	-.03	.02
Mexican-American Population	-.20	-.03	-.06
Percent Population White	.43	.34	.41
Percent Population Black	.06	-.12	.07

Percent Population Mexican-American	-.39	-.22	-.35
Percent Population Living in Different House in 1955	.17	.36	.05

Source: Author's Calculations

SIMPLE LINEAR CORRELATIONS COMPARING THE THREE DISTANCE-BASED INDEXES WITH SOCIO-ECONOMIC AND DEMOGRAPHIC VARIABLES FOR SELECTED URBANIZED AREAS OF THE SOUTHWEST, 1970

	Segregation Variables		
	White Versus Black	White Versus Mexican-American	Black Versus Mexican-American
Status Variables			
Percent of Civilian Population Employed	.14	.02	.45
Percent Employed in Construction	.19	.19	.07
Percent Employed in Manufacturing	-.01	-.35	-.05
Percent of Population Employed in White Collar Jobs	-.28	.02	-.08
Percent of Blacks Employed in White Collar Jobs	-.25	.16	-.27
Percent of Mexican-Americans Employed in White Collar Jobs	-.29	-.36	-.27
Median School Years Completed by Total Population	.10	.27	.08
Median School Years Completed by Blacks	-.56	-.12	-.38
Median School Years Completed by Mexican-Americans	-.36	-.35	-.31
Percent of Population Completing High School	-.22	.07	-.22
Percent of Blacks Completing High School	-.58	-.14	-.44
Percent of Mexican-Americans Completing High School	-.47	-.42	-.37
Cultural Variables			
Mean Number of Persons Per Household	-.14	.10	-.27
Mean Number of Whites Per Household	.22	.20	.10
Mean Number of Blacks Per Household	.09	.26	-.25
Mean Number of Mexican-Americans Per Household	.41	.43	.34
Economic Variables			
Median White Family Income	-.12	-.20	-.28
Median Black Family Income	-.43	-.17	-.49
Median Mexican-American Family Income	-.20	-.28	-.24
Ratio between White and Black Median Family Incomes	.48	.05	.35
Ratio between White and Mexican-American			

Median Family Incomes	.10	.14	-.02
Ratio between Black and Mexican-American Median Family Incomes	.33	-.05	.34
Percent Housing Available	.24	.11	.32
Median Gross Rent for Total Population	-.14	.01	-.21
Median Gross Rent for Black Population	-.41	-.19	-.48
Median Gross Rent for Mexican-American Population	-.19	-.21	-.27
Demographic Variables			
Total Population	-.09	-.10	.01
White Population	-.05	-.13	.03
Black Population	-.01	-.14	.09
Mexican-American Population	-.23	.14	-.07
Percent Population White	.28	.11	.27
Percent Population Black	.14	-.37	.16
Percent Population Mexican-American	-.31	.11	-.29
Percent of Total Population Moved Since 1965	.21	.36	.05
Percent of Black Population Moved Since 1965	-.38	-.15	-.37
Percent of Mexican-American Population Moved Since 1965	.21	-.14	.33

Source: Author's Calculations

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