HOUSEHOLD TYPE, ECONOMIC DISADVANTAGE, AND RESIDENTIAL SEGREGATION: EMPIRICAL PATTERNS AND FINDINGS FROM SIMULATION ANALYSIS

A Thesis

by

LINDSAY MICHELLE HOWDEN

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2005

Major Subject: Sociology

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Approved as to style and content by:

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ABSTRACT

Household Type, Economic Disadvantage, and Residential Segregation: Empirical Patterns and Findings from Simulation Analysis.

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In this thesis I focus on segregation between households giving attention to the roles that family type, economic inequality, and race can play in promoting and maintaining these patterns. I first consider three lines of urban ecological theory that have been offered to help explain patterns of segregation. One line of theory emphasizes the role of variation in preferences and needs. The second emphasizes urban structure, market dynamics, and economic inequality, while the third emphasizes the role of race. Research examining the role of consumer preferences in the neighborhood and housing choices of Americans has documented the salience of preferences regarding housing characteristics, neighborhood income, distance to employment, and neighborhood racial composition. Related research shows that these preferences vary with social characteristics such as socioeconomic status, ethnicity, gender, stage in the life cycle, and household type. I review these literatures and link them with urban ecological theory and the related literatures on social area analysis and factorial ecology. These theories argue that households within a city are likely to cluster together in space based on mutually shared characteristics and preferences. To explore these theories, I draw on

census data for Houston, Texas and use the $_xP_x$ measure to document patterns of contact between households based on family type, poverty status, and race. I also decompose the effects that each of these variables can have separately and in combination with each other. Following this analysis, I estimate a spatial attainment model that predicts characteristics of neighborhoods that individuals in each of the race, poverty and family type groups would live in. Finally, I use computer simulation methods to explore how micro-level dynamics of housing markets can produce patterns of segregation between groups who are similar in their location preferences. Specifically, I explore how the factors of area stratification and group income inequality can lead to segregation between groups who hold similar location preferences.

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CHAPTER I

INTRODUCTION

In this thesis I focus on segregation between groups that differ on multiple social characteristics. In recent decades, the overwhelming majority of research on residential segregation has focused on segregation between racial and ethnic groups, usually considering segregation between groups that differ on only one social characteristic - race. Relatively little research has focused on patterns of residential separation between household types, and how this may vary by race and poverty status. I direct attention to this issue because it may have relevance to understanding certain aspects of recent trends in the neighborhood composition of "under-class" neighborhoods – inner-city poverty areas in large metropolitan areas (Wilson 1987).

Over the past several years, inner-city poverty neighborhoods have changed both quantitatively and qualitatively. Quantitatively these neighborhoods have become more numerous and qualitatively these neighborhoods have become more homogeneously poor with high proportions of households in poverty (Jargowsky 1996; 1997). Massey and Denton (1993) stress the role of housing discrimination and racial segregation in these trends, while others stress the role of class dynamics, economic inequality, and urban structure (Jargowsky 1997; Wilson 1987). These two perspectives are not mutually exclusive and need not be pitted against each other. Taken together they

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This thesis follows the style of *American Sociological Review*

provide a compelling argument that high levels of racial segregation can combine with class segregation, especially increasing class segregation within minority populations, to concentrate poor minority households in underclass neighborhoods. These areas are distinctive because, in contrast to poor neighborhoods in earlier decades, they are characterized by unprecedented levels of homogeneous poverty and concentrated social problems.

I accept these important arguments and build on them by directing attention to a third dynamic that may be an additional factor contributing to residential segregation generally and underclass neighborhoods in particular. This third dynamic is segregation by household type. Based on an interest in the consequences of segregation for children, I focus particular attention on families with children and segregation between married couple families and families headed by unmarried women. Several factors make this form of segregation relevant to understanding urban poverty and underclass neighborhoods. One factor is that there is a steady long-term trend in which larger fractions of children reside in households headed by unmarried women, a trend that is especially pronounced for minority groups. Another factor is that economic inequality between married couple and single-mother families is substantial and may be growing due to the emergence of the norm that both parents in married couple families work. Additionally, in underclass areas the fraction of children residing in married couple households is very small and declining over time. These and other factors suggest that segregation by household type may be important in shaping the nature of underclass areas.

Following this introductory chapter, Chapter II gives an overview of the previous research that is relevant to this topic. This literature review is divided into three parts: First, the previous research that documents segregation patterns is reviewed, followed by a review of the literature regarding outcomes or neighborhood characteristics associated with segregation or membership in a disadvantaged social group, and finally, literature is reviewed that gives examples of previous explanations of the causal factors that influence the development of residential segregation. The sections of this literature review correspond to the following three chapters in this thesis. Chapter III documents patterns of segregation in Houston, Texas based on race, poverty status, and family type. This analysis is followed in Chapter IV by an analysis of neighborhood outcomes associated with these segregation patterns, or with membership in a particular social group. Chapter V concludes the empirical portion of this thesis by using simulation methodology to explore how area stratification and inter-group inequality can interact to influence the development of residential segregation between groups. The final chapter, Chapter VI provides a summary of the findings presented in this thesis along with concluding remarks.

CHAPTER II

LITERATURE REVIEW AND RESEARCH HYPOTHESES

The study of residential segregation has many facets. Research documents patterns of segregation that exist between groups with different social characteristics, it examines the impact segregation and disadvantaged social status have on individual life chances and neighborhood characteristics, and it investigates the factors that influence the patterns of segregation. The research reported in the later chapters of this thesis addresses each of these three aspects of residential segregation. The present chapter reviews previous research that has been conducted in each of these areas of focus.

Patterns of Segregation

Segregation along race and ethnic lines has been an important research topic for many decades. The consistent finding has been that segregation along racial and ethnic lines continues to exist to a significant degree within the United States (Alba and Logan 1993; Charles 2003). While there is some evidence that the level of segregation by race/ethnicity has been declining over time, this decline is modest (Fischer 2003; Logan 2003; Glaeser and Vigdor 2003; Frey and Farley 1996). Other studies report that racial segregation is substantial, even when educational attainment, occupation, and income are taken into account (Farley 1977b; Fischer 2003; Massey and Fischer 1999; Sims 1999).

Recent research on race/ethnic residential segregation has also focused on the differences in levels of segregation across different racial/ethnic groups. This research consistently finds that there are significant variations in the level of segregation

experienced by different groups (Fischer 2003; Frey and Farley 1996; Alba and Logan 1993). This research indicates a "hierarchy" of minority contact with whites, where Asians consistently experience the least amount of segregation from non-Hispanic whites, followed by Hispanics. Blacks have always been found to experience the highest degree of segregation and lowest levels of contact with whites (Fischer 2003; Frey and Farley 1996; Alba and Logan 1993). In addition, Blacks are also found to experience segregation along multiple dimensions (e.g., uneven distribution, isolation, centralization, clustering, etc.) more frequently than other minority groups, resulting in a "hypersegregation" that is rarely seen for other groups (Massey and Denton 1989).

Another important aspect of segregation is segregation by socioeconomic status. This type of segregation has also been well documented (Jargowsky 1996). Research on economic segregation finds that area stratification is an important aspect of this type of segregation, resulting in a pattern where central cities become areas with high concentrations of poverty compared to relative low levels of poverty in suburban rings (Jargowsky 1997; White 1987). In addition segregation by socioeconomic status overall, economic segregation is found to exist both within and across racial groups.

Within race and ethnic groups, a degree of segregation by socioeconomic status is found for all groups, however the level of SES segregation varies (Sims 1999). This research indicates that white, upper-class households experience less contact with members of lower-class households than do their minority counterparts, indicating that high status minority groups have less ability to translate their status into residential location than do members of the white majority (Sims 1999). Massey and Fischer

(1999) examined economic segregation across groups, finding that, while majority-minority contact did increase as income increased, the overall level of segregation remains high. In addition, this research found that income increased contact with whites for Hispanics and Asians at a higher rate than it did for Blacks, again supporting the notion of a racial "hierarchy" (Massey and Fischer 1999). Previous research has also found evidence of an additive effect of SES on race/ethnic segregation. For example, Fischer (2003) found that segregation along racial and economic lines is compounded for individuals who experience a disadvantaged status in both groups (i.e. poor, black households).

While there has been much research documenting segregation patterns by race and economic factors, as indicated in the previous discussion, relatively little research has examined segregation based on other characteristics. One exception to this is found in Michael White's 1987 study describing neighborhood characteristics and spatial distribution. White found a degree of segregation to exist along multiple characteristics, including occupation, education, age, marital status, and household type. White looks at these variables separately and within race/ethnic groups. His finding of segregation along multiple characteristics indicates that more attention to the interaction of several variables on the degree of segregation between groups is warranted.

Research on residential location and family status (Spain 1990), although not directly concerned with measurement of segregation by household type, has also found that single mothers are over-represented in central cities and under-represented in suburbs. Since previous research has indicated an increase in households headed by

single mothers (Lerman 1996), and that these single mother households are significantly more likely to be poor (Rank 1986) and of a race/ethnic minority (Bianchi 1980; Franklin 1988), separate and interaction effects of race, SES, and family type are potentially important factors for the study of residential segregation.

With these previous findings concerning segregation patterns in mind, I introduce several hypotheses regarding segregation patterns. The hypotheses are:

- **H.1:** Households will be segregated by family type both overall and controlling for ethnic status and socioeconomic status.
- **H.2:** Households will be segregated by racial and ethnic status both overall and controlling for socioeconomic status and household type.
- **H.3:** Households will be segregated by socioeconomic status both overall and controlling for ethnic status and household type.
- **H.4:** Households that differ on multiple status dimensions will be more highly segregated than households that are similar on these same status characteristics. The highest level of segregation will be between households that differ on all three characteristics of race, poverty, and household type.

These hypotheses will be tested in Chapter III of this thesis.

Consequences of Segregation

The dynamics of segregation by household type are important in their own right. They are also important for the fact that they may combine with other segregation dynamics, especially racial dynamics, to produce even higher amounts of segregation. One obvious possibility is that groups that experience a disadvantaged status in more than one area can be significantly impacted in the types of neighborhoods that they

reside in. For example, a larger number of single parent, female-headed households are from a racial/ethnic minority than are from the majority group (Franklin 1988; Bianchi 1980; Eggebeen and Lichter 1991). In addition, these women are also more likely to be from a low socioeconomic background and to be living in poverty than are other groups (Bianchi 1980; McLanahan 1985; Rank 1986; Treas and Walther 1978). Households with this combination of social characteristics may be especially unlikely to reside in affluent neighborhoods thus reinforcing broader patterns of racial and economic segregation (Jargowsky 1996; Farley 1977b; Wilson 1987).

In addition to research that simply documents patterns of segregation for various social groups, much research has also been concerned with the consequences of segregation for disadvantaged social groups. Concern about the level of segregation in U.S. cities is not solely focused in contact between social groups, but also the negative impact that segregation can have on the groups who experience it. The consistent finding is that groups who experience a disadvantaged social status also experience negative outcomes in other characteristics (Jargowsky 1997; Bianchi 1980; Alba, et al 1994; McLanahan 1985; Charles 2003; Wilson 1987).

General Status Attainment

A large literature provides theoretical and empirical arguments that segregation has implications for status attainment. For majority populations, researchers theorize that segregation carries benefits and leads to higher status outcomes in many domains including education, employment, occupation, and income, home ownership, and wealth accumulation (e.g., via home ownership). For minority populations, researchers theorize

the opposite, arguing that it leads to lower status outcomes in these and other domains. The arguments draw on a variety of underlying mechanisms that vary across neighborhoods and are seen as potentially relevant to status attainment. These include variations in school quality, peer groups, presence of role models, access to social and cultural capital, and so on. In this section I briefly note some of these arguments.

Home ownership has often been portrayed as the quintessential fulfillment of the "American Dream." Research on home ownership has found that access to the American Dream of home ownership is not the same for all groups (Shapiro 2004; Spain 1990). Shapiro (2004) uses a qualitative analysis to study differences in home ownership between whites and blacks. He finds that even among individuals with similar status, blacks are less able to translate their status into home ownership. He also finds that when blacks are able to purchase homes they are of lower quality and value. Similar findings for minority home ownership are found in studies that are more quantitative in nature (Rosenbaum 1996; Massey, et al 1987). Low rates of home ownership have also been found among single mothers. In a parallel to the findings for minority groups, Spain (1990) found that households headed by an unmarried female are less likely to be homeowners (also Sweet 1990). This research also finds that single mothers are more likely to live in poor quality housing and in homes with a lower value than do married couples (Spain 1990).

Residential segregation has also been linked to differences in educational attainment for groups. This includes differences in a minority individual's ability to afford education as well as access to a comparable quality of education as is available to

whites (Shapiro 2004). Additional research finds that, not only are minorities and whites different in the level of education that they attain, but also in the pathways that each experiences towards that attainment (Kerckhoff and Campbell 1977; Portes and Wilson 1976). Similar results are found when rates of unemployment are examined across racial groups. Rates of unemployment are found to be higher among minorities, specifically blacks and Hispanics, than they are for whites (Farley 1977a; D'Amico and Maxwell 1995).

Another important aspect of segregation is individual poverty. The impact of poverty can be assessed from two angles. First, poverty can be seen as a variable that impacts other outcomes (Jargowsky 1997). Additionally, poverty itself can be seen as an outcome influenced by other characteristics, such as race and family type (Bianchi, 1980; Lerman 1996; McLanahan 1985). Family type is associated with childhood poverty, welfare use, and the reproduction of childhood poverty into adulthood (Rank 1986; McLanahan 1985; Lichter 1997). This research also finds that rising levels of child poverty is associated with increasing numbers of single parent families (Lichter 1997; Bianchi 1980). Farley (1977a) also finds that income inequality along racial lines interacts with inequality by family type.

The research documented above reports that segregation and membership in a disadvantaged group is associated with detrimental outcomes for characteristics such as home ownership, educational attainment, and poverty. As mentioned previously, the characteristics of race, poverty status, and family type are often interrelated, indicating that the impact of these characteristics on outcomes is interrelated as well. This implies

that the effects of race, poverty, and family type could be additive, with disadvantaged status on more than one of these characteristics leading to an increasing likelihood of detrimental outcomes in other characteristics.

Neighborhood Attainment

The previous section reviewed previous literature that discusses the outcomes of individuals on the basis of their race, poverty status, or family type. The consequences of segregation for attainment can also be considered in terms of the attainment of residential outcomes at the neighborhood level. This would include the impact of segregation on such neighborhood level outcomes as the presence of other groups, the status level of the neighborhood, the neighborhood crime rate, and so on.

In this section, I describe how this view of segregation has led to the emergence of a literature focusing on neighborhood attainments. Neighborhood attainment is an individual-level outcome, but it is assessed on the basis of neighborhood characteristics, not just the status characteristics of the household. Thus, education, home ownership, and home value are status outcomes which can be assessed based on the outcomes seen for the individual household. The interpretation of these outcomes is slightly different, however, since the education level of the neighborhood, the home ownership rate for the neighborhood, and the value of homes in the neighborhood are separate outcomes apart from the education, home ownership status, and home value for a household. In the neighborhood attainment literature both individual and neighborhood attainments are seen as relevant. Thus, for example, a household is seen as attaining neighborhood

status (say as measured by average neighborhood home value) separately from the status of the household itself (i.e. the value of their own home).

In the neighborhood outcome of home ownership, previous research has found that neighborhoods characterized by high rates of poverty also experience low rates of home ownership. Jargowsky (1997) found an inverse relationship between neighborhood poverty rate and the rate of neighborhood home ownership. Another social characteristic that can be associated with segregation is unemployment and labor force participation rates. Jargowsky (1997) finds that black and Hispanic minority groups tend to live in neighborhoods with higher unemployment rates and a lower rate of labor force participation than whites for men, and with higher neighborhood rates of unemployment also found for black and Hispanic women. Similarly, Jargowsky (1997) finds that neighborhoods with an increasing proportion of poverty households also experience increasing rates of unemployment, with minorities again consistently displaying higher neighborhood unemployment rates than whites for all levels of neighborhood poverty.

The previous literature on neighborhood status attainment finds that racial segregation can also be associated with crime rates (Alba, et al 1994), neighborhood poverty rates, and vacancy rates (Jargowsky 1997). The previous research documenting outcomes of social characteristics for *individuals*, leads to the hypothesis that an individual's race, poverty status, or family type will also affect the outcomes of the *neighborhood* that they reside in. As shown in this section, previous research has found neighborhood outcomes to in fact be related to race or poverty status. This body of

theory and research will motivate empirical analyses I report in Chapter IV, which will investigate the impact of race, poverty status, and family type on neighborhood attainments. The hypotheses guiding this section of the analysis are:

H.5: Membership in a disadvantaged group increases the likelihood of living in a neighborhood with negative characteristics.

H.6: There is an additive effect to the social characteristics being investigated, such that membership in more than one disadvantaged group is associated with a higher exposure to detrimental neighborhood outcomes.

H.7: The effect of the poverty status and family type variables on neighborhood level characteristics varies across racial groups. For example, the effect of single mother status on median neighborhood income is hypothesized to be higher for blacks than for whites.

These hypotheses will be tested in a spatial attainment model that creates an individual-level dataset from aggregate census data using the Alba and Logan (1992) methodology, allowing for the evaluation of neighborhood outcomes at the individual level. This methodology will reviewed at length in Chapter IV

Explanations of Segregation

There have been many theories put forth that explain the development of residential segregation. While some of these theories present conflicting views about the reasons for segregation, many of these theories offer explanations that are complementary and are not mutually exclusive. The perspective of social area analysis posits that households have needs and preferences based on specific characteristics.[1]

[1]See Schwab (1982) for a review of this perspective.

People then make choices and cluster into "social areas" in cities guided by these characteristics, or tastes. According to this theory, people with similar interests are likely to make similar location decisions. These similar interests are associated with social characteristics such as status, family type, or ethnicity. As a result, areas within a city may take on a distinctive character with regard to social characteristics of the inhabitants and the area may maintain its character over time even as the individual households in the neighborhood come and go.

Social distance theory draws on similar premises but develops implications for segregation in a different way. Social distance theory states that dissimilarity in social characteristics leads to social distance and to less social approval that the member of one group feels with another group. The greater the dissimilarity in social characteristics, the greater the social distance and separation in physical space, leading to lower levels of residential "contact" between the groups (Payne, et al 1974; Evans and Giles 1986). Robert Park gives a succinct statement of this theory in his 1926 book, *Human Communities:*

> 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. And this is true, finally, because it is only as social and psychical facts can be reduced to, or correlated with, spatial facts that they can be measured at all. (Park 1952, pg. 177)

Changes in attitudes over time can be measured by the level of closeness an individual is willing to accept between themselves and members of another social group (Payne, et al 1974). Previous research indicates that high levels of social distance exist between Whites and members of racial minorities (Evans and Giles 1986).

The theories of social area analysis and social distance are theories that can be used to relate continuing segregation to the racial preferences exhibited by race and ethnic groups (Charles 2003; Emerson, et al 2001). These racial preferences have been found to vary by both race/ethnic group (Bobo and Zubrinsky 1996; Evans and Giles 1986), and family type (Emerson, et al 2001; Krysan 2002), lending support to the differences in segregation experienced by these different groups. Theoretical analysis has also provided support for the theory that the residential preferences of both majority and minority groups are important for the development of segregation (Fossett 2003). Salient preferences have been documented for housing characteristics (Shlay 1985), average neighborhood income (Shlay 1986), distance to employment (Baxter 1975), and neighborhood racial characteristics (Emerson, et al 2001; Krysan and Farley 2002). This research also suggests that preferences vary with social characteristics, including family life cycle stage (or family type) (McAuley and Nutty 1982), socio-economic status (as indicated by income) (Shlay 1986, Charles 2000), race/ethnicity (Emerson, et al 2001; Krysan and Farley 2002), and gender (Shlay and DiGregorio 1985).

Social area analysis and urban ecological theory posit that preferences can help foster residential segregation as households cluster together based on mutually shared characteristics and preferences (Anderson and Egeland 1961; Schwab 1982). This leads to the hypothesis that segregation by household type can emerge based on differences in preferences. For example, households with children may hold different preferences and priorities for housing and neighborhood characteristics compared to households without children (e.g., young singles, retired empty-nesters, gay households, etc.) and this may

lead to their uneven distribution across neighborhoods in a city. Similarly, single mother households may hold different priorities regarding housing choices compared to married couple households. For example, married couple households may be more likely to consider housing options where home, work, and schools are more separated in space.

Segregation can also emerge when groups with similar preferences differ in their ability to fulfill these preferences (Clark and Dielman 1996; Sims 1999; Hwang and Albrecht 1987; Jargowsky 1996). This may be an important factor contributing to the segregation of married couple families with children from single parent, female-headed families. These households are likely to have many similarities in preferences based on stage of the family life cycle (i.e., having children in the home), but due to systematic differences in income they may nevertheless be unevenly distributed across neighborhoods based on differences in their ability to satisfy their preferences. Segregation between two groups can also emerge as the result of an interaction between these micro-level processes described in urban ecological theory and urban structure. Preferences and economic inequality can both help explain segregation by household type. Furthermore, they may interact to produce particular patterns of segregation. For example, single-mother families and married couple families may hold many similar preferences based on their stage in the family life cycle, but they may also differ with respect to some preferences based on their household situation. Some evidence suggests that single-mother families may place a higher emphasis on central location and access to public transportation than do married couple families. This suggests that single-

mother and two-parent households may be residentially separated *even controlling for economic status.*

Research on consumer preferences in the housing and neighborhood choices of Americans lends support to the micro-level assumptions of this theory of segregation. It documents that households are guided by a number of salient preferences regarding housing and location outcomes. These include preferences regarding housing characteristics (Shlay 1985), average neighborhood income (Shlay 1986), distance to employment (Baxter 1975), and neighborhood racial characteristics (Emerson, et al 2001; Krysan and Farley 2002). Research also documents that housing preferences vary with social characteristics, including family life cycle stage (McAuley and Nutty 1982), socioeconomic status (Shlay 1986), race/ethnicity (Emerson, et al 2001; Krysan and Farley 2002), and gender (Shlay and DiGregorio 1985).

Macro-level research on aggregate-segregation patterns also lends support to the theory. While studies of segregation generally focus on segregation by race and socioeconomic status, some studies discuss segregation by other factors such as socioeconomic status and family life cycle status (Schwab 1982; Jargowsky 1996). In addition, the extensive literature on factorial ecology provides evidence that multiple social dynamics work to produce segregation in American cities. Factor analytic studies do not measure segregation between groups directly. Instead, they establish that residential neighborhoods differ systematically with regard to the social characteristics of the households residing in them. The consistent finding in this literature is that the three major dimensions of residential clustering can be found in American cities: racial

and ethnic mix, socioeconomic status, and family life-cycle status (Schwab 1982; Hunter 1972). The previous literature also provides a clear direction in support of research that looks at segregation along multiple dimensions simultaneously, as well as the effect that these multiple characteristics can have on the neighborhood characteristics experienced by individuals in these social groups.

The discussion about the factors behind the development of segregation patterns provides a background for the development of several hypotheses about some of the factors involved in the development of segregation patterns by household type. The hypotheses include:

H.8: Segregation produced by market dynamics will vary directly with the extent of economic inequality between groups.

H.9: Segregation produced by market dynamic will vary directly with area stratification.

H.10: The effects of economic inequality and area stratification condition each other such that market dynamics produce the highest levels of segregation when economic inequality and area stratification are both high.

These hypotheses will be tested utilizing simulation analysis to assess the impact of area stratification and inequality between groups on segregation. This analysis is presented in Chapter V of this thesis.

CHAPTER III

DESCRIPTION OF SEGREGATION PATTERNS

In this section, I draw on census data for Houston, Texas to assess patterns of segregation between households based on racial/ethnic status, socioeconomic status, and family type. The data used allow me to examine patterns of segregation and neighborhood characteristics between groups delimited on the basis of varying combinations of these three important social characteristics. After reviewing relevant concepts and measures, as well as a description of my data and sample, this section will report the results of descriptive analysis for Houston, TX and results documenting segregation patterns. In the following section, I define the concepts and measures that will be used in this section of my thesis. These concepts and measures utilize information provided in the technical documentation accompanying Summary File 3 of the 2000 U.S. Census (U.S. Bureau of the Census, 2003).

Concepts and Measures

Family Life-Cycle Status/Household Type

I draw family types on the types identified by the U.S. Census Bureau in the 2000 census. The Census data used for this project includes all family households, while excluding non-family households. Family households are defined as households with two or more related persons. These households are further divided by family type and the presence of related children under 18. The family types included are: married couple families, unmarried male-headed families, and unmarried female-headed families. Each

of these family types is then divided into households with and without children under 18. For this section of the analysis, only married couples with children and unmarried female-headed families with children are included. I have excluded the other family types due to the smaller size and the greater heterogeneity within categories. For example, unmarried women without children includes both elderly and young women.

Race/Ethnic Status

I focus on four census categories of race and ethnicity: Non-Hispanic White alone (hereafter referred to as White), Black alone, Hispanic or Latino alone, and Asian alone. All other race/ethnicity categories, including those identifying as more than one race, I excluded from my analysis due to the small size of the categories.

Socioeconomic Status/Poverty Status

The Census Bureau categorizes families by poverty status according to the income guidelines established by the federal government's official poverty status definition. This definition takes into account both the amount of income and the number of persons in the household. Households are categorized as a poverty household if their household income falls below this level and as a non-poverty household if their income is above.

Neighborhood

I draw on the census measure of "block group" to approximate residential neighborhoods. Block groups are relatively small geographic areas that typically contain 250-500 households.

Residential Segregation

Massey and Denton (1988) identified five distinct dimension of residential segregation: evenness, exposure, concentration, centralization, and clustering. In this study, I examine the dimension of *exposure*, or contact between households based on family type, race/ethnicity, and poverty status. Exposure is defined as "the degree of potential contact, or the possibility of interaction, between majority and minority group members within geographic areas in a city" (Massey and Denton 1988). I measure contact using the $_{X}P_{Y}^{*}$ index and compare observed values to values expected under the assumption of no segregation. I assess the impact of race, poverty, and family type by first examining contact between the contact group, that is, the "Y" group, and itself. I then examine how contact changes when the comparison (X) group differs on one or more social characteristics. For example, the amount of contact that White, married couples with children who are not in poverty have with their own group (an Isolation measure), is calculated first. This contact measure can then be compared to the amount of contact that white, married couples with children who are not in poverty has with groups that differ on one or more status characteristics to asses the effects of race, poverty status, and family type.

An analysis of contact between groups begins with a calculation of the expected amount of contact between the groups if there were no segregation present. This level of contact is equal to the proportion that the contact (Y) group (for example, white, married couples with children not in poverty) represents in the population being studied. In this case, white, married couples with children not in poverty represent 36.9% of the

households included in this study. Under the assumption of random assignment, this is the amount of contact that all other groups should have with white, married couples with children not in poverty. When the actual contact observed between two groups deviates from this expected level of contact, the difference reflects the impact of segregation.

As mentioned above, an analysis of contact begins with first calculating the amount of actual contact that a particular group is found to have with their own group. This is known as the Isolation Index. This index is calculated using the following formula:

$$ {}_{x}P_{x}^{*} = \Sigma\, [(x_i/X)(x_i/t_i)] $$

Where:

x_i = The population of the group for block group i.

X= The group's total population for the city.

t_i = The total population of block group i.

This formula is calculated for each block group in the Houston, Texas area, and then added together to receive an Isolation Index for the city. For example, to obtain the isolation index for white, married couples with children who are not in poverty, the number of these households present in each block group, their total citywide number of households, and the total population in each block group is calculated for each of the 2,706 block groups. This yields an Isolation Index of 61.2, which is larger than the amount of contact expected under random assignment (i.e., 36.9). This indicates that this group is isolated, or segregated, from other groups within the city. To determine the amount of segregation this group experiences from other specific groups, I compute exposure indices for the relevant two-group combinations.

The P* exposure index is calculated in a similar manner to the isolation index, with the exception that it now takes into account the representation of two groups within each block group. The formula for the exposure index is:

$$_xP_y^* = \Sigma\ [(x_i/X)(y_i/t_i)]$$

Where:

x_i = The population of the comparison group (for example, blacks) for block group i.

y_i = The population of the contact group (for example, whites) for block group i.

X= The comparison group's total population for the city.

t_i = The total population of block group i.

For example, the two-group exposure index can be calculated between white, married couples with children who are not in poverty (i.e., theY group) and Black, married couples with children who are not in poverty (i.e., the X group), for example. The number of each of these households for each of the block groups is then entered into the formula along with the total population of each block group and the black (X) group's total representation in the city. This calculation yields an exposure index of 19.2. This index can be compared to both the expected contact measure (36.9) and the isolation measure calculated for the reference group (61.2, for white, married couples with children, non-poverty). This indicates that the level of contact that black, married couples with children who are not in poverty (X) have with white, married couples with children who are not in poverty (Y) is lower than both the amount of contact expected if

there were no segregation and is also lower than the amount of contact that white, married couples with children who are not in poverty (X) have with their own group. In the analysis section, the exposure index is calculated between comparison (X) and contact groups (Y) that differ on every combination of status characteristics (i.e. race, poverty status, and family type), so that effect that each of these status characteristics have on segregation can be determined.

Data and Sample

The data I used in this study was taken from the 2000 Census of the Population. Specifically, I use data provided in Summary File III of the 2000 census. I limit my analysis to the Houston-Galveston-Brazoria Consolidated Metropolitan Statistical Area. For this section of the paper, the relevant tables include information about the race/ethnicity, poverty status, and household type of the Census respondents. These variables are measured both separately and in combination with each other. Appendix A of this thesis contains a more detailed description of how the social groups identified in this study were constructed from census categories for ethnic status, household type, and poverty status.

Table 1. Distribution of Households in Houston, Texas by Race and Poverty Status

	All Family Types			
Race	**Total Households**		**Non-Poverty**	**Poverty**
All Races	*(1,178,163)*	*100.0%*	*89.1%*	*10.9%*
White	(617,258)	52.4%	95.9%	4.1%
Black	(194,666)	16.5%	80.9%	19.1%
Hispanic	(293,802)	24.9%	80.3%	19.7%
Asian	(55,710)	4.7%	90.4%	9.6%

Descriptive Results

I first report descriptive data about the distribution of race/ethnicity, poverty status, and family types in Houston, Texas. Table 1 gives the race/ethnicity and poverty status distribution for all family types. The racial distribution for family households was 52.4% white, 16.5% black, 24.9% Hispanic, and 4.7% Asian. Households with incomes below the poverty line comprised 10.9% of all households. Within racial groups, whites were found to have the lowest proportion of households below the poverty line. Hispanic households had the largest proportion of households in poverty, with Blacks following closely behind.

The next two tables, Tables 2 and 3, give the distribution of married couple households and unmarried female-headed households[2] both by race and poverty status. Both of these tables include only households with children. Out of all family households in Houston, Texas, 43.2% of them were married couples with children, while 12.7% were households headed by single mothers. Single mothers were comprised of a higher proportion minority and poor than married couple households. Despite being a smaller overall proportion of the city population than both whites and Hispanics, black single mothers comprised a higher "raw" number of households than either of these two groups, and was 31.5% of all single mother households. Hispanics were had the highest proportion of households in poverty for married couples and single mothers, 18.7% and 41.2% respectively. Hispanics also had the highest proportion of married couples overall, with Asian households following closely behind. White and Asian households both had a similar proportion of households that were married couple and single mother.

[2]Unmarried Female headed households are hereafter referred to as single mother households.

Table 2. Distribution of Married Couple Households with Children in Houston, TX by Race and Poverty Status

	Married Couples[3]		
Race	**Total Households**	**Non-Poverty**	**Poverty**
All Races	*(509,098) 43.2%*	*90.9%*	*9.1%*
White	(246,028) 39.9%	97.3%	2.7%
Black	(59,428) 30.5%	91.2%	8.8%
Hispanic	(166,196) 56.6%	81.3%	18.7%
Asian	(30,102) 54.0%	91.5%	8.5%

Table 3. Distribution of Unmarried Female Households with Children in Houston, TX by Race and Poverty Status

	Single Mothers		
Race	**Total Households**	**Non-Poverty**	**Poverty**
All Races	*(150,156) 12.7%*	*67.9%*	*32.1%*
White	(46,538) 7.5%	81.2%	18.8%
Black	(61,295) 31.5%	63.1%	36.9%
Hispanic	(37,157) 12.6%	58.8%	41.2%
Asian	(2,941) 5.3%	70.1%	29.9%

[3]Both Single Mother households and Married Couple households are with related children under the age of 18 in all descriptive tables.

The final part of the descriptive analysis in this section separates households by poverty status and then examines the racial and household distribution for each category. These results are presented in Tables 4 and 5. Poverty households who were black had a significantly higher proportion of single mother households than any of the other racial categories. For all races, the proportion of families who were headed by a single mother was higher for poverty households than non-poverty households. Likewise, a higher proportion of non-poverty households were married couple households than poverty households, for all of the race/ethnic categories. Finally, out of all poverty households, the highest proportion of families were Hispanic, while the majority of non-poverty households were white.

The results of this descriptive analysis was not surprising. It has already been well documented by previous research that black and Hispanic minority households tend to have higher proportions in poverty and who are single mothers. This analysis provides further support for these patterns in the city of Houston, Texas. This means that many families who are experiencing a disadvantaged status on one social characteristic are also facing a disadvantaged status on other characteristics as well. Although previous research has documented these patterns, relatively little research has taken the next step to determine the impact that being disadvantaged on multiple social characteristics can have. The impact that each of these characteristics has (both separately and in combination with each other) on residential segregation is determined in the next section.

Table 4. Distribution of Poverty Households in Houston, TX by Race and Family Type

	Poverty Households		
Race	**Total Households**	**Single Mothers**	**Married Couple**
All Races	*(127,962) 10.9%*	*37.7%*	*36.1%*
White	(25,581) 20.0%	34.1%	25.7%
Black	(37,182) 29.1%	60.8%	14.1%
Hispanic	(57,998) 45.3%	26.4%	53.5%
Asian	(5,332) 4.2%	16.5%	47.8%

Table 5. Distribution of Non-Poverty Households in Houston, TX by Race and Family Type

	Non-Poverty Households		
Race	**Total Households**	**Single Mothers**	**Married Couple**
All Races	(1,050,201) 89.1%	9.7%	44.1%
White	(591,677) 56.3%	6.4%	40.5%
Black	(157,484) 15.0%	24.6%	34.4%
Hispanic	(235,804) 2.5%	9.3%	57.3%
Asian	(50,378) 4.8%	4.1%	54.7%

Effects Analysis

I test my hypotheses concerning segregation, by using P* measures of segregation to assess the effects of race, poverty status, and family type, separately and in combination with other characteristics. This approach allows me to evaluate the effect each variable has on inter-group contact with controls for the other variables. It also allows the magnitude of each of these effects to be compared with each other.

Before reviewing the data, it is useful to first clarify some terminology for the ${}_{X}P^{*}_{Y}$ measures. As noted above, the measures indicate the level of exposure or contact members of Group X have with members of Group Y. I term Group X the *comparison* group – it is the group whose exposure level to members of Group Y is being assessed. I will term Group Y the *contact* group. The figures and tables in this section of the chapter present a detailed analyses of how different *comparison* groups (i.e., "X" groups) experience different levels of contact with a particular *contact* group. In any single figure or table, the contact (Y) group is the same for every calculation of P*. For example, in Figure 1, the contact (Y) group for all P* calculations is white, married couples[4] who are not in poverty. The P* values reported in the figure documents how different comparison (X) groups have different levels of exposure to the contact (Y) group.

[4]Since all households are households with children, they will be referred to hereafter as simply 'married couple' and 'single mother' households.

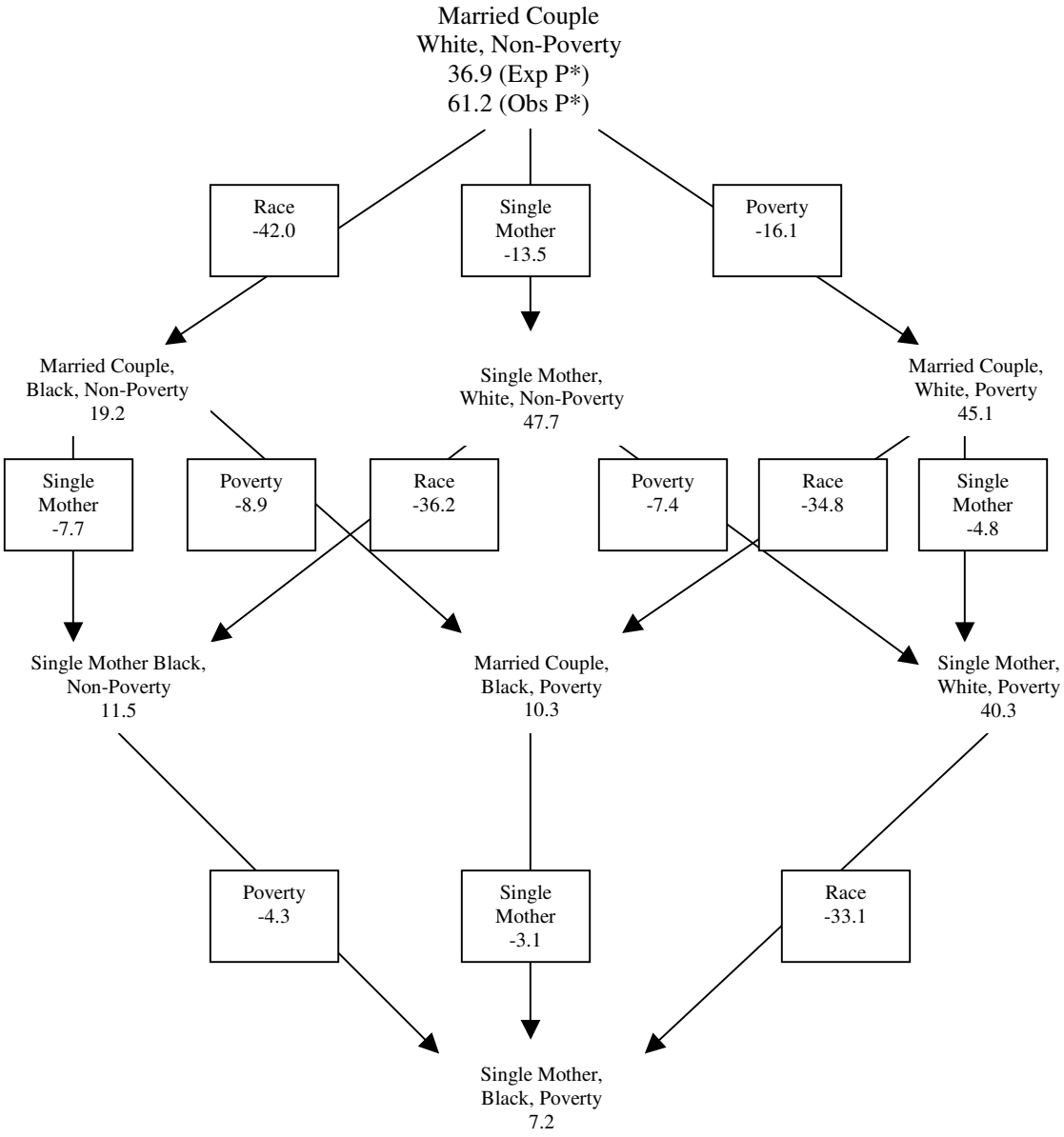

Figure 1. Analysis of How Contact with White, Married Couples with Children Varies by Race (Black), Family Type (Single Mother), and Socioeconomic Status (Poverty)

The figures are organized in four levels. The first level reports the value of P* for the contact (Y) group in question when the contact group and the comparison (X) group are the same group. In this case, the comparison and contact groups do not differ on any social characteristics. The resulting P* score is a measure of same-group contact or "isolation".

The second level of the figure reports the values of P* when the comparison (X) group differs from the contact (Y) group on only one of the three social characteristics that delimit the contact group (i.e., race, poverty status, and household type). The difference between the value of P* at Level 1 and at Level 2 in the figure indicates the impact that the social characteristic in question (e.g., race) has on exposure to the contact (Y) group. These "impact" values or "effects" are reported in the squares between the first and second levels of the figure. The text inside the squares indicates the social characteristic involved.

The third level of the figure reports the values of P* when the comparison (X) group differs from the contact (Y) group on two out of the three social characteristics that delimit the contact (Y) group. The difference between the values of P* at Level 2 and Level 3 indicate the impact that the social characteristic in question has on exposure to the contact (Y) group, given an initial difference on one other social characteristic. Again, the effects for each social characteristic are reported in the squares between the second and third levels of the figure.

The fourth level of the figure reports the values of P* when the comparison (X) group differs from the contact (Y) group on all three social characteristics that delimit

the contact (Y) group. The difference between the values of P* at Level 3 and Level 4 indicate the impact that the social characteristic in question has on exposure to the contact (Y) group, given an initial difference on two other social characteristics. The effects for each of the social characteristics are reported in the squares between the third and fourth levels of the figure.

The difference between the value of P* at the first level and the fourth level reflects the *combined* impact of all three social characteristics – race, poverty status, and household type – on exposure to the contact (Y) group. The levels in between provide insight into the specific effects of each social characteristic considered from different vantage points.

Finally, P* values should be considered in relation to the expected value of exposure to the contact (Y) group. As mentioned earlier, this is simply the contact (Y) group's representation in the population of households considered in the analysis. This expected value is presented in the first level of the figure.

The structure of the figures can now be summarized as follows.

Level 1

Expected P* for the contact (Y) group.
Observed P* is when the comparison (X) group and contact (Y) group are the same.

Level 2

Observed P* when the comparison (X) group differs from the contact (Y) group on one social characteristic.

Level 3

Observed P* when the comparison (X) group differs from the contact (Y) group on two social characteristics.

Level 4

Observed P* when the comparison (X) group differs from the contact (Y) group on three social characteristics.

Analyses Involving Majority Contact (Y) Group

The top level of Figure 1 reports the expected level of contact that households who are white, married couples, and non-poverty have with themselves (i.e., with other white, married couple, non-poverty households). As mentioned earlier, the expected level of contact is 36.9. In the absence of segregation, this is the expected level of contact any group would have with white, married couple, non-poverty households. When actual contact departs from this expected value, it indicates that segregation is present. The observed level of contact is 61.2. This level of contact is 166% of the level of contact expected under even distribution. This is obviously much higher than the expected amount of contact and constitutes clear evidence of segregation.

The next level of the figure presents the P* values obtained when the comparison (X) group differs from the contact (Y) group on one characteristic. The boxes between Levels 1 and 2 represent the associated change in P*. A change in poverty status alone (i.e. a comparison of white, married couples, non-poverty (Y) with white, married couples, in poverty (X) resulted in a P* score of 45.1, reduction in contact of 16.1 points (i.e., from 61.2 to 45.1). A change in family type alone (i.e. a comparison of white, married couples, non-poverty (Y) with white, single mothers, non-poverty (X) resulted in a reduction of the initial same group contact that was 13.5 points, from 61.2 to 47.4. A change in race alone (i.e. a comparison of white, married couples, non-poverty (Y) with Black, married couples, non-poverty (X) reduced the initial same group contact by

42.0 points from 62.1 to 19.2. All three social characteristics – race, poverty, and family type – have effects on contact. Race has the largest effect, -42.0 points, while poverty status and family type have smaller but still important effects, -16.1 and -13.4 points respectively.

Level 3 of Figure 1 documents changes in exposure (P*) observed when changes in race, poverty status, and family type for the comparison (X) group are implemented in combination with changes previously implemented at Level 2. The resulting P* values are listed at Level 3. The boxes between Levels 2 and 3 highlight the effects associated with changes in race, poverty status, and family type. Examination of the boxes shows that all changes in social characteristics have negative effects on exposure regardless of the initial comparison at Level 2. Changing the comparison (X) group from white to black results in a reduction in exposure of -36.2 points when implemented after a previous change in family type and it results in a reduction in exposure of -34.8 points when implemented after a previous change in poverty status. Similarly, changing the comparison (X) group from married couple to single mother results in a reduction in exposure of -7.7 points when implemented after a previous change in race and it results in a reduction in exposure of -4.8 points when implemented after a previous change in poverty status. Finally, changing the comparison (X) group from non-poverty to poverty results in a reduction in exposure of -8.9 points when implemented after a previous change in race and in a reduction of -7.4 points when implemented after a previous change in family type.

Level 4 of Figure 1 documents changes in exposure (P*) observed when changes in race, poverty status, and family type for the comparison (X) group are implemented in combination with changes previously implemented at Level 3. The resulting P* value is listed at Level 4. The boxes between Levels 3 and 4 highlight the effects associated with changes in race, poverty status, and family type. Examination of the boxes shows that all changes in social characteristics again have negative effects on exposure regardless of the initial comparison at Level 3. Changing the comparison (X) group from white to black results in a reduction in exposure of -33.1 points when implemented after previous changes in poverty status and family type. Changing the comparison (X) group from married couple to single mother results in a reduction in exposure of -3.1 points when implemented after previous changes in race and poverty status. And changing the comparison (X) group from non-poverty to poverty results in a reduction in exposure of -.43 points when implemented after previous changes in race and family type.

The cumulative impact of all three changes is documented by the comparison between P* at Levels 1 and 4. At Level 1, when the comparison (X) group is white, non-poverty, married couple families, their exposure to the contact (Y) group, which in this case is themselves, is 61.2%. When the comparison (X) group is black, poverty, single mother families, as in level 4, their exposure with the contact group is 7.2%. The total reduction in exposure is 54.0 points. The resulting P* value of 7.2 is only 20% of the expected value of 36.9.

Table 6 provides a summary of the "effects" reported in Figure 1. In addition, it presents the effects found in analyses where other racial groups, namely, Hispanics and

Asians, are taken as the comparison (X) groups. The top panel of the table reports the P* value when the comparison (X) group (whites, non-poverty, married couple families) is the same as the contact (Y) group. The bottom panel reports the P* value when the comparison (X) group differs from the contact (Y) group on race, poverty status, and family type.

The middle panel of the table reports the effects associated with each social characteristic. The effects reported for blacks (in column 1) were previously reported in the squares in Figure 1. The effects reported for Hispanics (in column 2) and Asians (in column 3) are taken from Figures 2 and 3. The effects are reported in a manner that helps clarify the impact of each of the three social characteristics under consideration (i.e., race, poverty status, and family type).

Thus, for example, the table shows that the effect of poverty status is always negative. This is true when it is the only characteristic changed, or when it is changed after other characteristics (i.e., family type or race) have been changed. The same pattern of consistent negative effects is generally seen for family type and for race. In the case of family type, however, the effect is negligible for Hispanics and Asians if it is assessed after changes in race and poverty status. The race effect in the white-Hispanic comparison was less in magnitude than that of the white-black comparison. This race effect in the white-Asian comparison was even lower than the white-Hispanic race effect, indicating a "hierarchy" in the degree of contact that whites have with minority groups. As in the initial black-white model, the race effect in the white-Hispanic and white-Asian models consistently yielded the highest magnitude of effect.

Table 6. Changes in P* Associated with Changing Race, Poverty Status, and Family Type of Comparison (X) Groups, Contact (Y) Group is White, Married Couples, Non-Poverty

	Out-group Considered		
Description (Comparison Group):	**Black**	**Hispanic**	**Asian**
P When Comparison (X) Group is the Same as Contact (Y) Group:*			
Contact (Y) Group: White, Married Couple, Non-Poverty			
L1: Observed (Same Group Contact)	61.2	61.2	61.2
Effects of Varying Characteristics of the Comparison (X) Group:			
Changing from Poverty to Non-Poverty:			
L2: Alone	-16.1	-16.1	-16.1
L3: After Changes in Family Type	-7.4	-7.4	-7.4
L3: After Changes in Race	-8.9	-8.6	-14.7
L4: After Changes in Family Type and Race	-4.3	-6.1	-8.9
Changing from Married Couple to Single Mother:			
L2: Alone	-13.5	-13.5	-13.5
L3: After Changes in Poverty Status	-4.8	-4.8	-4.8
L3: After Changes in Race	-7.7	-2.5	-5.6
L4: After Changes in Race and Poverty Status	-3.1	0.0	0.2
Changing from White to Minority Race:			
L2: Alone	-42.0	-39.5	-24.0
L3: After Changes in Poverty Status	-34.8	-32.0	-22.6
L3: After Changes in Family Type	-36.2	-28.5	-16.1
L4: After Changes in Poverty Status and Family Type	-33.1	-27.2	-17.6
P When Comparison (X) Group Differs on All Characteristics:*			
L4: Observed Outgroup Contact	7.2	13.1	22.7
Expected Contact	36.9	36.9	36.9
Proportion of Expected P*	20%	36%	62%

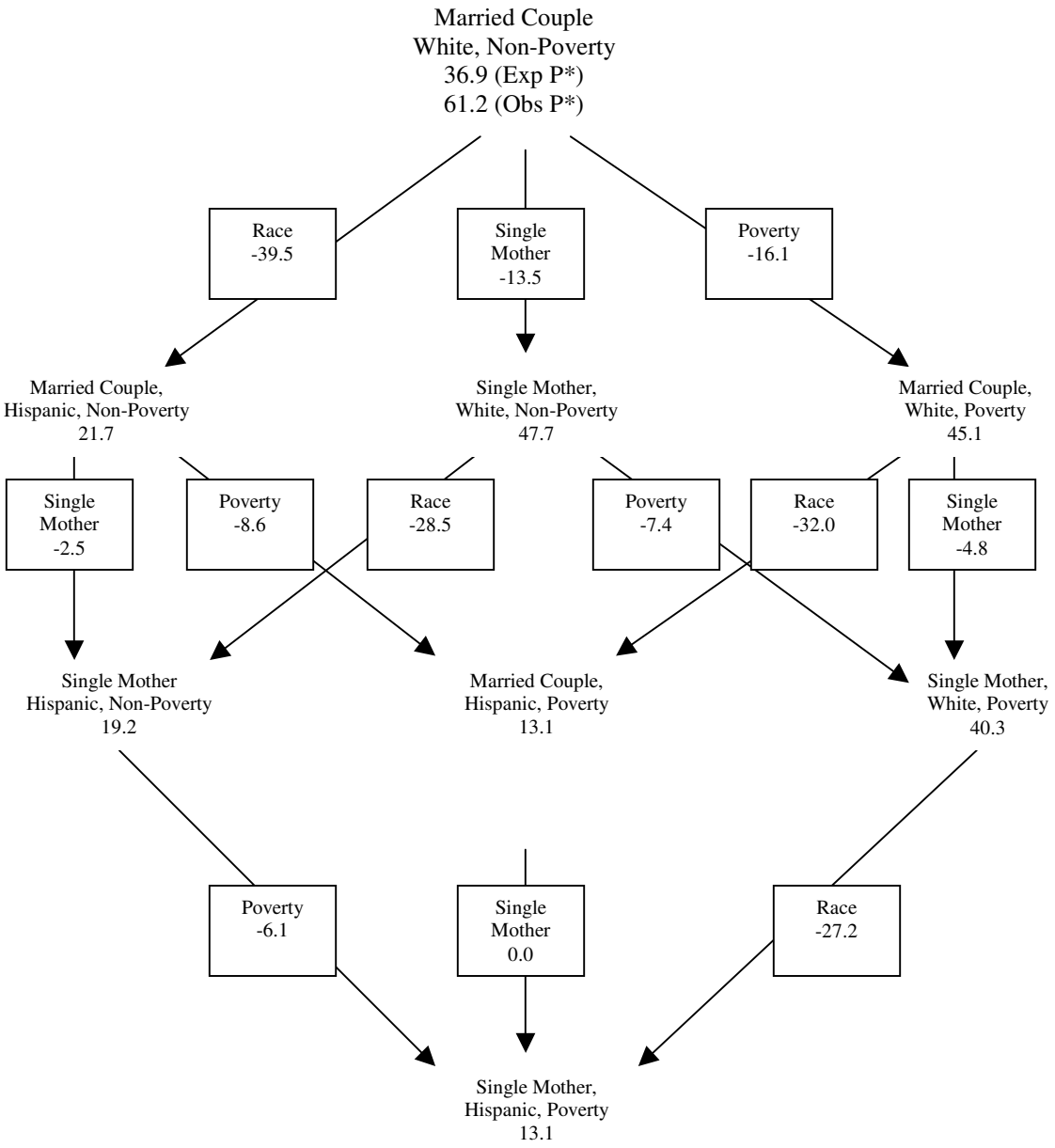

Figure 2. Analysis of How Contact with White, Married Couples with Children Varies by Race (Hispanic), Family Type (Single Mother), and Socioeconomic Status (Poverty)

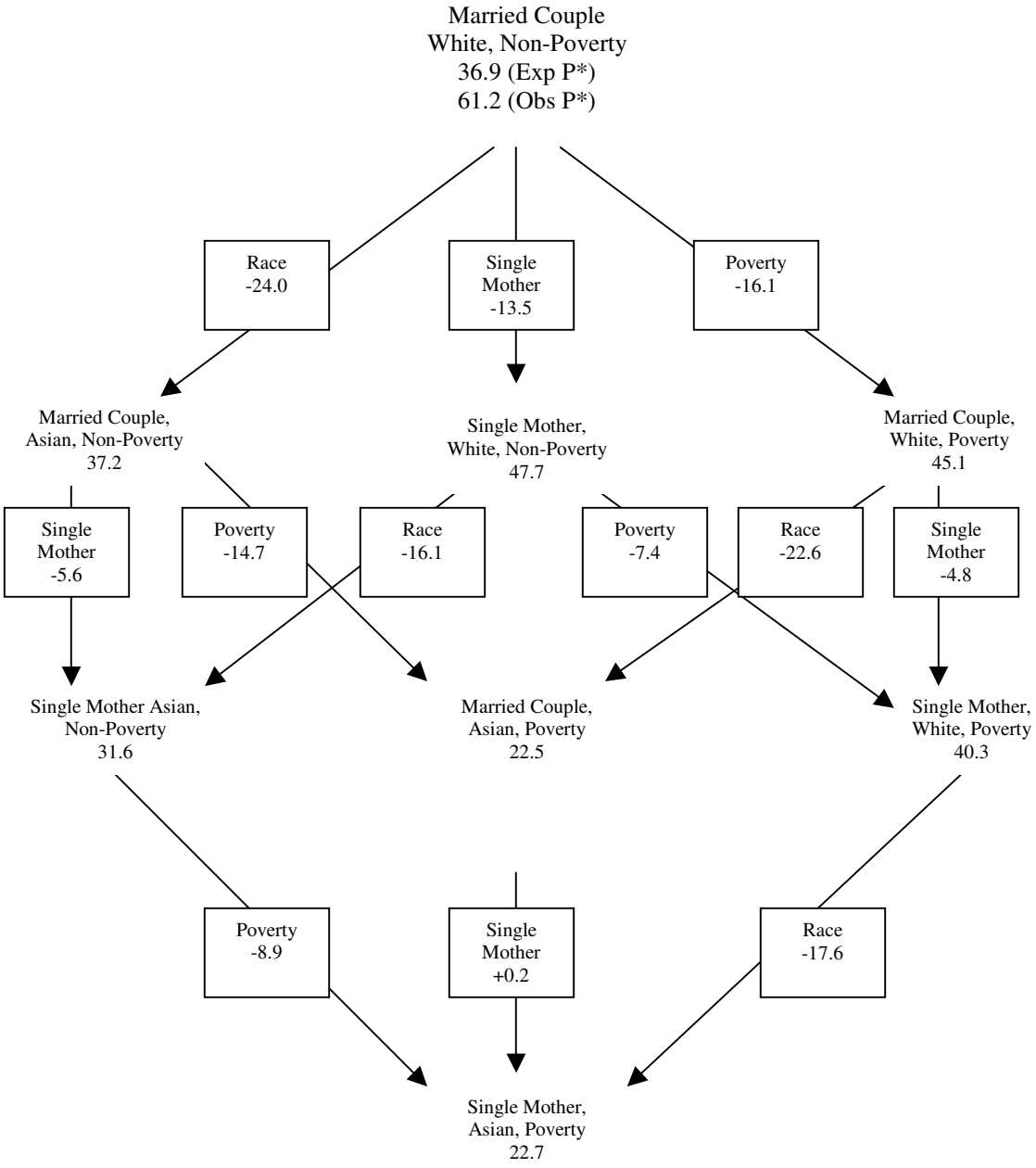

Figure 3. Analysis of How Contact with White, Married Couples with Children Varies by Race (Asian), Family Type (Single Mother), and Socioeconomic Status (Poverty)

In addition, comparing the race effect across groups, the effect of race in the presence of any combination of controls continues to be the highest for blacks and the lowest for Asians, with the effect of race for Hispanics falling in between. In the white-Hispanic model, the exposure index for groups that differed on all three dimensions, the level 4 analysis, was 13.1. This was 48.1 points lower than the initial isolation index reported for white, married couples, non-poverty (i.e. ${}_yP^*_Y$) . This indicates that Hispanic, single mothers in poverty have contact with white, married couples not in poverty that is only 36.0% of the expected contact. Likewise, the level 4 comparison for whites and Asians yields a final exposure index that is 38.49 points lower than the initial isolation index reported for white, married couples, non-poverty (i.e. ${}_yP^*_Y$) ., a contact proportion of that is 62.0% of the expected contact. In general, the effect estimated for each of the characteristics is largest when it is considered in isolation and smallest when it is considered after all other characteristics have first been taken into account.

Analyses Involving Minority Contact (Y) Groups

In the remainder of this chapter I repeat the type of analysis just reviewed, but in each of the next analyses I vary the race of the contact (Y) group. This focuses on how social characteristics of race, poverty status, and family type impact exposure to Blacks, Hispanics, and Asians, respectively. As in the previous analysis, the contact (Y) group is set to non-poverty, married couple families. Table 7 presents the results I obtain when Blacks are adopted as the contact (Y) group. Table 8 presents the results I obtain when Hispanics are adopted as the contact (Y) group. Table 9 presents the results I obtain

when Asians are adopted as the contact (Y) group. Appendix B to this thesis provides figures comparable to Figures 1-3 for all of the relevant analyses.

I begin by discussing the results when Blacks are adopted as the contact (Y) group. The top row of Table 7 indicates that black, married couples, non-poverty have a P* isolation index at Level 1 of 23.6. The expected level of P* under conditions of no segregation is reported in near the bottom of the table and is 8.3. The observed level of contact is thus 283% higher than the expected level.

The P* comparison when all three social characteristics (i.e., race, poverty status, and family type) are changed is presented at the bottom of the table just above the expected value of P*. These correspond to the P* scores reported at the bottom of Figure 1 (i.e., Level 4). The levels of contact when the comparison group is different on all three social characteristics are 4.8 when the comparison group is Whites, 6.1 when the comparison group is Hispanics, and 8.4 when the comparison group is Asians. The values for whites and Hispanics are significantly lower than the expected value of 8.3.

Table 7. Changes in P* Associated with Changing Race, Poverty Status, and Family Type of Comparison (X) Groups, Contact (Y) Group is Black, Married Couples, Non-Poverty.

	Out-group Considered		
Description (Comparison Group):	**White**	**Hispanic**	**Asian**
P When Comparison (X) Group is the Same as Contact (Y) Group:*			
Contact (Y) Group: Black, Married w/Children, Non-Poverty			
L1: Observed (Same Group Contact)	23.6	23.6	23.6
Effects of Varying Characteristics of the Comparison (X) Group:			
Changing from Poverty to Non-Poverty:			
L2: Alone	-5.6	-5.6	-5.6
L3: After Changes in Family Type	-3.6	-3.6	-3.6
L3: After Changes in Race	0.0	-1.0	+0.7
L4: After Changes in Family Type and Race	-0.2	-0.7	-1.1
Changing from Married Couple to Single Mother:			
L2: Alone	-3.9	-3.9	-3.9
L3: After Changes in Poverty Status	-1.9	-1.9	-1.9
L3: After Changes in Race	+0.6	+0.1	0.6
L4: After Changes in Race and Poverty Status	+0.4	-0.4	-1.2
Changing from Black to Other Race:			
L2: Alone	-19.6	-16.9	-14.7
L3: After Changes in Poverty Status	-13.6	-12.3	-8.4
L3: After Changes in Family Type	-14.7	-12.9	-10.2
L4: After Changes in Poverty Status and Family Type	-11.3	-10.0	-7.7
P When Comparison (X) Group Differs on All Characteristics:*			
L4: Observed Outgroup Contact	4.8	6.1	8.4
Expected Contact	8.3	8.3	8.3
Proportion of Expected P*	57%	74%	101%

Table 8. Changes in P* Associated with Changing Race, Poverty Status, and Family Type of Comparison (X) Groups, Contact (Y) Group is Hispanic, Married Couples, Non-Poverty.

	Out-group Considered		
Description (Comparison Group):	**White**	**Black**	**Asian**
P When Comparison (X) Group is the Same as Contact (Y) Group:*			
Contact (Y) Group: Hispanic, Married w/Children, Non-Poverty			
L1: Observed (Same Group Contact)	36.3	36.3	36.3
Effects of Varying Characteristics of the Comparison (X) Group:			
Changing from Poverty to Non-Poverty:			
L2: Alone	+0.6	+0.6	+0.6
L3: After Changes in Family Type	-3.1	-3.1	-3.1
L3: After Changes in Race	+5.4	+0.5	+4.7
L4: After Changes in Family Type and Race	+2.5	-1.9	+0.2
Changing from Married Couple to Single Mother:			
L2: Alone	-5.5	-5.5	-5.5
L3: After Changes in Poverty Status	-3.0	-3.0	-3.0
L3: After Changes in Race	+3.1	-0.1	+1.6
L4: After Changes in Race and Poverty Status	+0.2	-2.5	-2.9
Changing from Hispanic to Other Race:			
L2: Alone	-24.0	-19.6	-21.2
L3: After Changes in Poverty Status	-19.2	-19.7	-17.1
L3: After Changes in Family Type	-15.4	-14.2	-14.1
L4: After Changes in Poverty Status and Family Type	-16.0	-19.2	-17.0
P When Comparison (X) Group Differs on All Characteristics:*			
L4: Observed Outgroup Contact	17.9	14.7	16.9
Expected Contact	20.8	20.8	20.8
Proportion of Expected P*	86%	71%	81%

Table 9. Changes in P* Associated with Changing Race, Poverty Status, and Family Type of Comparison (X) Groups, Contact (Y) Group is Asian, Married Couples, Non-Poverty.

	Out-group Considered		
Description (Comparison Group):	**White**	**Black**	**Hispanic**
P When Comparison (X) Group is the Same as Contact (Y) Group:*			
Contact (Y) Group: Asian, Married w/Children, Non-Poverty			
L1: Observed (Same Group Contact)	16.3	16.3	16.3
Effects of Varying Characteristics of the Comparison (X) Group:			
Changing from Poverty to Non-Poverty:			
L2: Alone	-5.0	-5.0	-5.0
L3: After Changes in Family Type	+0.2	+0.2	+0.2
L3: After Changes in Race	-1.4	-2.3	-1.0
L4: After Changes in Family Type and Race	-1.5	-1.5	-1.1
Changing from Married Couple to Single Mother:			
L2: Alone	-4.4	-4.4	-4.4
L3: After Changes in Poverty Status	+0.8	+0.8	+0.8
L3: After Changes in Race	-0.2	-1.1	+0.3
L4: After Changes in Race and Poverty Status	-0.3	-0.3	+0.2
Changing from Asian to Other Race:			
L2: Alone	-12.0	-11.8	-13.2
L3: After Changes in Poverty Status	+0.2	-9.1	-9.2
L3: After Changes in Family Type	-7.8	-8.5	-8.5
L4: After Changes in Poverty Status and Family Type	-9.5	-10.2	-9.8
P When Comparison (X) Group Differs on All Characteristics:*			
L4: Observed Outgroup Contact	2.6	1.9	2.3
Expected Contact	4.2	4.2	4.2
Proportion of Expected P*	61%	44%	54%

The P* for the comparison with Asians as the comparison (X) group is very similar to the level of contact that would be expected if the groups were not segregated from each other.

The effects of race here are very similar to those reported in the previous analysis. Under all conditions, changing the race of the comparison (X) group reduces contact. The effect is consistent and, while it varies in magnitude, it is always large. The race effects for the black-Hispanic and black-Asian comparisons were not as high as the effects in the black-white comparison. This pattern was consistent across all levels of analysis.

The effects of poverty status are a bit more complicated. When the comparison (X) group changes from non-poverty to poverty, it has a negative effect on contact, but only if the effect is assessed *before* the race of the comparison (X) group is changed. The poverty effect is small or negligible when it is assessed *after* the race of the comparison (X) group is changed. Looking back at the race effect, we see that it is smaller when it is assessed *after* poverty status is changed. This pattern indicates that race and poverty status "interact" such that a portion of their negative effect on exposure is shared.

The effect of family type follows a similar pattern. When the comparison (X) group changes from married couple to single mother, it has a negative effect on contact, if the effect is assessed before the race of the comparison (X) group is changed. But the single mother effect is near zero when it is assessed *after* the race of the comparison (X) group is changed. Again, looking back at the race effect, we see that it is smaller when it

is assessed *after* family type is changed. This pattern indicates that race and single mother status "interact" such that a portion of their negative effect on exposure is shared.

The role of these interactions can be highlighted as follows. The Level 4 effects of changing each social characteristic after the others have been changed are unambiguous. But these effects do not fully account for the difference between the value of P* at Level 1 to Level 4. The remainder of the difference reflects the impact on exposure that is shared in common by the pairs of variables.

Table 8 presents the results for the analysis where Hispanic, married couples, non-poverty are the contact (Y) group. The top row of this table indicates that Hispanic, married couples, non-poverty, have a P* isolation index at Level 1 of 36.3. This was higher than what P* would be in the absence of segregation, 20.8, indicating that the contact (Y) group has an amount of contact with their own group that is 174% of what would be expected.

The P* comparison when all three social characteristics (i.e. race, poverty status, and family type) are changed was 17.9 when the comparison (X) group was white, 14.7 when the comparison (X) group was black, and 16.9 when the comparison (X) group was Asian. These values are found near the bottom of Table 8. Contact at Level 4 was consistently lower than the contact that would be expected under conditions of no segregation.

As in the previous analyses, the effects of races were found to be consistently negative and to have a greater impact than the effects of the other two variables. The magnitude of the race effect was found to vary across comparison (X) groups. In Level

2 and Level 3, the race effects were the larger for the Hispanic-white analysis than they were for the Hispanic-Black or Hispanic-Asian analyses.

The effects of poverty status in the analyses that used Hispanics as the contact (Y) group was inconsistent, and have a complicated interpretation. The effect of poverty is positive, but negligible, at Level 2. In Level 3, the magnitude of the effect is larger than it was in Level 2 for the Hispanic-white and Hispanic-Asian analyses, yielding a negative effect after changes in family type but a positive effect after changes in race. The pattern is the same for the Level 3 effects in the Hispanic-Black analysis, however the effect of a change in poverty status after a change in race is negligible. The final, Level 4 effects, of poverty status are also inconsistent across the races of the comparison (Y) groups, yielding a positive effect for the Hispanic-White comparison, a negative effect for the Hispanic-Black comparison, and a negligible but positive effect for the Hispanic-Asian comparison. These effects suggest that race and poverty status "interact" such that a portion of their effects are shared.

The effect of family type in this analysis was also inconsistent, but slightly more straightforward in its interpretation. When the comparison (X) group changes from married couple to single mother, it has a negative effect on contact, if the effect is assessed before the race of the comparison group is changed. After race is changed, the effect of family type is positive for the Hispanic-white and Hispanic-Asian comparisons and negative for the Hispanic-Black comparison. The effect of family type changes again in Level 4, yielding a negligible but positive effect for the Hispanic-white comparison, and a negative effect for the Hispanic-black and Hispanic-Asian

comparisons. These effects also suggest an interaction between the effects of family type and race.

The effects found in the analysis that used Hispanic, married couples, not in poverty as the contact (Y) group were more complex than the patterns found in either of the two previous sets of analyses. For example, the finding of a positive effect of poverty status in the Hispanic-white comparison appears to indicate that poverty increases the amount of contact that another group has with Hispanics. A closer look at these groups reveals that, for Hispanic, married couples, non poverty, their contact with whites is in fact higher than their contact with their own group, however this contact is with low status (i.e. poor) whites. This is further support for the presence of an interaction effect between race and the other variables. The finding that is consistent with the previous sets of analyses is the effects of race. Race effects were again found to be consistently negative and of a greater magnitude than the effects of the other variables.

In the final sets of analyses, Asian, married couples, non-poverty were used as the contact (Y) group. These results are presented in Table 9. In the top row of this table, the isolation index for this group indicates that Asian, married couples, non-poverty have a level of contact with their own group that is 16.3. This index was 384% of what would be expected if this group was not segregated, a P* of 4.2. The P* comparison when all three social characteristics (i.e. race, poverty status, and family type) are changed was 2.6 when the comparison (X) group is white, 1.9 when the comparison (X) group is black, and 2.3 when the comparison (X) group is Hispanic.

These levels of contact were all significantly lower than the amount of contact with this group that would be expected under the assumption of random assignment.

The effect of race in the analyses that used Asians as the contact (Y) group, was found to be consistently negative and of a greater magnitude than the other effects in the table, with one notable exception. This exception was found in the Level 3 effect of race controlling for poverty status in the Asian-white comparison. In this case, the effect of race was found to have a negligible, but positive, effect.

The effect of poverty status was negative across all comparison groups, except for the Level 2 effect that controls for family type. In this case, the effect of poverty status is negligible, but positive. For all other poverty effects, the effects are negative and higher in magnitude. These results suggest that, when Asians comprise the contact (Y) group, there is an interaction between the effect of poverty status and family type.

The results for family type in this analysis found that there is a negative effect of family type at Level 2, however in this case the effect of family type for Level 3 and Level 4 is consistently small. The Level 3 effect of family type in the Asian-black comparison, controlling for race effects, was -1.1, with all other Level 3 and Level 4 effects less than 1. Family type was found to have a slight positive effect when poverty status is controlled, again suggesting an interaction between these two effects.

These effects in the analysis that used Asian, married couples, not in poverty as the contact (Y) group also had a complex interpretation. All three variables (i.e. race, poverty status, and family type), were found to reduce the amount of contact between the contact (Y) and comparison (X) groups at Level 2, when each variable was changed

alone. The effects of race in this analysis were almost always negative, and larger than the effects of the other variables, with the one exception noted above. The poverty and family type effects were inconsistent, becoming negligible or positive in several instances.

The results presented in this chapter test the first four hypotheses introduced in Chapter II. These hypotheses were:

H.11: Households will be segregated by family type both overall and controlling for ethnic status and socioeconomic status.

H.12: Households will be segregated by racial and ethnic status both overall and controlling for socioeconomic status and household type.

H.13: Households will be segregated by socioeconomic status both overall and controlling for ethnic status and household type.

H.14: Households that differ on multiple status dimensions will be more highly segregated than households that are similar on these same status characteristics. The highest level of segregation will be between households that differ on all three characteristics of race, poverty, and household type.

In the set of analyses that used White, married couples, non-poverty as the reference group, the results of the hypothesis tests are straightforward. Full support is found for H.1 in the models where blacks or Asians are the comparison (X) group, with partial support for this hypothesis found when Hispanics are the comparison (X) group. The support is partial because family type has a negative effect in levels 2 and 3, but has no effect in level 4. Hypotheses H.2 and H.3 are fully supported in the models with

white, married couples, non-poverty as the contact (Y) group, no matter which race was the comparison (X) group. For H.4, full support was again found in the comparison that used blacks or Asians as the comparison (X) group, and conditonal support when Hispanics were the comparison (X) group. This was because the final P* index in level 4, when the groups differed on all three characteristics, was the same as one of the level 3 effects, when the groups differed on only two characteristics.

The results from the comparisons that used a minority, married couple, non-poverty as the contact (Y) group also provided general support for the hypotheses guiding this section. The specific interpretation of the hypothesis tests for these models is more complicated than in the models with a white contact (Y) group. The effects within models that used a minority as the contact (Y) group continue to show segregation between the groups that is impacted by race, poverty, and family type. The results in these models, however, were not of the same magnitude as the effects of these variables in the models that used whites as the contact (Y) group. This indicates that, while minority groups do experience segregation from each other, it is not to the same degree as their segregation from whites. Additionally, the proportion of contact in level 4 was greater for most of the comparisons between a minority contact (Y) group and another minority as the comparison (X) group than it was when whites were either of the groups. At first glance, it would appear that the positive effects found in some of these models do not support the hypotheses raised. A closer investigation into these effects reveal that, when a high status minority group is the contact (Y) group (as is the case when a minority, married couple, not in poverty is the contact group), contact is higher

with low status whites (i.e. whites that are poor or single mothers), rather than with whites that have a similar socioeconomic status. This represents a further aspect of the race effect, rather than a true effect of poverty or family type. The effect of race was consistently negative in all models and in all levels, with the exception of the level 3 effect of race in the presence of the poverty status control for the Asian-white comparison.

CHAPTER IV

NEIGHBORHOOD OUTCOME MODEL

The previous chapter investigated patterns of segregation using aggregate-level measures of segregation (e.g., ${}_xP_y$ exposure measures). This chapter investigates patterns of segregation using models of neighborhood attainment. Specifically, I use the Alba and Logan (1992) method of analysis in which data available in census tabulations are adapted to perform individual-level analyses of neighborhood attainment. In this method, an individual-level model is estimated which assesses the impact of household-level on the likelihood of living in a neighborhood with specific characteristics. The effects of these analyses can be interpreted in two ways. First, they can be interpreted as further documentation of segregation, indicating the amount of exposure that households from different social groups have to particular residential characteristics. They can also be interpreted as neighborhood-level consequences of segregation. This methodology is attractive because significance testing can be applied and comparisons of the segregation between groups are possible. Another advantage of this methodology is that it provides a means for assessing the impact of one characteristic, such as family type on neighborhood outcomes, while controlling for other characteristics such as poverty and race. Finally, this method allows for the determination of the additive and non-additive effects of each of the relevant variables.

Independent Variables

The measurement of family type, poverty status, and race/ethnicity in this section of the analysis is the same as described in the previous chapter. As before, the family

types utilized in this analysis are married couples with children and unmarried females with children, the poverty types are poverty and non-poverty households, and the race/ethnic groups are white, black, Hispanic, and Asian. In the neighborhood attainment approach these characteristics will be used as independent variables that predict neighborhood outcomes. The dependent variables in the analysis are the characteristics of the neighborhood the household resides in. I estimate separate neighborhood attainment models for several different neighborhood outcomes. These are summarized in the following section.

Neighborhood Outcomes

Neighborhood Income

Neighborhood income is measured by median household income for the households in the block group. Household income includes the total earnings of all members of the household over the age of 15 for the year prior to the Census year.

Neighborhood Education Level

I measure this variable by determining the percent of college graduates for persons 25 and older in the block group. Census respondents classify themselves according to the highest level of education that they have completed, and this is tabulated this for all individuals over the age of 25. For the purposes of this project, I have collapsed the education categories to simply college graduates and non-college graduates. I then calculated the percentage of college graduates for the population 25 and older for each neighborhood.

Neighborhood Home Ownership

This variable is the percentage of households in each block group living in a home that they own, or co-own, themselves. It is computed based on the number of homeowners and the total households in the neighborhood.

Neighborhood Unemployment Rate

I calculated the neighborhood unemployment rate based on the percentage of respondents in each block group that were currently unemployed. Employment status is determined for all individuals over the age of 16. The Census defines a respondent as unemployed if they are currently without employment, are available to work, and are seeking to be employed. The employed category includes males and females in the armed forces or currently employed in a civilian job.

Neighborhood Vacancy Rate

I measured the vacancy rate based on the total number of dwellings in each block group and the number currently unoccupied. Vacant units include dwellings that are for sale, for rent, or are currently owned or rented but are not currently occupied. The vacancy rate is the percentage of all dwellings in the neighborhood that were vacant.

Data and Sample

As before, data are taken from Summary File III of the 2000. Following Alba and Logan (1992), the aggregate-level information in the STF tabulation is converted into a format suitable for estimating individual-level analysis of neighborhood attainment. The equation for the analysis is:

$$\mathbf{Y = a + b_1X_1 + b_2X_2 + b_3X_3}$$

Where:

Y = Neighborhood Characteristic

$\mathbf{X_1}$ = Race (white, black, Hispanic, Asian)

$\mathbf{X_2}$ = Poverty Status (poverty, non-poverty)

$\mathbf{X_3}$ = Family Type (married couple, single mother)

The data needed to perform the analyses are created as follows. Records are created for each of the 16 possible combinations of the values of the three independent variables (i.e. 4 categories of race, 2 categories of poverty status, and 2 categories of family type). This is performed separately for each of the 2,706 block groups. The neighborhood characteristics measured at the block group level are merged onto these data records to serve as dependent variables. This creates a dataset where each household level record contains the household's status on each of the independent variables as well as the characteristics of the neighborhood that they reside in. A portion of this dataset is shown in Table 10. The resulting dataset has 649,685 records for individual households. Effects of the independent variables are estimated using an ANOVA model which includes all additive and non-additive race effects. Separate models are estimated for each of the seven dependent variables. This method of analysis is an individual-level analysis, that is, the predictions are the expected neighborhood outcomes for individual households based on their race, poverty status, and family type. In the following sections, the results of a descriptive analysis along with the ANOVA results will be presented for each of the seven relevant neighborhood outcomes.

Table 10. Example Dataset for Neighborhood Outcome Analysis

Respondent	Neighborhood Poverty Rate	Race	Poverty Status	Family Type*
Respondent 1	0%	Hispanic	Non-Poverty	Married Couple
Respondent 2	0%	Hispanic	Non-Poverty	Unmarried Female
Respondent 3	4%	White	Non-Poverty	Unmarried Female
Respondent 4	4%	Asian	Non-Poverty	Married Couple
Respondent 5	7%	Black	Poverty	Married Couple
Respondent 6	9%	Asian	Non-Poverty	Unmarried Female
Respondent 7	10%	Black	Poverty	Unmarried Female
Respondent 8	13%	Black	Poverty	Unmarried Female
Respondent 9	15%	White	Non-Poverty	Unmarried Female
Respondent 10	20%	White	Non-Poverty	Married Couple
Respondent 11	23%	Hispanic	Poverty	Married Couple
Respondent 12	25%	Hispanic	Poverty	Unmarried Female

** All family types are with children*

Neighborhood Outcome Results

Neighborhood Percent White

The first neighborhood outcome considered is percent of all of the households in the neighborhood that were white. Descriptive information about the distribution of neighborhood percent white for neighborhood is found in Table 11. For *neighborhoods* in the MSA, the average percent white in the neighborhood was 49.8%. The percent white was found to range from 2.9% for neighborhoods at the 10th percentile to 90.9% for neighborhoods at the 90th percentile. The distribution of neighborhood percent white for

households is slightly different, since households are not distributed evenly across neighborhoods. *Households* have a mean neighborhood percent white of 52.4%. The results by race shows large differences in neighborhood percent white for different groups. The average white household lived in a neighborhood that was 71.6% white, compared to 22.0% for blacks, 33.1% for Hispanics and 46.4% for Asians. Non-poverty households were found to have a higher mean neighborhood percent white than poverty. This was also the case for married couple households,[5] which were found to have a higher percent white than single mother households.

Results of an ANOVA model estimating the additive and non-additive effects of race, poverty status, and family type are presented in Table 12. To enhance interpretability, the ANOVA effects are reported as group specific effects. In the original ANOVA models, the independent variables included poverty status, family type, and each racial group, as well as race by poverty and race by family type interactions. For each racial group, the effects of poverty status and family type are expressed as deviations from married couples with children who are not in poverty, who serve as the reference group.

[5]Since all family types included in these analyses are households with children, these groups will hereafter be referred to as simply married couples and single mothers.

Table 11. Distribution of Neighborhood Percent White

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
%White	2682*	49.84	32.71	2.86	53.10	90.89	88.03
Households:							
All Households	1,178,163	52.39	31.74	5.06	58.92	90.34	85.28
By Race:							
White	617,258	71.62	21.64	37.85	78.83	93.06	55.21
Black	194,666	22.00	24.95	0	11.18	64.52	64.52
Hispanic	293,802	33.05	26.48	3.32	26.95	75.28	71.96
Asian	55,710	46.44	26.35	8.96	45.96	81.73	72.77
By Poverty Status:							
Poverty	127,962	30.18	29.01	0	19.69	78.87	78.87
Non-Poverty	1,050,201	55.10	30.99	6.50	63.40	90.86	84.36
By Household Type:							
Married Couple	509,098	53.67	31.04	6.50	61.07	90.28	83.78
Single Mother	150,156	37.07	31.10	1.27	30.60	83.43	82.16

** Total number of block groups is 2706. The number of block groups in this table excludes 24 block groups that had no family households.*

Table 12. Results From ANOVA Model Estimating Effect of Race, Poverty, and Household Type on Neighborhood Percent White

	White	Black	Hispanic	Asian
*Percent White Households:**				
Poverty	-7.37	-6.89	-9.76	-12.89
Unmarried Female with Children	-6.57	-7.62	-0.99	-3.31
Married Couples, not in Poverty	73.88	28.12	34.56	49.16
Adj. $R^2 = 0.47$ N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*
*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

White married couples who are not in poverty had a mean for neighborhood percent white of 73.9. This indicates that this group lives in neighborhoods with an average percent white of 73.9%. Race effects can be assessed by comparing the coefficients for married couples who are not in poverty across race groups. Whites have the highest amount of neighborhood percent white households (73.8%), followed by Asians (49.2%), Hispanics (34.6%), and finally blacks (28.1%). These effects control for poverty and family type.

The effect of the poverty variable is negative for all groups – poverty households experience lower levels of neighborhood percent white, however the effect varies across race/ethnic groups. Poverty status had the largest impact within the Asian group, and the lowest impact in the Black group. This indicates that, for Asian households, the initial percent white in the neighborhood for married couples not in poverty (49.2%) is reduced by 12.9 points when the married couple is in poverty. For black households, although the effect of poverty status is the lowest (-6.9) this reduction leads to a lower percent white than the other groups (21.2%) since the initial proportion for married couples not in poverty was already the lowest (28.1%).

For family type, the coefficient for single mother status is always negative but varies across all race/ethnic groups. In this case, the highest impact is found in the black group and the lowest in the Hispanic group. This indicates that for black households, percent white in the neighborhood for married couples not in poverty (28.1%) is reduced by 7.6 points when the household is headed by a single mother, resulting in a neighborhood that is only 20.5% white.

As hypothesized, disadvantaged status on multiple characteristics leads to lower levels of neighborhood outcome, in this case percent white. For example, a being a black, single mother in poverty results in a neighborhood that is 13.6% white, compared to 73.8% for white, married couples not in poverty. All of the coefficients in the model were found to be statistically significant at the $p < .01$ level. The total adjusted R^2 for the model was 0.47, which was the highest adjusted R^2 found for all of the ANOVA models estimated in this section.

Neighborhood Poverty Rate

Table 13 presents the descriptive statistics for the neighborhood poverty rate for the Houston, Texas area. For neighborhoods, the average neighborhood poverty rate was 12.4%, ranging from 0 for neighborhoods at the 10th percentile to 29.3% for neighborhoods at the 90th percentile. The distribution of neighborhood poverty rate for households had a mean of 10.9%, ranging from 0.9% at the 10th percentile to 27.2% at the 90th. The results by race show that the white households tended to live in neighborhoods with lower poverty rates than the other racial groups. The mean neighborhood poverty rate for white households was 6.3%, with a relatively small interquartile range between 0 at the 10th percentile and 15.0% at the 90th percentile. Black households, however, were found to have both the highest mean neighborhood poverty rate (17.8%) and also the largest interquartile range, with neighborhood poverty rates that ranged from 2.9% at the 10th percentile to 35.3% at the 90th. Within poverty status, poverty households were found to have a higher average neighborhood poverty rate than non-poverty households. Likewise, single mothers had a higher rate than married couple households.

Table 14 reports the results of the ANOVA analysis for percent of households in poverty. The reference group in this case, married couples not in poverty, live in a neighborhood with a poverty rate of 4.7% for whites compared to 6.6% for Asians, , 12.0% for blacks, , and finally 14.3% for Hispanics. The effect of household poverty status on the neighborhood poverty rate is consistently positive across all groups, as would be expected. This effect ranges from a high of 12.0 for blacks to a low of 6.5 for whites. The effect of single mother status is also positive and varying for all racial groups, ranging from a high of 5.0 for blacks to a low of 0.9 for Hispanics. The combined effects of poverty and single mother status yield the highest neighborhood proportion below poverty for black households (28.9%) followed by Hispanics (22.5%), Asians (15.5%), and whites (13.3%). All coefficients in this model were significant at $p < .01$, yielding an adjusted R^2 of 0.33.

Table 13. Distribution of Neighborhood Poverty Rate

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
Poverty Rate	2682*	12.36	11.61	0	9.01	29.03	29.03
Households:							
All Households	1,178,163	10.86	10.84	0.85	7.21	27.24	26.39
By Race:							
White	617,258	6.26	6.69	0	3.94	15.02	15.02
Black	194,666	17.79	13.85	2.85	14.88	35.32	32.47
Hispanic	293,802	16.52	11.11	3.05	14.97	31.59	28.54
Asian	55,710	8.55	8.50	0.89	5.65	20.90	20.01
By Poverty Status:							
Poverty	127,962	21.69	13.53	5.86	20.00	38.53	32.67
Non-Poverty	1,050,201	9.54	9.67	0.58	6.19	23.86	23.28
By Household Type:							
Married Couple	509,098	9.99	10.05	0.80	6.37	25.75	24.95
Single Mother	150,156	16.55	13.77	2.22	13.37	34.19	31.97

** Total number of block groups is 2706. The number of block groups in this table excludes 24 block groups that had no family households.*

Table 14. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type on Neighborhood Poverty.

	White	Black	Hispanic	Asian
*Percent Below Poverty:**				
Poverty	6.49	11.99	7.27	7.20
Unmarried Female with Children	2.07	4.95	0.90	1.70
Married Couples, not in Poverty	4.71	11.98	14.30	6.59
Adj. $R^2 = 0.33$ N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Neighborhood Income

In the descriptive analysis for neighborhood income, Table 15, neighborhoods were found to have a mean income of $47,191, with a median of $40,803. The neighborhood income was slightly higher for households, with a mean of $52,075 and a median of $45,602. The results by race indicate that the typical white lived in a neighborhood with a median income of $62,696, compared to $58,370 for Asians, $38,392 for Hispanics and $36,995 for blacks. The pattern is the same when median neighborhood income is compared across all groups, but with slightly lower amounts. As expected, poverty households had a lower neighborhood income than non-poverty households. Single mothers ($39,625) also had lower neighborhood incomes than married couples ($54,964).

Table 16 presents the ANOVA results for neighborhood income. It indicates that married couples not in poverty who are white are predicted to live in a neighborhood with a median neighborhood income that is $67,891 per year. For Asians, this amount is $63,717 per year, Hispanics $40,572, and Blacks $44,400.

The effect of poverty status was negative for all racial groups, ranging from a low of –3,658 for Asians to a high of -14,962 for whites. Although the effect of poverty status for blacks (-4,657) was much lower than the effect for whites (-14,962), this effect still yielded a predicted value for median household income ($39,743) that was lower than that of whites ($52,929) or Asians ($60,059).

Interestingly, the median neighborhood household income for black, married couples not in poverty was lower than that of white married couples in poverty, $44,400 and $52,929 respectively. For unmarried females, the effect is also negative for all groups, with the highest reduction in median neighborhood income found for white single mothers (-12,818), followed by Hispanic single mothers (-10,513), Asian single mothers (-6,579), and black single mothers (-4,240). The effects of both poverty and family type yield the lowest median neighborhood household income for Hispanic, single mothers in poverty ($23,141). All coefficients in this model are significant at $p < .01$, with an adjusted R^2 of 0.29.

Table 15. Distribution of Median Neighborhood Household Income

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
Median Income	2706	$47,191	26,754	$22,741	$40,803	$82,122	59,381
Households:							
All Households	1,178,163	$52,075	27,054	$25,053	$45,602	$90,040	64,987
By Race:							
White	617,258	$62,696	28,023	$33,203	$56,932	$98,861	65,658
Black	194,666	$36,995	18,035	$18,203	$32,981	$60,875	42,672
Hispanic	293,802	$38,392	17,146	$22,741	$33,796	$59,861	37,120
Asian	55,710	$58,370	28,815	$28,021	$50,722	$98,861	70,840
By Poverty Status:							
Poverty	127,962	$33,863	16,629	$18,845	$30,357	$52,212	33,367
Non-Poverty	1,050,201	$54,294	27,241	$26,485	$47,969	$91,732	65,247
By Household Type:							
Married Couple	509,098	$54,964	28,038	$26,250	$48,173	$93,011	66,761
Single Mother	150,156	$39,625	19,790	$20,579	$35,214	$64,830	44,251

Table 16. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type on Neighborhood Income Level.

	White	Black	Hispanic	Asian
*Median Household Income ($1,000):**				
Poverty	-14.962	-4.657	-6.918	-3.658
Unmarried Female with Children	-12.818	-4.240	-10.513	-6.579
Married Couples, not in Poverty	67.891	44.400	40.572	63.717
Adj. $R^2 = 0.29$ N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Neighborhood Education Level

The average percentage of college graduates for neighborhoods, as presented in Table 17, was 23.5%, ranging from 3.4% at the 10th percentile to 57.7% at the 90th. The education level for households was similar, with a mean for percent college graduate of 26.3% ranging from 4.1% at the 10th percentile to 58.7% at the 90th. Within the racial groups, blacks and Hispanics were had substantially lower mean percentage of college graduates in the neighborhood, 17.8% and 15.1% respectively, than whites and Asians, 32.8% and 36.9% respectively. The interquartile range for blacks and Hispanics was also smaller than that of whites and Asians. The mean neighborhood percentage college graduate was also lower for poverty households (14.2%) than non-poverty households (27.5%) and for single mother households (19.1%) than married couple households (26.7%).

Table 18 presents the ANOVA results for neighborhood education level. In these results, Asian married couples not in poverty were predicted to have the highest neighborhood percentage of college graduates, 38.8%. This was followed by 34.4% for white married couples not in poverty, and 21.0% and 14.8% for blacks and Hispanics respectively. The poverty variable had consistently negative effects across all racial groups. Poverty had the highest impact on the percent of college graduates for whites, a reduction of 11.5% leading to a neighborhood rate of college graduates of 22.9%.

The effect of poverty status for Hispanic households was the least negative (-6.7), however the low initial proportion of college graduates for this group gave it the lowest percentage college graduates (10.3%) of all racial groups in poverty. As expected, the effect of single mother status for whites, blacks, and Asians on percent neighborhood college graduates was negative. The effect of single mother status on percent college graduates for Hispanics, however, was positive (1.0), indicating that Hispanic single mothers not in poverty actually have a higher percentage of college graduates in their neighborhood (15.8%) than Hispanic married couples not in poverty (14.8%). This proportion continues to be lower than the percentage of white (28.3%) and Asian (35.6%) non-poverty single mothers, however, because of their higher initial percentage of college graduates. As in the previous models, all coefficients in this model are significant at the $p < .01$ level, with an adjusted R^2 for this model of 0.23.

Table 17. Distribution of Neighborhood Proportion College Graduates

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
%College Grad	2688*	23.50	20.94	3.37	15.94	57.67	54.30
Households:							
All Households	1,178,163	26.03	20.82	4.13	20.25	58.68	54.55
By Race:							
White	617,258	32.75	21.80	6.68	28.59	65.57	58.89
Black	194,666	17.76	14.28	3.85	13.46	38.05	34.20
Hispanic	293,802	15.07	14.89	2.14	9.92	36.39	34.25
Asian	55,710	36.94	20.23	12.17	33.47	65.68	53.51
By Poverty Status:							
Poverty	127,962	14.20	14.25	2.29	9.09	33.40	31.11
Non-Poverty	1,050,201	27.47	21.03	4.51	22.07	59.88	55.37
By Household Type:							
Married Couple	509,098	26.65	21.24	4.02	20.72	59.88	55.86
Single Mother	150,156	19.14	16.41	3.45	13.74	43.50	40.05

** Total number of block groups is 2706. The number of block groups in this table excludes 18 block groups that had no population.*

Table 18. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type Effects on Neighborhood Education Level.

	White	Black	Hispanic	Asian
*Percent College Graduate:**				
Poverty	-11.52	-6.68	-4.48	-11.09
Unmarried Female with Children	-6.15	-3.70	1.02	-2.98
Married Couples, not in Poverty	34.43	20.99	14.82	38.83
Adj. $R^2 = 0.23$ N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Neighborhood Vacancy Rate

The descriptive results shown in Table 19 find that neighborhoods overall had a mean vacancy rate of 7.1%, which ranged from 1.2% at the 10th percentile to 15.0% at the 90th percentile. Households overall were found to have a mean neighborhood vacancy rate that was slightly lower, at 6.1. The mean neighborhood vacancy rate across racial groups was similar, ranging from a low of 5.0% for Asians to a high of 6.9% for blacks. The racial groups also had a similar range from the 10th to the 90th percentiles. Larger discrepancies in neighborhood vacancy rate were found between poverty and household types. The average poverty household was found to reside in a neighborhood with 7.6% vacant homes compared to 5.9% for non-poverty households. For single mother, the average neighborhood vacancy rate was 7.0% compared to 5.5% for married couples.

Table 20 presents ANOVA results for neighborhood vacancy rate. It predicts a vacancy rate for married couples not in poverty of 6.0% for Hispanics, 5.7% for blacks, 4.5% for Asians, and 5.0% for whites. The poverty variable has a consistently positive effect. The effect is the highest for whites (2.0), followed by blacks (1.4), Asians (1.3), and finally Hispanics (0.9). For the family type variable, the effects are also all positive, however the pattern is slightly different, with black single mothers yielding the highest effect (1.3), followed by whites (1.0), Asians (0.9), and finally Hispanics (0.8). The effect of poverty status and single mother status led to the highest level of unemployment for black households at 8.4%. These coefficients were all significant at $p < .01$, however the adjusted R^2 for this model was the lowest of all of the ANOVA models at 0.03.

Table 19. Distribution of Neighborhood Vacancy Rate

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
Vacancy Rate	2687*	7.11	7.42	1.15	5.96	14.97	13.82
Households:							
All Households	1,178,163	6.09	5.94	1.32	5.22	13.08	11.76
By Race:							
White	617,258	5.75	6.35	1.19	4.79	12.54	11.35
Black	194,666	6.87	5.75	1.69	6.01	14.65	12.96
Hispanic	293,802	6.50	5.24	2.03	5.97	13.13	11.10
Asian	55,710	5.02	4.79	1.15	4.36	11.49	10.34
By Poverty Status:							
Poverty	127,962	7.60	6.11	2.51	6.82	14.88	12.37
Non-Poverty	1,050,201	5.90	5.89	1.26	5.06	12.77	11.51
By Household Type:							
Married Couple	509,098	5.50	5.27	1.21	4.82	11.89	10.68
Single Mother	150,156	7.03	5.77	1.97	6.23	14.48	12.51

** Total number of block groups is 2706. The number of block groups in this table excludes 19 block groups with no housing units.*

Table 20. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type on Neighborhood Vacancy Rate

	White	Black	Hispanic	Asian
*Percent Vacant:**				
Poverty	2.00	1.37	0.94	1.31
Unmarried Female with Children	1.00	1.30	0.76	0.86
Married Couples, not in Poverty	4.99	5.72	6.02	4.50
Adj. R^2= 0.03 N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Neighborhood Home Ownership Rate

Table 21 presents the distribution of neighborhood home ownership rate. These results indicate that the average percentage of owner-occupied homes in a neighborhood is 63.9%, ranging from 20.5% at the 10th percentile to 93.8% at the 90th. The average neighborhood home ownership rate was similar for households, at 65.6%. Across the racial groups, both the mean percentage of homeowners in the neighborhood and the interquartile ranges were different. Whites had a mean neighborhood percentage of homeowners of 74.7%, ranging from 38.1% at the 10th percentile to 96.4% at the 90th. In contrast, Hispanic households had a mean neighborhood percentage homeowners of 53.9 ranging from only 9.2% at the 10th percentile to 88.0% at the 90th. In addition, poverty households had a lower mean neighborhood percentage homeowners (49.6%) than non-poverty households (67.6%), and a similar relationship was found between single mothers (52.0%) and married couples (68.8%)

Table 22 presents ANOVA results for neighborhood home ownership rate. White, married couples not in poverty had the highest percentage owner occupied homes (78.7%), followed by Asians (66.9%), blacks (62.5%) and in this case with Hispanics last (57.9%). Poverty status has a negative effect for all groups but the magnitude varies by race.

Poverty had the greatest impact on Asian home ownership, reducing the percentage of homeowners by 17.1 points, resulting in a neighborhood rate of home ownership of 49.9%. For Hispanics, poverty reduced percent homeowners by 10.1 points, leading to a neighborhood rate of home ownership of 47.8%. The effect of poverty for neighborhood home ownership rate was the same for whites and blacks, -7.82 points, however the initial difference in home ownership for these two groups led the neighborhood rate of home ownership for married couples in poverty to be 70.9% and 54.7%, respectively. Single mother status also acts as expected, leading to a reduction in the rate of home ownership that is highest for blacks (-13.6), followed by whites (-12.2), Hispanics (-7.6) and Asians (-5.8). Following a change in poverty status and family type, the lowest percentage of owner occupied homes is found for the Hispanic group (40.2%), compared to 78.7% for white, married couples not in poverty. All of the coefficients in this model are significant at $p < .01$, with an adjusted R^2 that is 0.19.

Table 21. Distribution of Neighborhood Home Ownership Rate

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
%Home Owner	2685*	63.58	26.99	20.45	69.77	93.76	73.31
Households:							
All Households	1,178,163	65.60	28.08	18.87	74.18	95.18	76.31
By Race:							
White	617,258	74.74	23.61	38.13	83.31	96.37	58.24
Black	194,666	55.42	29.01	8.66	60.89	88.95	80.29
Hispanic	293,802	53.90	28.46	9.15	58.80	88.03	78.88
Asian	55,710	61.71	31.84	10.54	71.24	95.99	85.45
By Poverty Status:							
Poverty	127,962	49.55	28.41	7.30	52.22	85.94	78.64
Non-Poverty	1,050,201	67.55	27.41	21.73	76.49	95.50	73.77
By Household Type:							
Married Couple	509,098	68.77	27.05	24.24	77.81	95.87	71.63
Single Mother	150,156	52.01	29.45	7.99	56.88	88.95	80.96

** Total number of block groups is 2706. The number of block groups in this table excludes 21 block groups that had no households.*

Table 22. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type on Neighborhood Home Ownership Rate.

	White	Black	Hispanic	Asian
*Percent Owner Occupied:**				
Poverty	-7.82	-7.82	-10.10	-17.13
Unmarried Female with Children	-12.16	-13.57	-7.57	-5.77
Married Couples, not in Poverty	78.71	62.47	57.91	66.98
Adj. R^2= 0.19 N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Neighborhood Unemployment Rate

Table 23 presents descriptive statistics for neighborhood unemployment rate. For neighborhood, the average neighborhood unemployment rate was 7.1%, which ranged from 1.7% for neighborhoods at the 10th percentile to 13.9% for neighborhoods at the 90th percentile. For Households, the mean unemployment rate was 6.2%. The distribution of neighborhood unemployment rate by race, poverty status, and family type was similar to the distributions found for other neighborhood outcomes, with the average white living in a neighborhood with a lower rate of unemployment (4.6) than blacks (9.2), Hispanics (8.0), or Asians (5.1). The mean neighborhood unemployment rate was also higher for poverty and single mother households than it was for non-poverty and married couple households, respectively.

Table 24 presents ANOVA results for neighborhood unemployment rate. For married couple households, the neighborhood unemployment rates are the lowest for whites (3.7%), followed by Asians (4.2%), blacks (7.0%), and Hispanics (7.1%). Poverty acts as expected in this model, yielding an increase in unemployment for all groups. The effect is highest for blacks (3.3) and lowest for Hispanics (1.5). Single mother status also leads to an increase in the unemployment rate that is highest for blacks (1.5) and lowest for Hispanics (0.2). Because of the differences in the initial level of unemployment for the reference groups, however, white single mothers in poverty were found to have lower neighborhood rates of unemployment (6.2%) than single mothers in poverty for other racial groups (11.8% for blacks, 8.8% for Hispanics, and 6.7% for Asians). All coefficients in this model were found to be significant with an adjusted R^2 of 0.22.

Table 23. Distribution of Neighborhood Unemployment Rate

	N	Mean	SD	P_{10}	P_{50}	P_{90}	IDR
Neighborhoods:							
Unemployment	2686*	7.10	6.18	1.69	5.66	13.91	12.22
Households:							
All Households	1,178,163	6.23	4.60	1.78	5.22	11.99	10.21
By Race:							
White	617,258	4.59	3.17	1.48	3.96	8.66	7.18
Black	194,666	9.22	6.12	3.05	7.59	17.38	14.33
Hispanic	293,802	7.96	4.63	2.80	7.21	13.91	11.11
Asian	55,710	5.09	3.32	1.59	4.54	9.38	7.79
By Poverty Status:							
Poverty	127,962	9.31	5.86	3.26	8.01	16.71	13.45
Non-Poverty	1,050,201	5.86	4.28	1.68	4.96	11.21	9.53
By Household Type:							
Married Couple	509,098	5.89	4.20	1.70	4.98	11.34	9.64
Single Mother	150,156	8.11	5.58	2.50	6.79	14.95	12.45

** Total number of block groups is 2706. The number of block groups in this table excludes 20 block groups that had no individuals over the age of 16 who were in the labor force*

Table 24. Results From ANOVA Model Estimating Effects of Race, Poverty, and Household Type on Neighborhood Unemployment Rate.

	White	Black	Hispanic	Asian
*Percent Unemployed:**				
Poverty	1.72	3.34	1.54	1.84
Unmarried Female with Children	0.80	1.50	0.20	0.69
Married Couples, not in Poverty	3.71	6.97	7.10	4.15
Adj. $R^2 = 0.22$ N = 649,685				

**All coefficients reported in this table are significant at $p < .01$.*

*** Coefficients are taken from a pooled ANOVA model which includes all additive and non-additive race effects. Effects are presented in the form of group specific equations to enhance readability.*

Taken together, these results indicate that households that differ on the three status characteristics of race, poverty status, and family type live in very different neighborhoods. This can be seen clearly with a quick comparison of the neighborhoods predicted by all of the ANOVA models for two different households. For a black, single mother in poverty vs. a white, married couple not in poverty, the ANOVA results predict that they would live in the following neighborhoods:

Black, Single Mother in Poverty

- 13.6% white households
- 28.9% poverty households
- $35,503 median household income
- 10.6% college graduates
- 41.1% owner occupied homes
- 11.8% unemployment rate
- 8.4% vacant houses

White, Married Couple not in Poverty

- 73.9% white households
- 4.7% poverty households
- $67,891 median household income
- 34.4% college graduates
- 78.7% owner occupied homes
- 3.7% unemployment rate
- 5.0% vacant houses

While there may be numerous additional neighborhood characteristics of interest, the characteristics included in these analyses give a clear indication of how neighborhoods differ for different social groups.

These results provide strong support for hypotheses H.4-H.6 that were introduced in Chapter II:

H.15: Membership in a disadvantaged group increases the likelihood of living in a neighborhood with negative characteristics.

H.16: There is an additive effect to the social characteristics being investigated, such that membership in more than one disadvantaged group is associated with a higher exposure to detrimental neighborhood outcomes.

H.17: The effect of the poverty status and family type variables on neighborhood level characteristics varies across racial groups. For example, the effect of single mother status on median neighborhood income is hypothesized to be higher for blacks than for whites.

Membership in a disadvantaged group was found to increase the likelihood of living in a neighborhood with negative neighborhood outcomes, an additive effect to the social characteristics being studied was found, and the effect of the poverty status and family type variables was found to differ across racial groups.

CHAPTER V

SIMULATION ANALYSIS

The previous two chapters examine patterns of segregation by race, socioeconomic, and family type for Houston, Texas based on analysis of aggregate segregation measures and household-level neighborhood attainment patterns. One limitation of these research approaches is that they do not directly assess the micro-level behavior underlying the social dynamics hypothesized to produce the aggregate-level segregation patterns. Micro-level processes are *presumed* to operate, but are not directly examined.

In this chapter, I use the methodology of computer simulation to explore how one set of micro-level processes identified in urban-ecological theories can combine with urban and demographic structure to produce residential segregation between social groups. Specifically, I use simulation research to explore how market dynamics can produce segregation between married couple and single mother families based on economic differences.

Computer Simulation Data

Using computer simulation methods, a "virtual" city is built according to desired specifications. Then independent variables relating to city demographic structure and social processes can be manipulated while controlling for other variables in ways that are impossible in studies of actual cities. Here the crucial variables are family types, economic inequality between family types, and area stratification of neighborhood housing values. The focus is on segregation between different types of households,

namely married couples and single mothers. The independent variables are economic inequality between households and the level of area stratification in the city. The simulation methodology allows me to manipulate the independent variables in order to assess their effects on segregation between family types.

Among the advantages of this approach is that the simulation models allow for the implementation of micro-level dynamics regarding market processes as they are outlined in urban ecological theory. At the same time, the simulation model can insure that segregation outcomes produced in the simulation experiments reflect *only* the factors under consideration (i.e., economic inequality and area stratification) and do not reflect other factors that may be operating in "real" residential systems (e.g., differences in residential preferences, discrimination by race and ethnic status, etc.)(Fossett 2004).

Computer Simulation Methods

The simulation experiments for this chapter were conducted using *SimSeg* (Fossett 1998), an agent-based model which has been used in previous research exploring racial and economic residential segregation (Fossett 2005a, Fossett and Waren 2005, Fossett and Senft 2004, and Fossett 2005b). The "agents" in the simulation are households who move about in a virtual city guided by behavioral rules (i.e., computer algorithms) implemented in the simulation model. This program allows the researcher to design a city were households move and chose residential locations according to guidelines that are specified by the researcher, therefore, you can be certain that it is only the variables that you have specified that are reacting in the simulated city. This is not the case when studying actual outcomes in cities, where an observed phenomenon can

have numerous causes. Simulation research also allows for precise measurement of the variables to be studied, since all parameters are specifically defined by the researcher.

Households, Household Characteristics, and Residential Preferences

The simulation generates a virtual population of households. Each household is assigned status values on two social characteristics: household type and socioeconomic status. Household type is a dichotomy of married-couple households and single-mother households.[6] Socioeconomic status is a continuous variable ranging from a low of 1 to a high of 99. The overall distribution of status in the population of households is right skewed (as typical for status distributions) with a median 35. The interquartile range for the distribution of status is 30.

Households are assigned residential preferences that guide their evaluation of housing and neighborhood location decisions. In these simulation experiments, all households are given identical residential preferences: they seek to reside in high-quality housing units located in high-status residential areas. The household's ability to realize these preferences are constrained only by their economic means and by urban structure.

Housing Units, Bounded Neighborhoods, and Neighborhood Characteristics

The simulation program creates a virtual city that is divided into "bounded" neighborhoods. All bounded neighborhoods are located in a spatial grid and assume a roughly "circular" shape. All neighborhoods are equal in size and contain an equal number of housing units arranged in a square grid.

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[6]Strictly speaking, the SimSeg simulation does not provide labels for groups by household type. For the purposes of these experiments, I reinterpret the available label of ethnic status as household type. To ensure that this interpretation is substantively appropriate, the simulation specifications used in this study implement only social processes that are relevant for married couple and single mother households. Thus, ethnic categories can be interpreted as household type. Segregation between household types is determined solely by their economic standing and market dynamics.

Housing units have the characteristic of "quality" and "cost". Both are measured on the same scale used to measure household socioeconomic status. Housing values thus range from 1-99 with a median of 35 and an interquartile range of 30.

Neighborhoods have characteristics based on the composition of the housing stock in the area and of the population residing in the neighborhood. The mean status of a neighborhood is based on the average of the status scores for the households residing in the area. This is taken as an index of neighborhood quality and is a surrogate for a bundle of neighborhood amenities (e.g., quality of schools, crime rate, quality of city services, environmental quality, etc.) that reflect neighborhood desirability.

Socioeconomic Inequality Between Household Types

The simulations vary the extent of inequality between married-couple households and single-mother households. In some simulations, the two kinds of households have identical status distributions. Other simulations implement varying levels of inequality in socioeconomic status between the groups. Inequality is specified using Lieberson's (1975) index of net difference, which is varied from 0 to 80. As a rule of thumb, scores on this measure can be interpreted as follows:

Scores of 0 indicates no inequality,

Scores below 10 represent low inequality,

Scores between 20-30 represent medium inequality,

Scores between 40-50 represent high levels of inequality, and

Scores above 60 represent very high levels of inequality.

For purposes of comparison, inequality in income between black and white households is often in the range of 40-50 when measured using Liberson's indices of net difference (Fossett and Seibert 1997).

Area Stratification.

Area stratification refers to the systematic clustering of housing values by area to create areas of high housing value and areas of low housing value. The simulations implement systematic variation in the distribution of housing quality in urban space along a city-suburb continuum. When area stratification is absent, all neighborhoods have a similar mix of high- and low-quality housing regardless of spatial location. When area stratification is high, housing quality is systematically lower in central neighborhoods and systematically higher in suburban neighborhoods. The variable of area stratification is measured on a scale of 0 to 80 where the index number reflects the strength of the association between housing values and distance from the center of the city.[7] As a rule of thumb, scores on area stratification can be interpreted as follows:

Scores of 0 indicate no area stratification,

Scores below 20 represent low area stratification,

Scores above 40 represent medium area stratification, and

Scores above 60 represent high area stratification.

By way of comparison with real cities, spatial variation in housing values is high. For example, a one-way ANOVA of housing values by census block group using data for Houston, Texas yields an adjusted R^2 of approximately 0.65. This indicates that 65% of the variation in housing values is *between* block groups, with 35% within block groups.

[7]Specifically, the number reflects the percentage of variance in housing values "explained" by distance.

Micro-Level Housing Market Process

The simulation program allows households to search for housing units and neighborhoods that best match their housing preferences. Households move independently and are guided by their own housing preferences. Their moves are means-tested; that is, they can only move to a new location if they can afford the housing unit at the destination site. The process simulates the kind of decentralized housing market specified in many urban ecological models.

Segregation Outcomes

The index of dissimilarity between married-couple households and single-mother households is computed at the end of each simulation. The bounded neighborhood is the geographic unit for computing the index of dissimilarity. In addition to the index of dissimilarity, the P* isolation index is also calculated to measure the amount of contact that single mother households had with their own group.

Simulation Designs

In this study, I conducted simulations along three separate designs. For each set of simulations, I ran 1,000 trials to generate samples adequate to estimate effects. For each trial, households in the simulation were placed "in motion" for a period of 20 cycles, where a cycle produces housing turnover similar to levels seen in a year in a real city. In all simulations homes had a fixed value, and all moves are "means tested"; that is, households can only move to homes that are within their income/status level.

In the first set of simulations, area stratification was set at a low level, meaning that high, low, and medium quality housing was evenly distributed throughout the city. Group income inequality, however, was allowed to vary from low to high levels. In the

second set of simulations, area stratification was at a moderate level, with the same variation in-group inequality. The final set of simulations runs had high levels of area stratification combined with the variation in-group inequality. I measured segregation by calculating the index of dissimilarity between the two groups in each the simulation trial. I also calculated the revised index of isolation for the single mother group.[8] These scores are then compared for multiple simulation trials for each of three sets of simulation designs. The scores are then graphed for easy comparison.

Computer Simulation Results

For the first set of 1,000 simulations, area stratification was low while status inequality between the two groups was allowed to vary from low to high. In these simulations, for all levels of status inequality, dissimilarity between the two groups remained relatively low, below 20 as seen in Figure 4. The second set of 1,000 simulations used a medium level of stratification, while status inequality varied as before. In these simulations, segregation was found to increase as status inequality increased, as seen in Figure 5. The final set of 1,000 simulations implemented a high level of area stratification with the same variation in inequality. These simulations showed the same pattern as the simulations with medium area stratification, but with more pronounced segregation, as depicted in Figure 6.

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[8]The revised index of isolation (R) is based on the P* isolation score, that is calculated R = 100 (P*-Q)/(100-Q), where Q is the expected value of P* (i.e., the group's percentage in the population).

The index of dissimilarity scores in this case ranged from a low of below 20 (while inequality was low) to a high of 60 (when inequality between the two groups was high). For the purposes of comparison, Figure 7 displays the data from all three sets of simulations in the same graph and clearly shows how segregation increases with inequality between groups, but only when area stratification is high.

Table 25 presents the means for the index of dissimilarity by area stratification and inequality. It documents the findings seen in the graphs: when area stratification is low, and inequality between groups is also low, the mean index of dissimilarity was 14.5. In contrast, a high level of area stratification combined with a high amount of inequality between groups, resulted in an average index of dissimilarity of 48.9. I ran an ANOVA using these data, which indicates that variation in the index of dissimilarity by area stratification and inequality is statistically significant, with a p value for F that was <0.01.

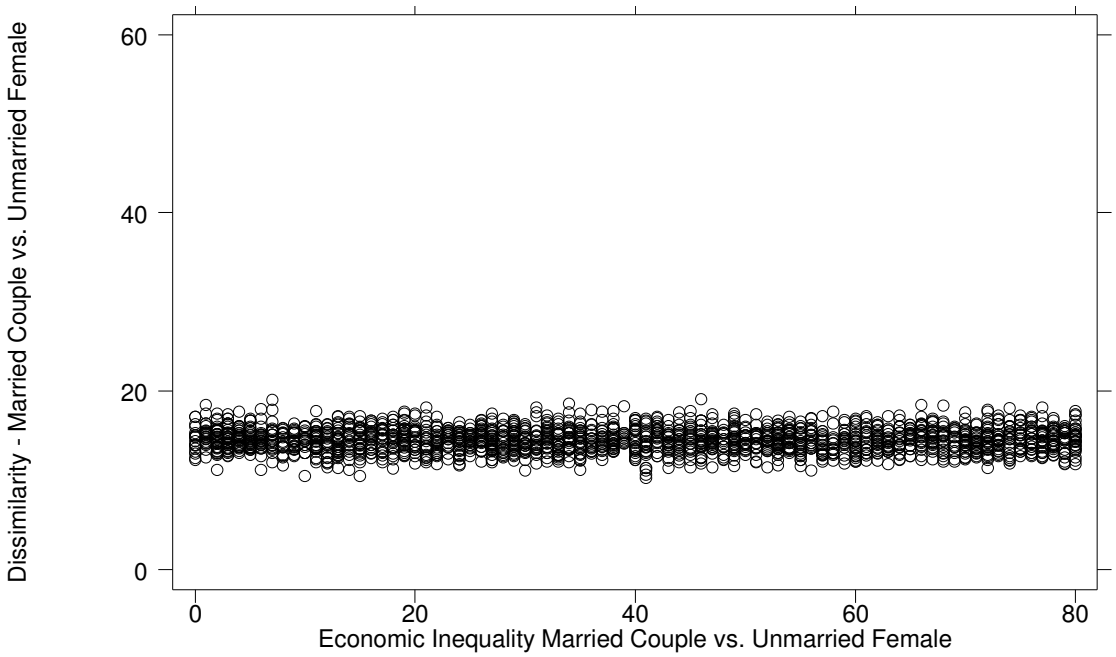

Figure 4. Dissimilarity by Inequality with No Area Stratification

Figure 5. Dissimilarity by Inequality with Medium Amount of Area Stratification

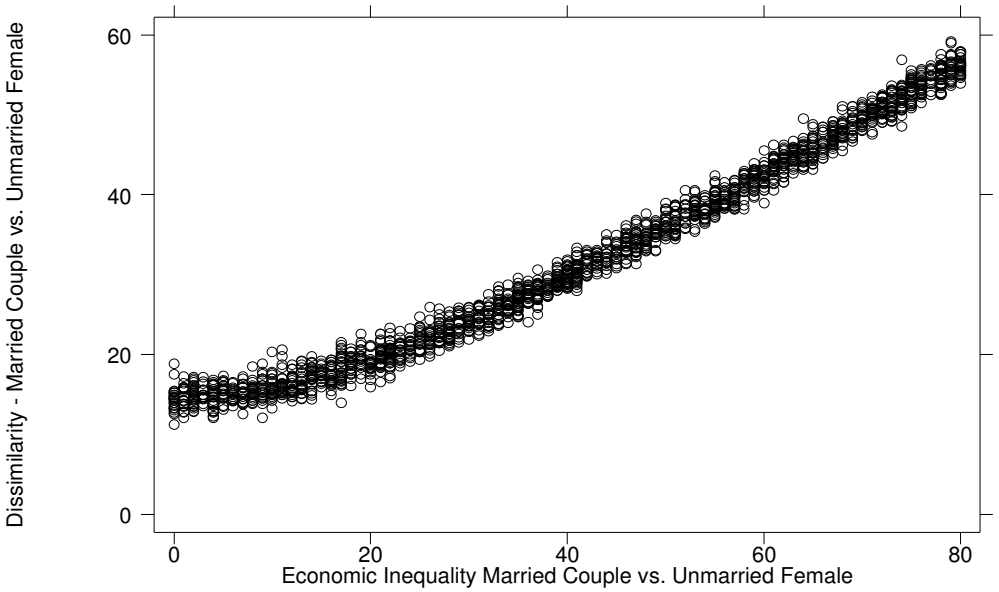

Figure 6. Dissimilarity by Inequality with High Amount of Area Stratification

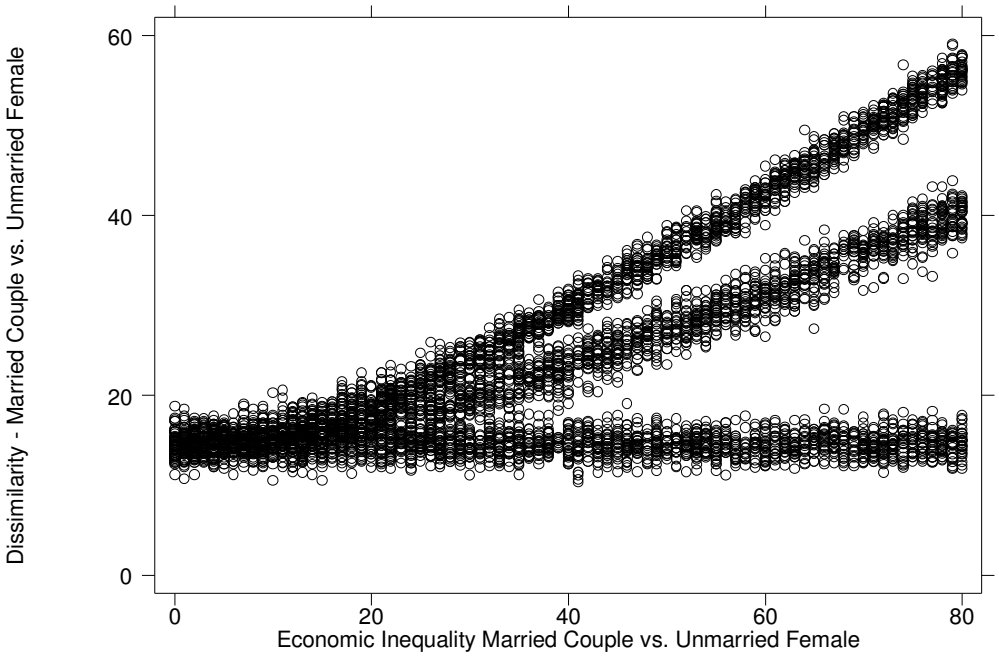

Figure 7. Dissimilarity by Inequality with All Three Levels of Area Stratification

Table 25. Mean Value of Dissimilarity by Area Stratification and Inequality

Area Stratification	**Inequality**		
	Low	*Medium*	*High*
Low	14.52	14.82	15.13
Medium	15.47	24.18	38.22
High	16.00	28.98	48.87

** P value for F is .01 for ANOVA*

Table 26. Mean Value of Revised Isolation by Area Stratification and Inequality

Area Stratification	**Inequality**		
	Low	*Medium*	*High*
Low	1.71	1.77	1.88
Medium	1.95	5.26	13.33
High	2.09	7.47	21.47

** P value for F is .01 for ANOVA*

I found the same basic patterns using the Revised Index of Isolation to measure segregation as was found when segregation was measured using the index of dissimilarity. Figure 8 presents the scores for the Revised Index of Isolation (R) for single mothers in a set of 1,000 simulations where area stratification was low and inequality was allowed to vary from low to high. As before, segregation was found to be minimal, and did not change with the amount of inequality between groups. The next set of 1,000 simulations, shown in Figure 9 was with a medium amount of area stratification. R in this case was found to increase when inequality increased. Finally, Figure 10 presents the results of a set of 1,000 simulations where area stratification was high. This figure shows that R in this case also increases with inequality, however these levels were higher than what was found in Figure 9. The final figure, Figure 11, gives all three of these simulation scenarios together, so that they can be more easily compared.

Table 26 presents means for the Revised Index of Isolation by area stratification and inequality. For example, when area stratification is low, and inequality between groups is also low, the mean for the Revised Index of Isolation for single mothers was 1.7. In contrast, a high level of area stratification combined with a high amount of inequality between groups, resulted in an average for the Revised Index of Isolation of 21.5. ANOVA resultes indicated that the pattern is statistically significant with the p value for F that was <0.01.

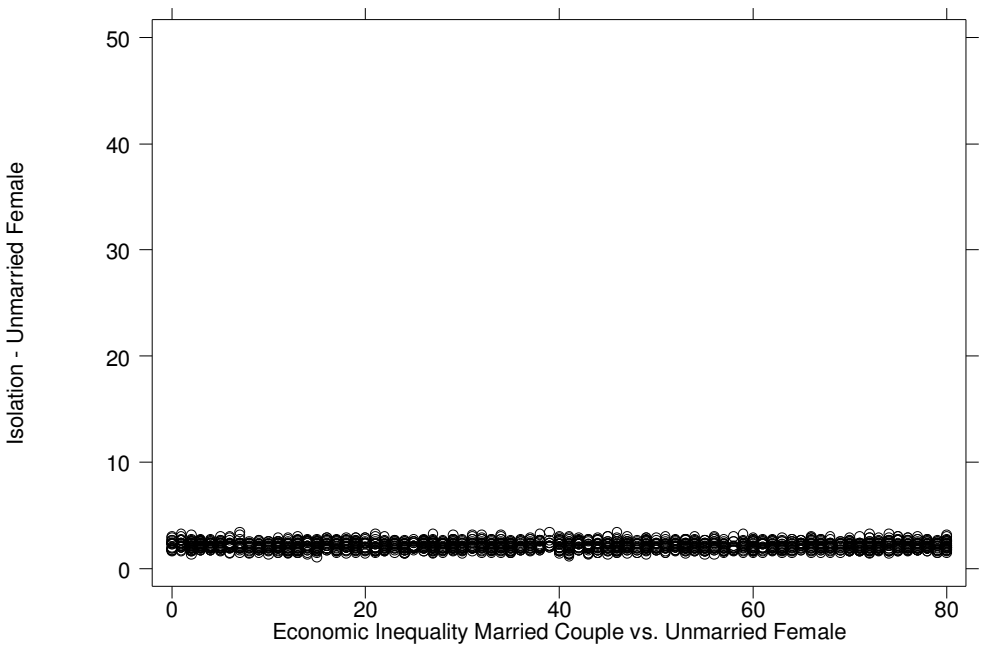

Figure 8. Revised Index of Isolation (R) of Unmarried Female Households with No Area Stratification

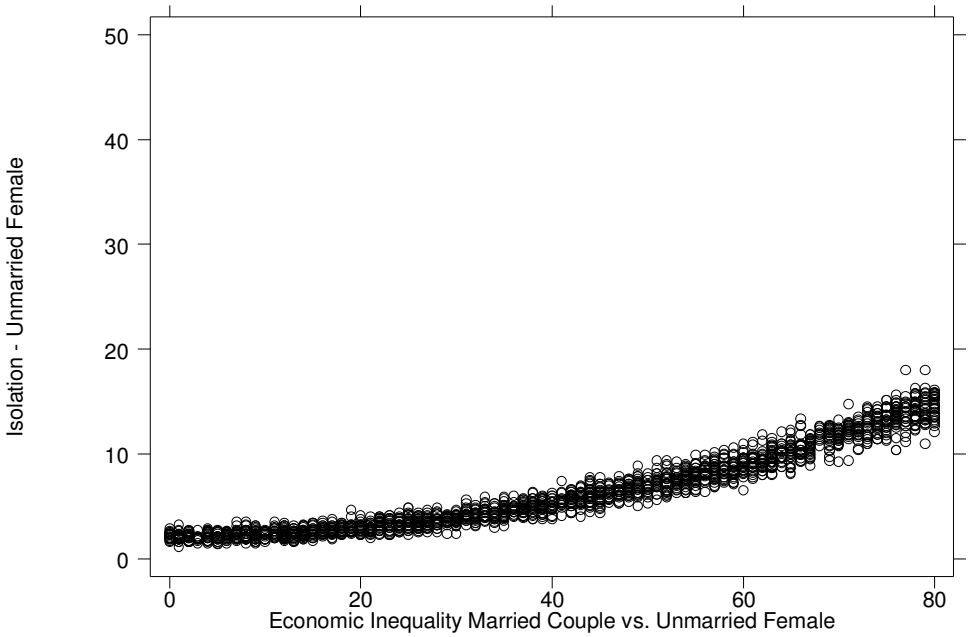

Figure 9. Revised Index of Isolation (R) of Unmarried Female Households with Medium Area Stratification

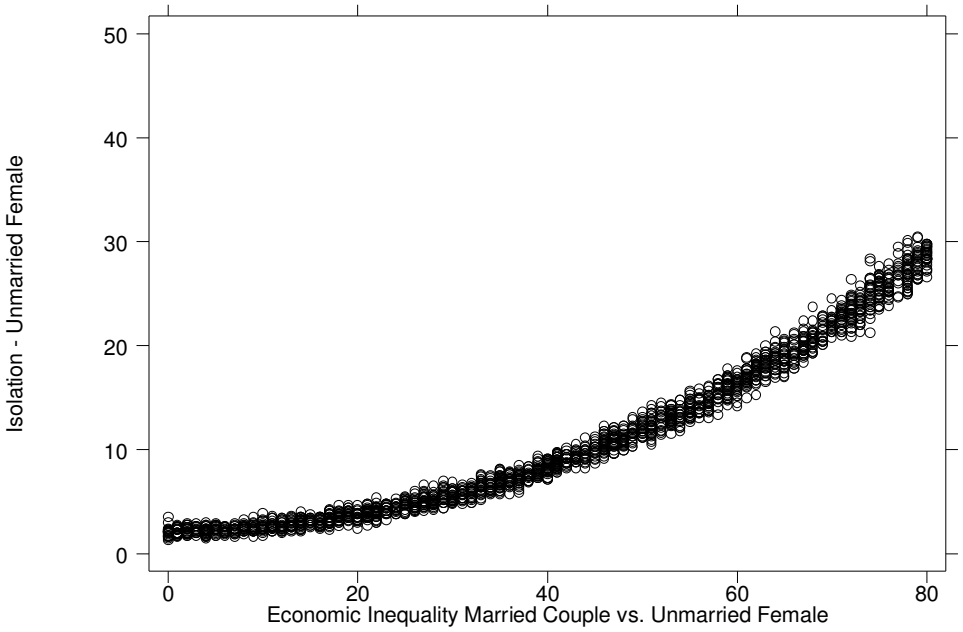

Figure 10. Revised Index of Isolation (R) of Unmarried Female Households with High Area Stratification

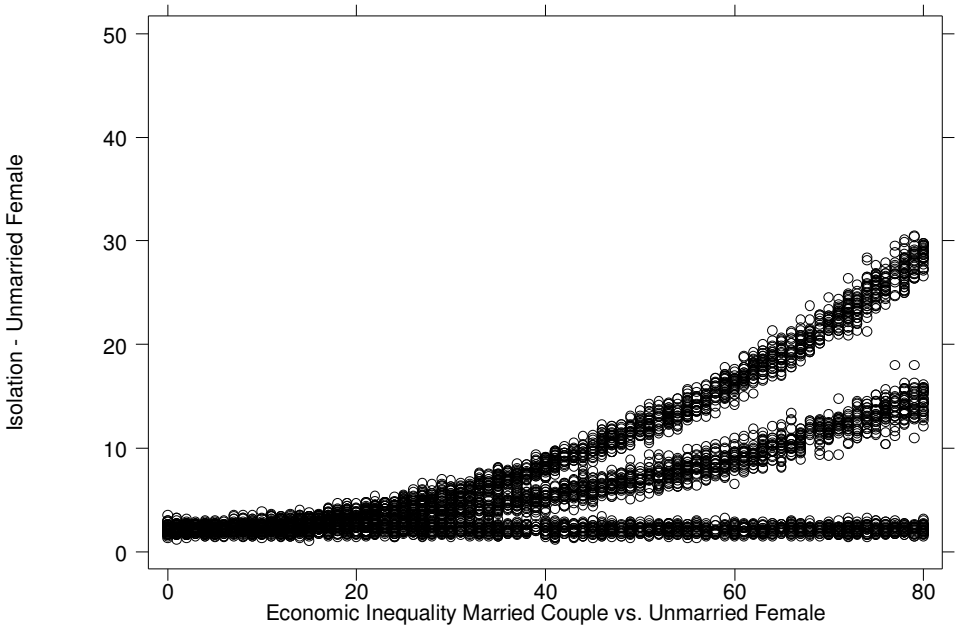

Figure 11. Revised Index of Isolation (R) of Unmarried Female Households with All Three Levels of Area Stratification

These results indicate that inequality between two groups is relevant to segregation, *but only in the context of area stratification*. Regardless of the amount of inequality, substantial segregation does not emerge until medium to high levels of stratification are introduced. These results provide partial support for hypotheses H.8 and H.9, and strong support for H.10:

H.18: Segregation produced by market dynamics will vary directly with the extent of economic inequality between groups.

H.19: Segregation produced by market dynamic will vary directly with area stratification.

H.20: The effects of economic inequality and area stratification condition each other such that market dynamics produce the highest levels of segregation when economic inequality and area stratification are both high.

For H.8, segregation was found to vary directly with the extent of economic inequality, *but only in the context of medium to high levels of area stratification*. For H.9, segregation was found to vary directly with the extent of area stratification, *but only in the context of medium to high inequality*.

Discussion

While this simulation shows that segregation between groups can arise from the interaction between inequality between groups and area stratification, it does not speak directly to the dynamics that are occurring in Houston, Texas. One way to relate these results to an actual MSA is to determine the amount of inter-group inequality and area stratification that is present in the MSA. As reported previously in Chapter III, the poverty rate for married couples and single mothers differs dramatically. For married couples, the poverty rate was 9.1%, while single mothers had a poverty rate of 32.1%.

This indicates that these two groups have unequal socioeconomic statuses. Also, as noted earlier in the chapter, area stratification is high in Houston, Texas. ANOVA using home values as the dependent variable and block groups as the independent variable yields an R^2 of 0.64. This indicates that 64% of the variation in housing value was across block groups. This amount of area stratification is similar to the "high" level present in the simulation models. These data speak to the potential relevance of the simulation findings, and suggest that segregation between groups in Houston, Texas is influenced by the interaction between inter-group inequality and area stratification. In this simulation model, however, these two variables were the only variables affecting segregation. Segregation levels in the city of Houston, Texas itself could potentially be influenced by numerous other factors, such as residential preferences or discrimination, in addition to the ones examined in these simulations.

CHAPTER VI

SUMMARY AND CONCLUSIONS

In this thesis I have examined residential segregation in Houston, Texas between groups that differ on multiple status characteristics, namely, race, poverty status, and family type. The findings support the relevance of considering multiple status characteristics in the measurement of segregation, since each of them had an impact on segregation. These findings are consistent with the theoretical perspectives of social area analysis and urban ecological theory. While the effect of race continues to yield the strongest impact, these results also found that poverty status and family type impact segregation as well. Additionally, the results reported in this thesis found that groups that were disadvantaged not only experienced segregation, but were exposed to other negative neighborhood outcomes as well. The impact of having a disadvantaged status on more than one social characteristic was higher segregation from advantaged groups and lower neighborhood quality. The results of a simulation analysis found that segregation between two groups can occur when the groups differ in their socioeconomic status and they live in an area that is stratified according to socioeconomic status.

Results of Hypothesis Testing

The first four hypotheses examined in this thesis were aimed at documenting segregation patterns and assessing how it varied with race, poverty, and family type. These hypotheses, as given in Chapter II, were tested in Chapter III based on analyses

using P*. This methodology allowed for the impact of each of the three social characteristics to be evaluated separately and in combination with each other. The first set of analyses took white, married couples, non-poverty as the contact (Y) group. In these analyses, full support was found for hypothesis H.1 in the white-black and white-Asian analysis, and partial support was found in the white-Hispanic analysis. In all three comparisons using white, married couples, non-poverty as the contact (Y) group, full support was found for hypotheses H.2 and H.3. Finally, for H.4, I also found full support in the white-black and white-Asian models and conditional support in the white-Hispanic model. I also found that the race variable consistently had a higher impact than the other variables, and that single mother and poverty status had an effect that differed across groups. A comparison of the three outgroups examined in the majority-minority segregation analysis confirmed the finding in previous literature that Hispanic and Asian groups experience more contact with whites than Blacks do.

The next sets of analyses used minority households as the contact (Y) group and compared the other three groups against them. In this set of analyses the interpretation is more complicated. At first glance, it appears that, for some of the status dimensions, groups that are different actually have more contact than groups that are similar (family type in the black-white analysis, for example). On closer examination, it can be seen that minorities that are high status experience an increase in contact with other groups that are low in status (for example, high status blacks have more contact with low status whites than they do with whites that are similar to them in status). As mentioned above, the race effects were consistently found to be stronger than the effects for poverty status

and family type, and these results are further confirmation of this finding. Also apparent in the minority-minority comparisons is that segregation between minority groups is not as strong as segregation between minority groups and whites.

Chapter IV tested the next three hypotheses using an individual-level spatial attainment model predicting neighborhood characteristics. These hypotheses were also given in Chapter II and focused on the impact that having a disadvantaged social status can have on the types of neighborhoods that an individual lives in. These hypotheses were fully supported in descriptive and ANOVA analysis in all but one instance. The exception was found for Hispanic single mothers, who were found to have a higher neighborhood education level than Hispanic married couples. As expected from the results in the previous analysis, the effects of race had a larger impact on neighborhood social characteristics than did the poverty and family type variables, although these variables were all consistently significant. These results indicate that households that are disadvantaged experience a higher exposure to negative neighborhood characteristics than households that are not disadvantaged. The limitations of these results is that, while individual level outcomes are determined, the dependent variables are neighborhood characteristics. The models estimated do not allow for the prediction of the characteristics of the individual households in regards to income, home ownership, etc.

The final empirical section of this thesis evaluates how area stratification and economic inequality by family type can combined to cause residential segregation between groups. This was conducted utilizing simulation analysis to determine the effects of inter-group inequality and area stratification. The hypotheses for this section

of this thesis were given in the last section of Chapter II. Inequality was found to be relevant, but *only when area stratification was present*. Additionally, area stratification was found to be relevant, but *only when inequality between groups was also present*. These results indicate support for H.10, and conditional support for H.8 and H.9. While these results do suggest that the patterns of segregation found in Chapter III could be influenced by the interaction of inequality and area stratification, caution must be used when generalizing from simulations to actual cities. The simulation presents a controlled environment, and represents what potentially could happen in some situations, not necessarily what does happen. In an actual city, additional factors can also have important influences on segregation as well.

Implications and Direction for Future Research

The purpose for this research, as was stated in the introduction, was to gain a more complete understanding of segregation and the neighborhoods that are created by segregation dynamics. Previous research that has been conducted on residential segregation has generally been focused on the effects of race and class, either separately or in combination with each other. Little research has focused on the effects of variables other than race or class. In this thesis, I utilized the previous research that had been done in this area, and built on it by adding a third characteristic, that of family type. I found support for the idea that multiple status characteristics should be taken into account in the study of residential segregation. In this thesis, I specifically focused on households with children due to a concern for the welfare of children impacted by disadvantaged social standing. Future research can also take into account additional factors.

With a more complete understanding of the experiences of children in segregated neighborhoods, more effective social policies can be suggested that target these areas. The fact that segregation occurs along multiple status characteristics can also be important for the planning of social policy, indicating that programs should target populations that experience more than one level of disadvantage. For example, a program that provides job training in a low income area can benefit from the knowledge that a large portion of the population in that area are families headed by a single mother. A more effective policy that takes this information into account would be a job training program that provides child care during the classes.

In this thesis I also used more than one methodology to examine residential segregation and the impact of multiple factors. Specifically, I blended analysis of Census data with a computer simulation analysis. These two methods provide a complement to each other by describing several aspects of the same phenomenon. In addition, the use of Census data provides concrete support for the theoretical findings of the simulation analysis, while the use of simulation analysis allows for research to be conducted in areas that are not feasible using Census data alone. My findings in this thesis support the use of more than one methodology in the study of residential segregation. In the future, there are additional areas of research that can benefit from a similar mixture of data and simulation analysis. For example, this research could focus on the residential preferences that different family types have, the effects of these preferences on residential segregation, and a comparison of the ability of these groups to satisfy their preferences.

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APPENDIX A

DEVELOPING MEASURES FROM CENSUS CATEGORIES

The data I used for this study are data collected by the U.S. Census Bureau in the 2000 census. These data are downloaded from the public U.S. Census Bureau website. The U.S. Census Bureau classifies the Houston, Texas area as a consolidated metropolitan statistical area, and combines the area of Houston with Galveston and Brazoria, Texas and presents them in one table. These are the data that are used for the Houston, Texas area. Using the technical documentation provided by the U.S. Census Bureau, tables were created using the relevant variables. There are several tables of relevant Houston, Texas data. These tables are:

- Households by age of householder, by household type, by presence of own children under 18 years of age (US Census table P12)
- Households by age of householder, by household type, by presence of own children under 18 years of age, by race (US Census tables P146A-P146I)
- Poverty status in 1999 of families, by family type, by presence of related children under 18 years, by age of related children, by race (US Census tables P160A-P160I)

For the first two tables, the age of householder categories are collapsed so that the categories of household type reflect all ages of householders. For the third table, ages of related children are collapsed so that the categories of presence of related children under 18 reflect all ages of children under 18. The only race information that I

included in this study is non-Hispanic White alone, Black alone, Hispanic alone, and Asian alone.

APPENDIX B

ADDITIONAL FIGURES TO ACCOMPANY CHAPTER III

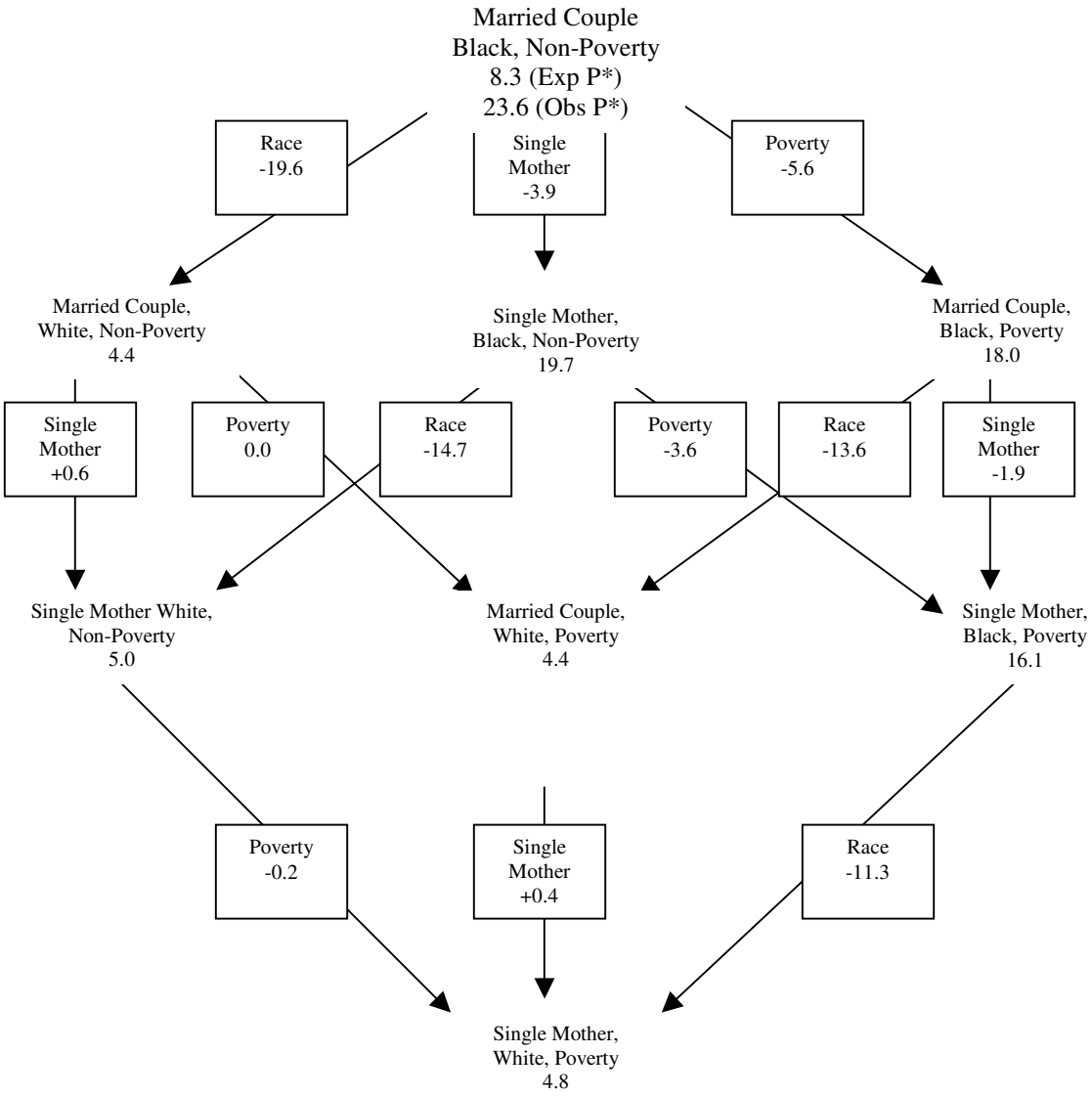

Figure 12. Analysis of How Contact with Black, Married Couples with Children Varies by Race (White), Family Type (Single Mother), and Socioeconomic Status (Poverty)

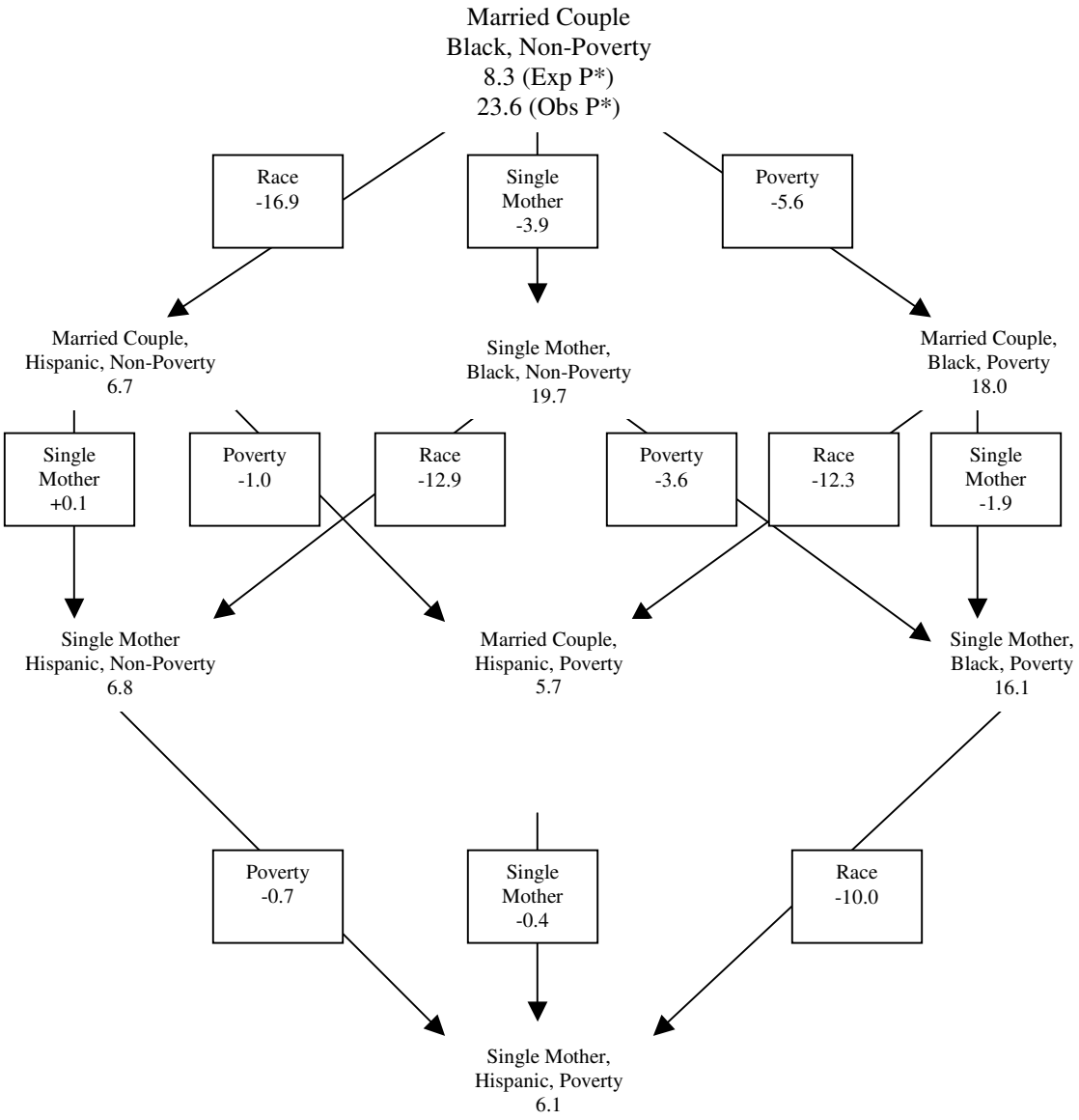

Figure 13. Analysis of How Contact with Black, Married Couples with Children Varies by Race (Hispanic), Family Type (Single Mother), and Socioeconomic Status (Poverty)

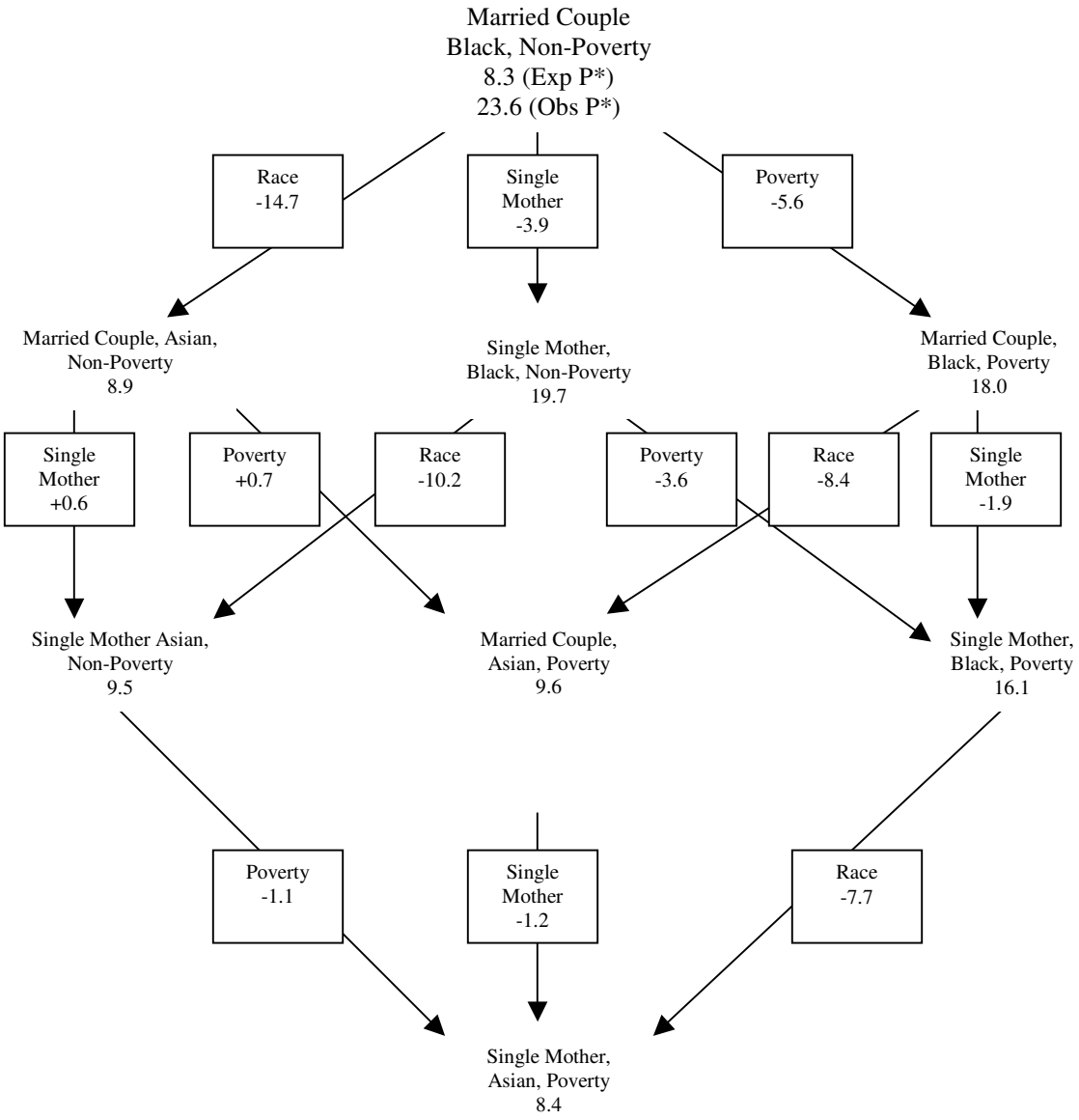

Figure 14. Analysis of How Contact with Black, Married Couples with Children Varies by Race (Asian), Family Type (Single Mother), and Socioeconomic Status (Poverty)

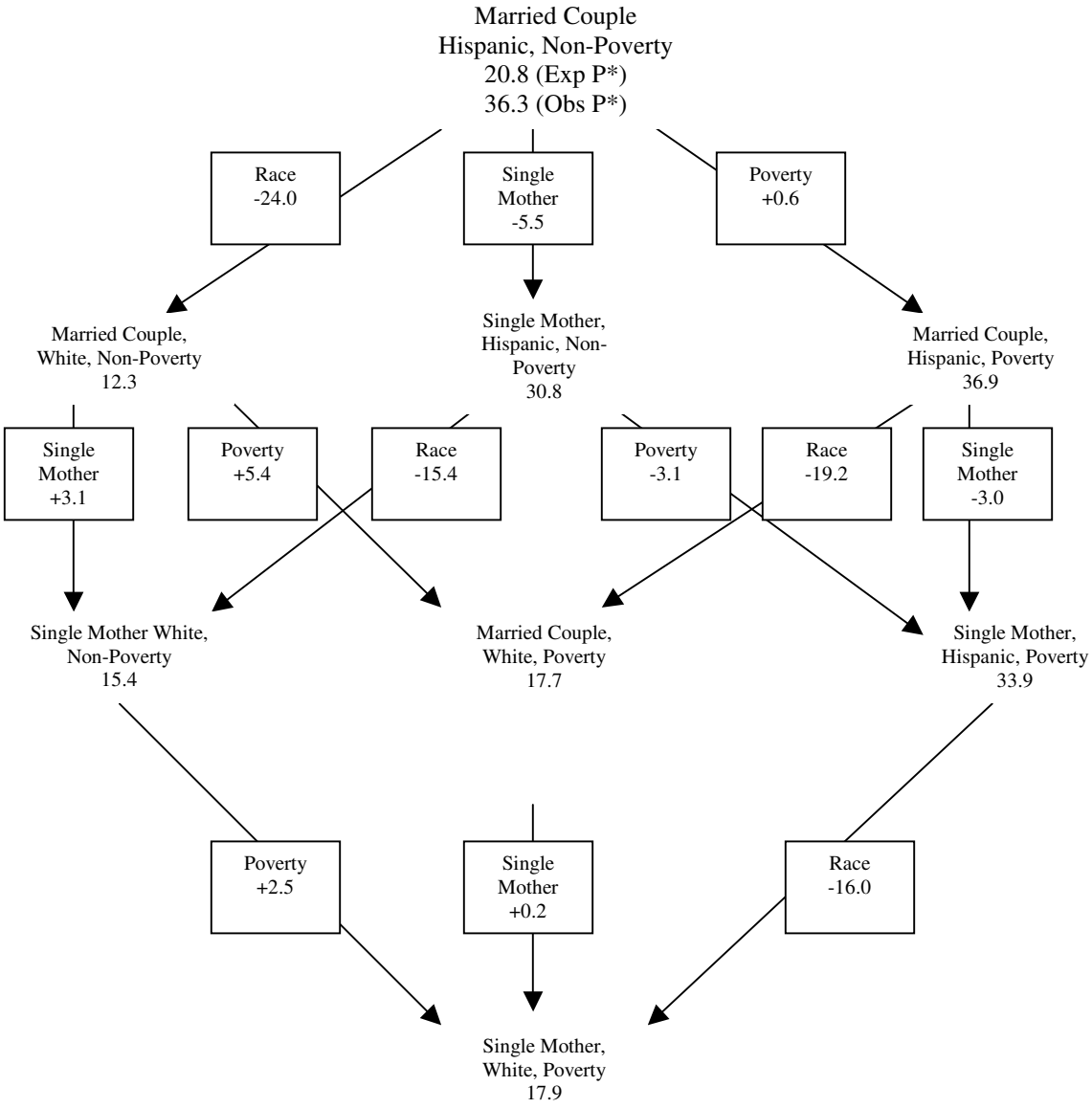

Figure 15. Analysis of How Contact with Hispanic, Married Couples with Children Varies by Race (White), Family Type (Single Mother), and Socioeconomic Status (Poverty)

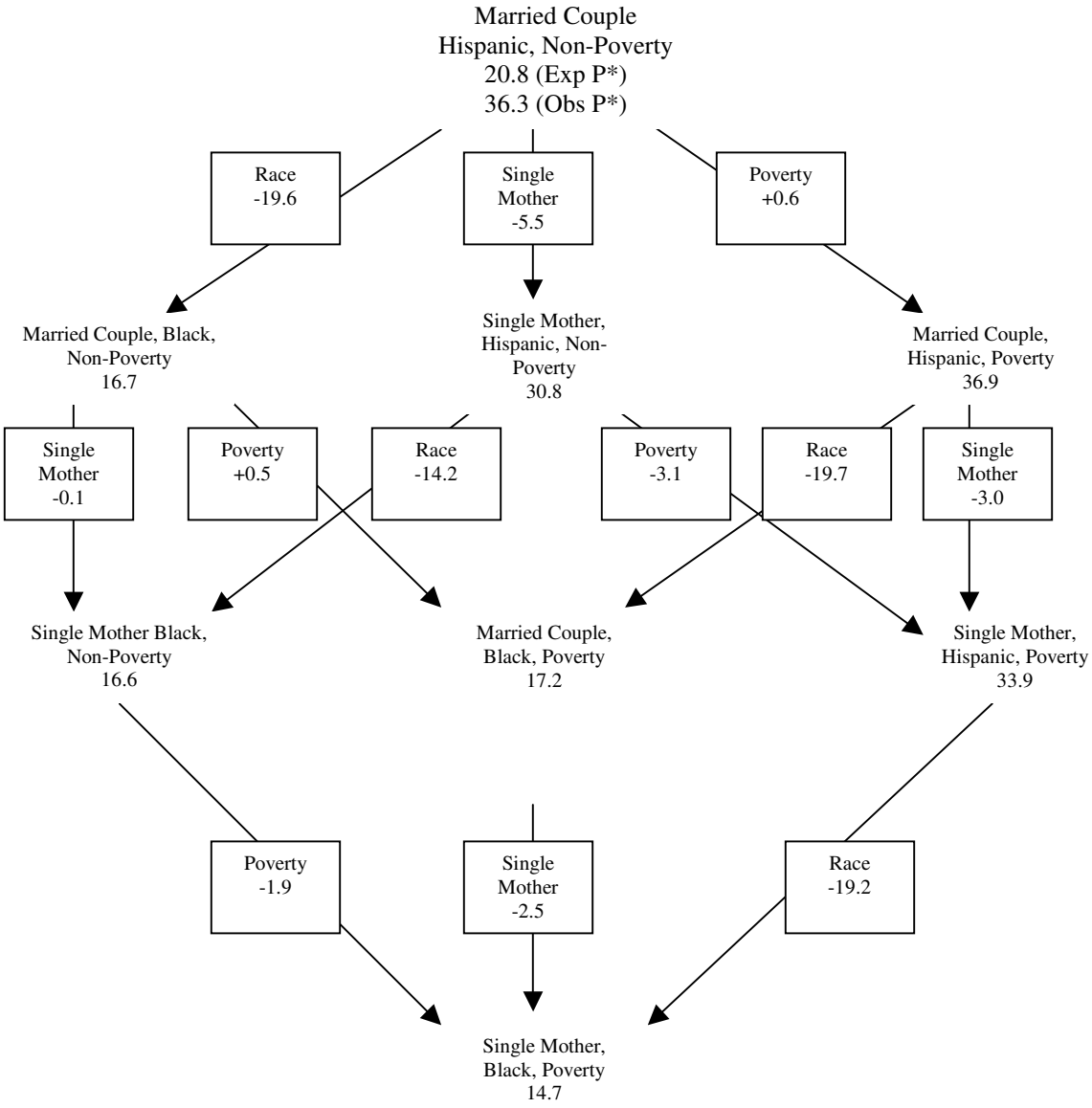

Figure 16. Analysis of How Contact with Hispanic, Married Couples with Children Varies by Race (Black), Family Type (Single Mother), and Socioeconomic Status (Poverty)

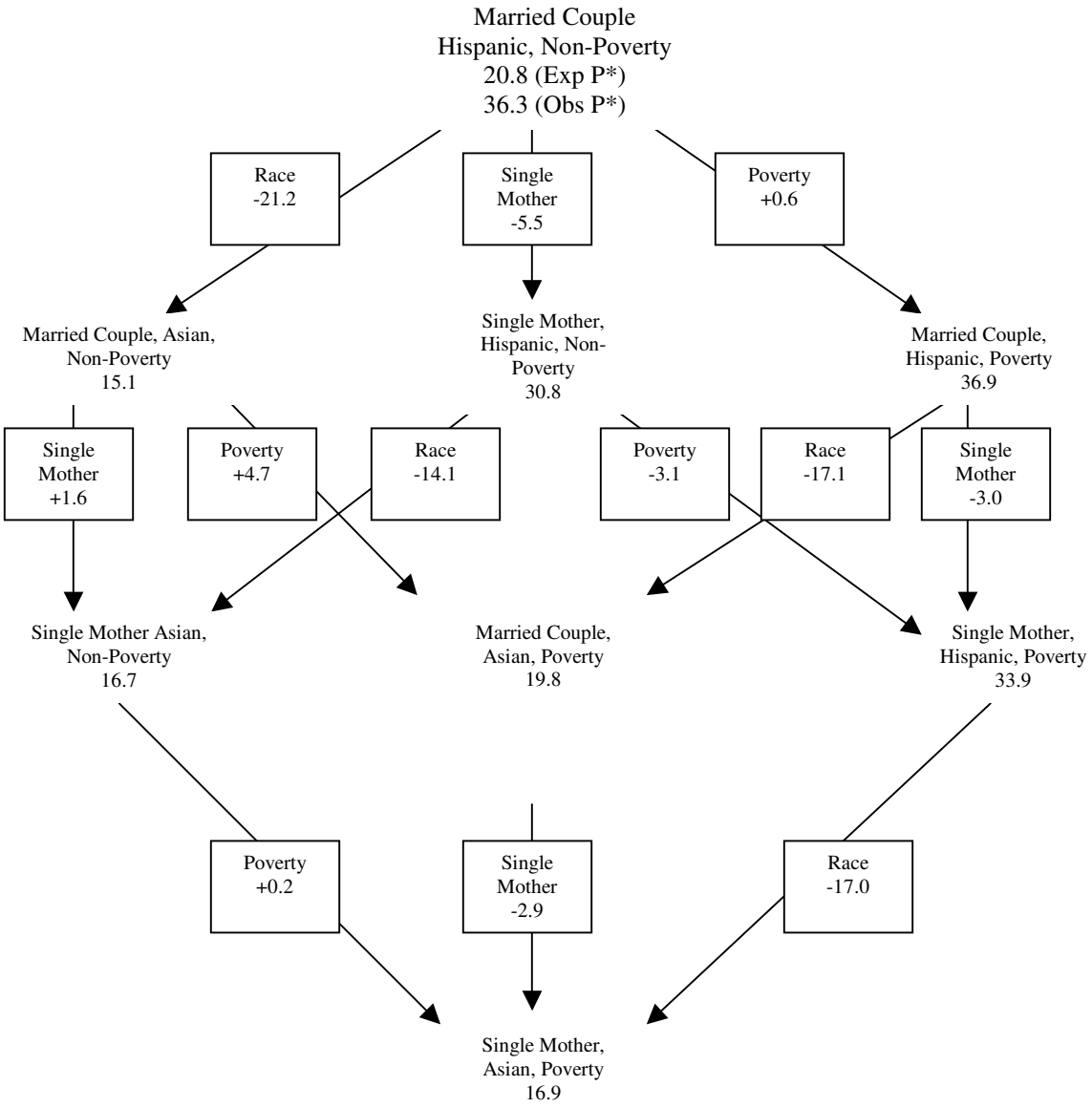

Figure 17. Analysis of How Contact with Hispanic, Married Couples with Children Varies by Race (Asian), Family Type (Single Mother), and Socioeconomic Status (Poverty)

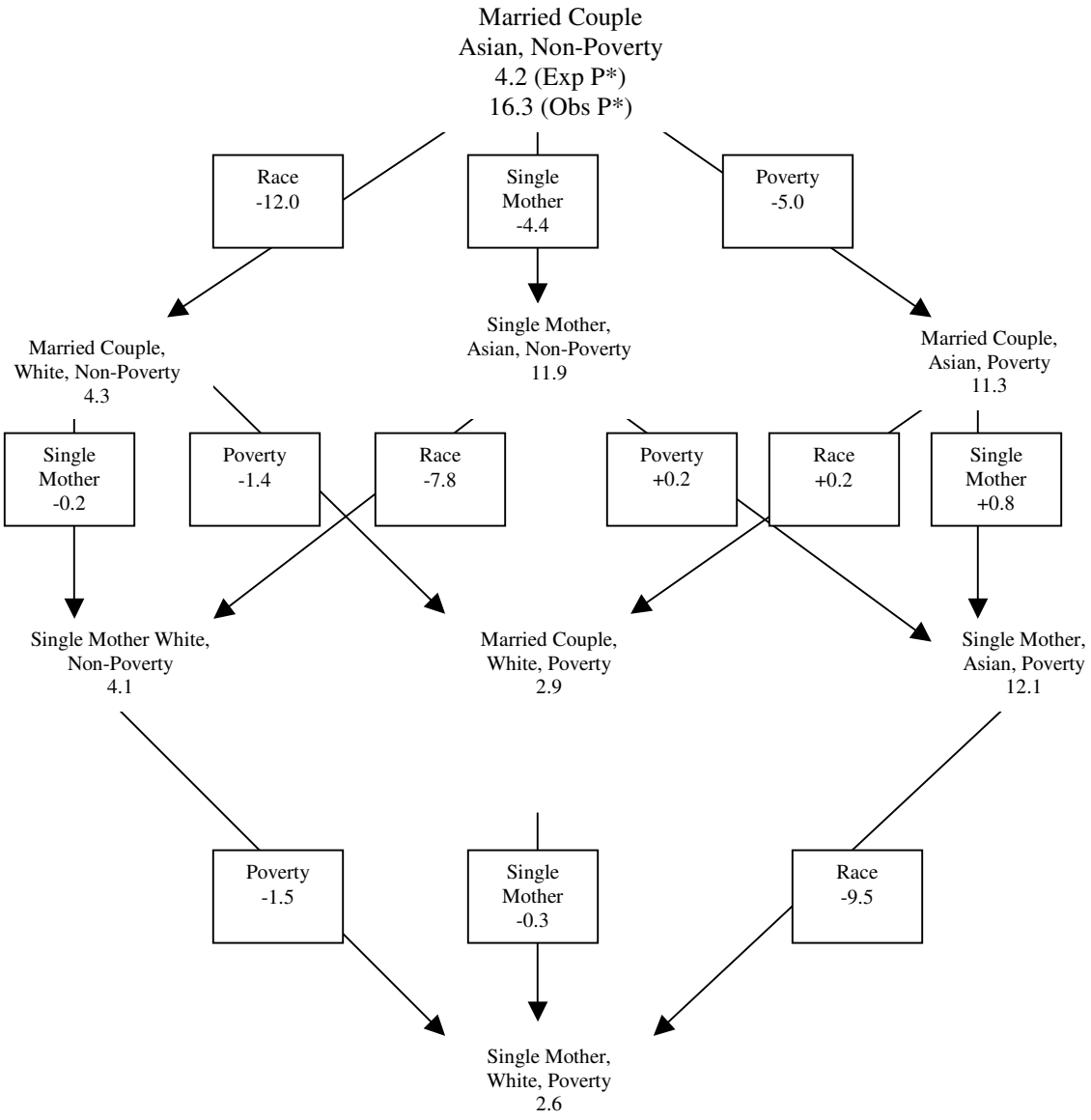

Figure 18. Analysis of How Contact with Asian, Married Couples with Children Varies by Race (White), Family Type (Single Mother), and Socioeconomic Status (Poverty)

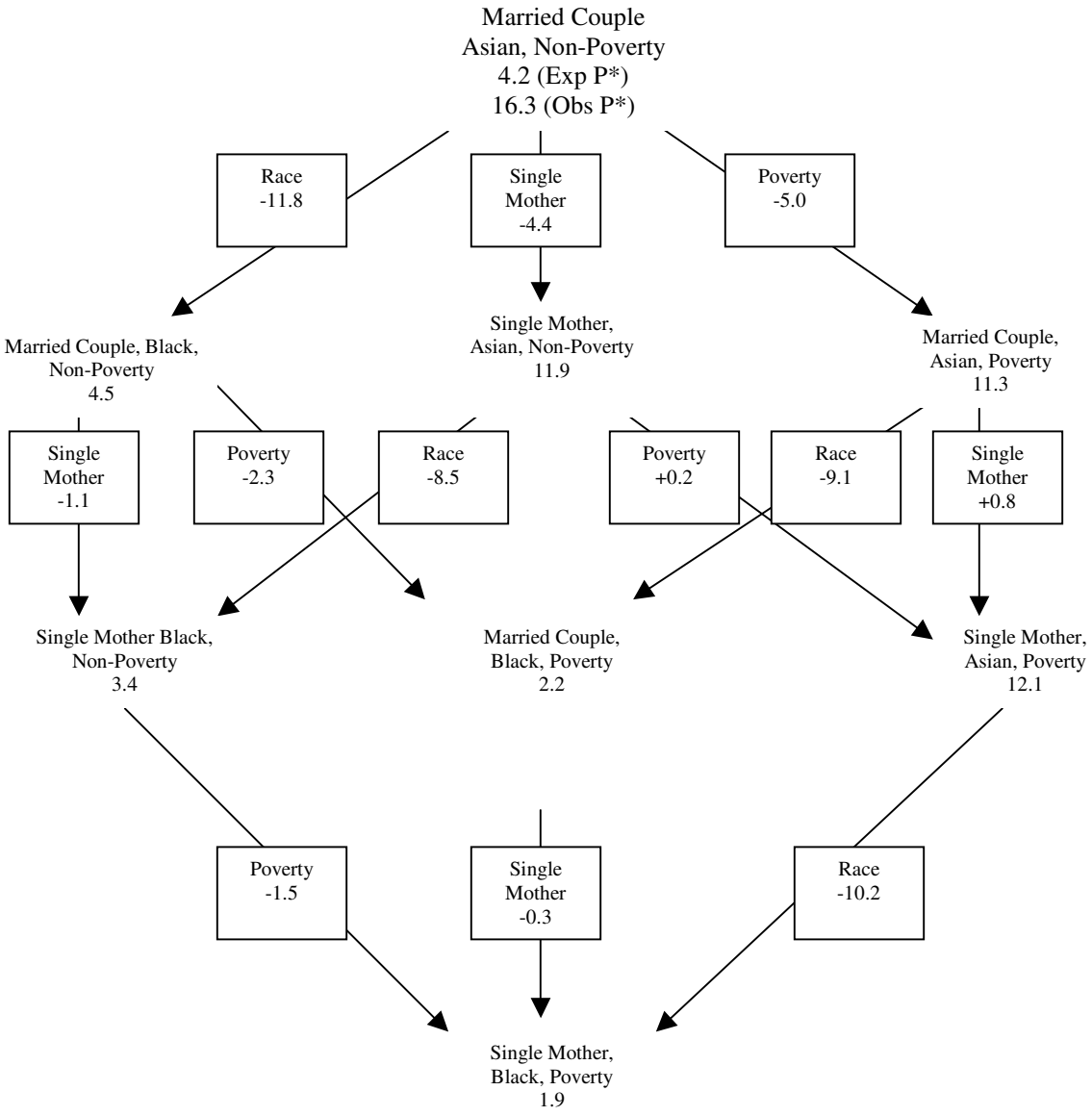

Figure 19. Analysis of How Contact with Asian, Married Couples with Children Varies by Race (Black), Family Type (Single Mother), and Socioeconomic Status (Poverty)

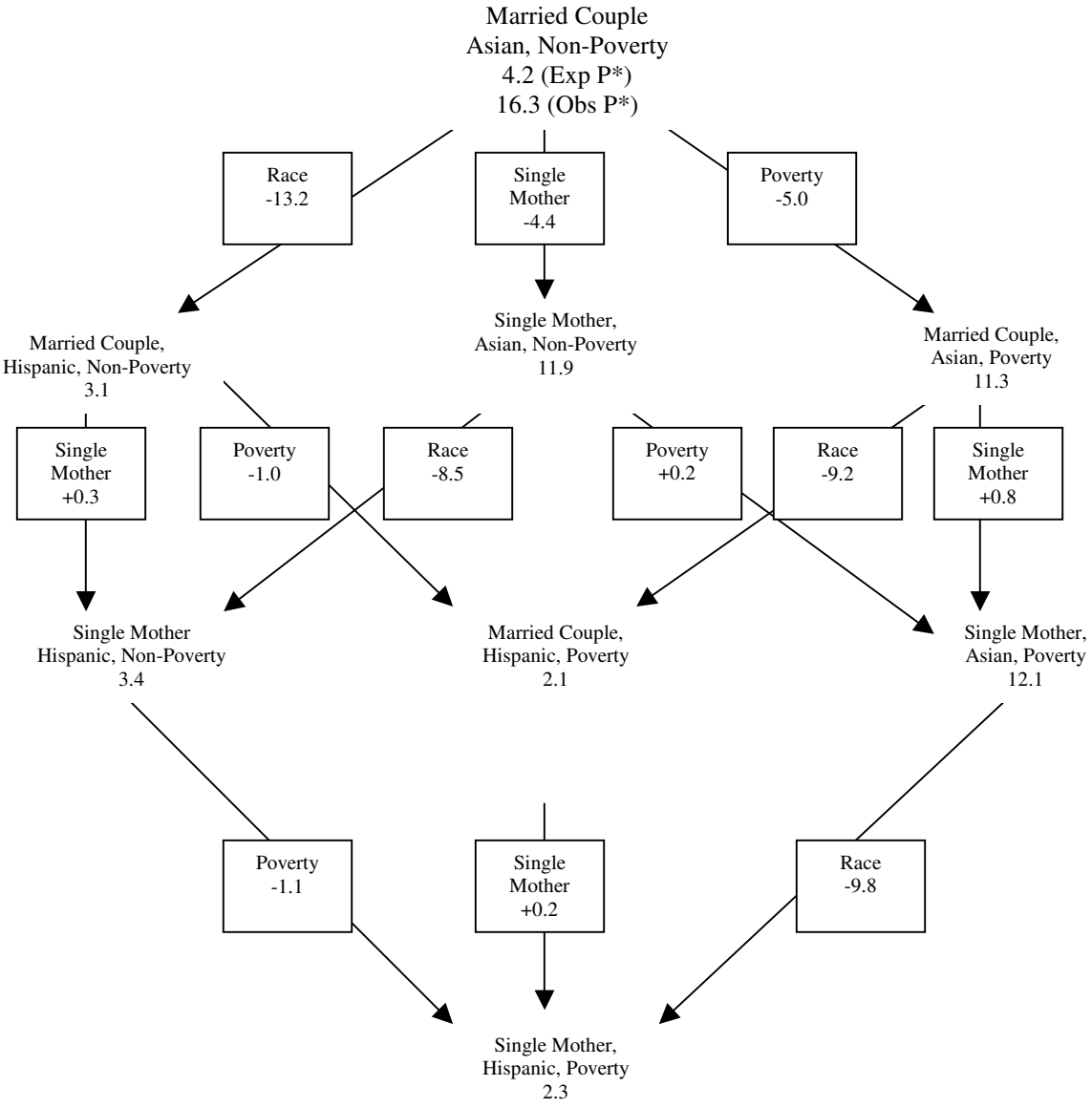

Figure 20. Analysis of How Contact with Asian, Married Couples with Children Varies by Race (Hispanic), Family Type (Single Mother), and Socioeconomic Status (Poverty)

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"Decomposing the Effects of Family Type, Race, and Poverty on Residential Segregation: Empirical Findings in Houston, TX." Paper presented at the Southwestern Social Science Association Annual Meeting, New Orleans, LA March 2005

"Household Type, Economic Disadvantage and Residential Segregation: Empirical Patterns and Findings from Simulation Analysis." Poster presentation at the Pathways Student Research Symposium, Corpus Christi, TX October 2004

"Household Type, Economic Disadvantage and Residential Segregation: Empirical Patterns and Findings from Simulation Analysis." Paper presented at the Southwestern Social Science Association Annual Meeting, Corpus Christi, TX March 2004

Awards

2005 recipient of the Distinguished Master's Level Paper Award from the Southwestern Sociology Association. Presented at the Southwestern Social Science Association Annual Meeting, New Orleans, LA March 2005

Fellowships

2003-2005 Recipient of Pathways to the Doctorate Fellowship, Department of Sociology, Texas A&M University Office of Graduate Studies

Summer 2005 Recipient of Lloyd Neal Summer Research Fellowship

Professional Experience

Graduate Research Assistant (September 2003-December 2004)
For Mark Fossett
Department of Sociology
Texas A&M University, College Station
Graduate Teaching Assistant (January 2005-May 2005)
Teaching Assistant for Soci 420, *Advanced Social Research Methods*