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THE NEIGHBORHOOD CONTEXT OF POLICE USE OF FORCE BEHAVIOR

By

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ABSTRACT

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By

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Police use of force has been an important topic of research within the field of criminal justice, and studies over the past several decades have attempted to explain this form of behavior. Social control theory and social disorganization theory are put forth as the most appropriate theoretical framework within which to analyze police use of force behavior. This research compares two different conceptualizations of use of force in attempt to determine which individual-level and neighborhood-level factors influence this behavior.

The focus of this research was to determine if interactions between individual-level variables and neighborhood-level variables are significant predictors of use of force behavior by police officers. More specifically, it is argued that both the prevalence and severity of force are affected by interactions between neighborhood levels of concentrated disadvantage and officer race, suspect race, and suspect demeanor. In addition, it is also argued that the prevalence and severity of force are affected by interactions between neighborhood levels of crime and officer race, suspect race, and suspect demeanor. The prevalence of force was defined as either the absence or presence of force, while the severity of force was defined as the maximum amount of force (as defined by officers) within an encounter.

Findings were consistent across both dependent variables. In both instances, none of the interactions between individual-level and neighborhood-level variables exerted a statistically significant effect. However, evidence for the statistically significant effect of suspect behavior was strong across both models. Specifically, if suspects were antagonistic toward officers, or provided physical resistance, both the prevalence and severity of force increased. Implications for both theory and policy are discussed.

This work is dedicated to my late paternal grandmother, Gertrude Heraux, who always wanted a Dr. in the family, and to my parents, Robert and Helyett Heraux, who always allowed me to follow my dreams. There are no words for how much your love and support mean to me.

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TABLE OF CONTENTS

LIST OF TABLES..xi

CHAPTER 1: INTRODUCTION...1

Why Study Neighborhoods?...4
General Theoretical Dimensions of Neighborhoods................................4
The Importance of Context...6
The Chicago School and Social Disorganization...............................7
Donald Black's Theory of Social Control.......................................10
Theoretical Definitions of Neighborhoods and Criminal Justice Research...11
Neighborhoods as the Unit of Analysis..17
A Brief Introduction to the Literature...26
Summary...29

CHAPTER 2: LITERATURE REVIEW..30

Studies Using Neighborhoods as a Variable of Interest..........................30
Offending Behaviors by Adults and Juveniles...................................30
Police Behavior...35
Use of Force Research...47
Studies of Association Examining Use of Force Behavior.....................48
Multivariate Studies on Use of Force Behavior..................................60
Use of Force Research and Neighborhood Context..............................75
Limitations of Prior Studies..80
Variables of Interest from Prior Studies...83
Summary...89

CHAPTER 3: DATA AND METHODS...90

The Police Use of Force (PUF) Study Data...91
Data Collection Procedures...91
Sample Characteristics...97
The Operationalization of Neighborhood.....................................100
Specific Hypotheses..104
Specification of Variables of Interest...106
Dependent Variables...106
Prevalence of Force...106
Severity of Force...108
Independent Variables...110
Neighborhood-Level Variables...111
Encounter-Level Variables...112

Suspect Characteristics....113
Officer Characteristics....114
Nature of the Encounter and Offense....115
Nature of the Encounter Location....117
Analysis Procedures....118
Spatial Autocorrelation....118
Hierarchical Linear Modeling....122
Summary....130

CHAPTER 4: RESULTS....131

Results....138
Dependent Variable Analyses for Maximum Force....139
Significant Findings from the Maximum Force Model....145
Dependent Variable Analyses for Physical Force plus Threats....151
Significant Findings from the Physical Force plus Threats Model....156
Summary....164

CHAPTER 5: CONCLUSIONS....166

Discussion....169
Re-Visiting the Theoretical Foundation for the Current Research....169
Theoretical Foundations of Current Hypotheses....172
Impact of Variables Concerning Neighborhood-Level Effects....173
Impact of Variables Concerning Interaction Effects....175
Impact of Individual-Level Variables....180
Impact of Variables Concerning the Nature of the Location....180
Impact of Variables Concerning the Nature of the Encounter....181
Impact of Variables Concerning Police Mobilization....183
Impact of Variables Concerning Officer Characteristics....185
Impact of Variables Concerning Suspect Characteristics....187
Interpretation of Results....189
Implications of the Current Research....196
Theoretical Implications....196
Research Implications....199
Practical Implications....200

APPENDIX A....202

APPENDIX B....204

APPENDIX C....208

APPENDIX D....256

APPENDIX E....261

APPENDIX F..267

REFERENCES...284

LIST OF TABLES

Table 1: Measures of Force, Methodologies and Sample Sizes....................73

Table 2: Characteristics of Six Jurisdictions..92

Table 3: The Force Continuum Across Jurisdictions.................................96

Table 4: Items within Prevalence of Force Measure................................107

Table 5: Items within Maximum Force Measure......................................109

Table 6: Sample Characteristics (Level-1 Independent Variables)................133

Table 7: Sample Characteristics (Level-2 Independent Variables)................138

Table 8: Full Model for Maximum Force...142

Table 9: Full Model for Physical Force Plus Threats.................................153

Table 10: Summary of Results...190

Table A-1: Significant Predictors of Use of Force Behavior Across Multivariate Studies...203

Table B-1: Sample Characteristics for Variables used in Factor Analysis.......205

Table B-2: Correlation Matrix for Variables used in Factor Analysis..............206

Table B-3: Factor Loadings for Variables used in Factor Analysis................207

Table C-1: 6-Site Correlation Matrix..209

Table D-1 : Descriptive Statistics (NUMERSO, NUMBERPO, OFF1AGE, SUSPAGE, REPEAT)...257

Table E-1: Maximum Force Model...262

Table E-2: Prevalence of Force Model..264

Table F-1: Mean Differences in Arrest – No Arrest Census Tracts...............269

Table F-2: Logistic Regression Analysis...270

Table F-3: Negative Binomial Regression Analysis..................................272

Table F-4: Mean Differences in 1-4 Arrests – 5 or More Arrests in Census Tracts...274

Table F-4: Poisson Regression Analysis for Prevalence of Force..................275

Table F-5: Negative Binomial Regression Analysis for Maximum Force.........277

LIST OF FIGURES

Figure 1: Charlotte Census Tract Arrests....................279

Figure 2: Colorado Springs Census Tract Arrests....................280

Figure 3: Dallas Census Tract Arrests....................281

Figure 4: St. Petersburg Census Tract Arrests....................282

Figure 5: San Diego Census Tract Arrests....................283

Chapter 1: Introduction

One of the most fundamental research problems in the criminal justice literature has been the examination of police behavior. It is not only important to understand what it is the police do while on patrol, but also *why* they do these things. In efforts spanning the past thirty years, numerous researchers have examined not only police behavior, but also the causes of that behavior, in order to increase our range of knowledge in this area. Within this relatively abundant literature there is general agreement concerning the actual actions of police officers (see Bayley 1994; Cordner 1979; and Manning 1997 for examples of studies of how police officers spend their time), but there is much less agreement concerning the causes of these behaviors (see Riksheim and Chermak 1993 for a comprehensive discussion of various explanatory factors, and how the latter have been studied). This is perhaps understandable, given the variety of methods employed and personal biases of the researchers towards particular theoretical orientations, but it severely restricts a proper understanding of police behavior, which in turn limits the effectiveness of policy recommendations stemming from this research. In these times when the public seems to have developed a mistrust of police officers due to negative publicity associated with police misconduct (Bell 2000; Cao et al. 1996; Tuch and Weitzer 1997), this is a particularly troubling observation. If we do not fully comprehend the causes of police behavior, it becomes extremely difficult to address *misbehavior*[1], thus ensuring that the gap between the police and the public will remain intact. For

[1] Note, however, that while police misconduct is a very important topic of study, this particular research will analyze all police use of force, regardless of the appropriateness of that behavior.

every stride made through community policing programs (Hickman et al. 2000; Mastrofski et al. 1995), we move three steps back for every instance, whether widely publicized or directly experienced by a citizen, of racial profiling, general harassment or the use of force. While the former two instances of police behavior are certainly a point of concern, it is the latter which has the greatest potential for harm, both in a physical sense to the citizen as well as in terms of damage to police-community relations. Accordingly, this dissertation will use data collected in six jurisdictions located in large American cities during officer and suspect surveys conducted subsequent to an adult arrest within these jurisdictions.[2] Using ideas from Donald Black's theory of social control, as well as from social disorganization theory, this research will examine all aspects of the police use of force during arrest encounters with adult citizens.

Within the theories mentioned above, this research focuses on a very specific issue regarding the use of force. Previous research has provided measures of: (1) how often police engage in the application of force within a specific encounter (Langan et al. 2001; Walker and Graham 1998;); (2) the prevalence of each method of force applied within a specific encounter[3] (Crawford and Burns 1998; Geis and Binder 1990); and (3) the maximum level of force applied within a specific encounter (Garner et al. 1995). More importantly, while most research has focused on only one of these three aspects of the use of

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[2] The methodology of the study and the data itself will be discussed in greater detail in Chapter 3 of this work.

[3] That is, the use of strictly verbal commands is vastly different than the firing of a weapon, and some research has differentiated between the various methods of force employed by officers. Note that this has often been difficult due to the fact that some methods of the use of force are utilized in a statistically rare manner.

force, these studies have also only focused on one class of explanatory factors (i.e. psychological, sociological, or organizational). In an attempt to be comprehensive, this research will rely on a combination of psychological (largely individual), sociological (largely situational), and organizational factors used to explain the use of force. However, rather than merely relying on what previous research has held regarding these explanations, this research attempts to integrate these perspectives within a neighborhood context framework. The approach used here allows one to explain variation in police use of force by demonstrating the importance of neighborhood context as a determinant of that behavior. Focusing solely on organizational constraints (Alpert and MacDonald 2001; Engel 2000), or on the individual characteristics of officers and/or citizens (Scrivner 1994), or on the specific situations at hand (i.e. the details of particular encounters) (Sorensen et al. 1993), previous research has largely ignored the social-psychological effect of neighborhood contextual cues in shaping how police officers perform in the field. By focusing on this aspect, therefore, this research will provide a comprehensive view of police use of force behavior, allowing us to develop a fuller understanding of that behavior. Using multilevel modeling techniques, this dissertation will estimate the effects of neighborhood context on police use of force, above and beyond the traditional explanatory factors located within psychological, sociological and organizational frameworks. Accordingly, the remainder of this chapter provides a discussion of why neighborhood context is important in the study of police behavior.

Why Study Neighborhoods?

Some of the recent literature in the field of criminal justice has focused on ecological factors which are theorized to affect police and/or offender behavior. In general terms, this body of research has examined how neighborhood-level variables interact to influence these behaviors in a variety of contexts. It is important to note, however, that when engaging in such research, one must take the preliminary step of defining "neighborhood" in order to maintain validity. In theoretical terms, researchers must properly operationalize such an important variable in order to ensure that the results are both valid and generalizable, while still adhering to a parsimonious model. The following discussion will be based on a theoretical description of neighborhoods, then, rather than a methodological one.[4]

General Theoretical Dimensions of Neighborhoods:

When studying the ecological basis of police behavior, the neighborhood can be examined from several different perspectives; those looking in may have a different view than those looking out. However, in all of these contexts, there remain a number of agreed-upon defining characteristics. First, there is typically a sense of geographic concentration. Bursik and Grasmick (1993: 6) note that, "most basically, a neighborhood is a small physical area embedded within a larger area in which people inhabit dwellings." There are two consequences of such a geographically-based definition: (a) business districts, while often

[4] Note that while this discussion focuses on theoretical characteristics which define neighborhoods, Chapter 3 will focus more closely on the methodology of how neighborhoods were defined for the current work, with an emphasis on how physical boundaries of neighborhoods are determined.

technically defined by geographic restrictions, do not exhibit other characteristics of true neighborhoods; and (b) neighborhoods differ from a sense of community. With regards to the latter concept, it is important to note that while members of ethnic and racial groups may make claims to an overall sense of community, Hispanics in a neighborhood in New York differ in small, but important, ways from Hispanics in a neighborhood in Miami. More importantly for the current research, it is also likely that Hispanics residing in the Greenwich Village neighborhood of New York differ from Hispanics residing in the Spanish Harlem neighborhood of New York.[5] Correlated with this geographic concentration is the well-noted phenomenon of increasing segregation of minority populations within urban centers. While a neighborhood may technically be rural in nature, it is the growth of urban ghettoes which has concerned sociologists and criminologists for the past few decades, and it thus upon these that this research shall concentrate. Indeed, Jackson (1989: 62) notes that "region, as a sociohistorical construct influencing the relationships between racial and ethnic groups, is a filter through which...groups are viewed."

A second characteristic of neighborhoods is the "collective life that emerges from the social networks that have arisen among the residents and the sets of institutional arrangements that overlap these networks" (Bursik and Grasmick 1993: 6). That is, there is a shared sense of values amongst the residents of the neighborhood. In order for coherence to truly emerge, the

[5] Throughout this research some common terminology will be used to maintain consistency regarding racial and ethnic groups. In particular, the term "Hispanic" will be used in place of "Latino" or "Chicano", and the term "Black" will be used in place of "African-American." These terms are used for simplicity, and do not reflect any disregard for the nominal preferences of the groups mentioned.

individuals in the collective must subscribe to similar beliefs. As Blau (1964: 255) states, "normative standards that restrict the range of permissible conduct are essential for social life." This arises out of culture, which Black (1976: 61) notes "includes conceptions of what ought to be, what is right and wrong, proper and improper..."

The final characteristic used to define neighborhoods in a general sense is that of a shared experience. Burisk and Grasmick (1993: 6) note that "the neighborhood is inhabited by people who perceive themselves to have a common interest in that area and to whom a common life is available...[That is,] the neighborhood has some tradition of identity and continuity over time." Individuals who have similar occupational distinctions (i.e. white-collar vs. blue-collar) and salary levels, and thus are located within the same social class, are more likely to reside in the same, or similar, neighborhoods, and thus have similar experiences. In addition, individuals who display the same levels of family stability and mobility (i.e. geographic consistency) will also have similar experiences due to these factors. Thus, while shared beliefs are a reflection of internal consistency, shared experiences allow individuals to form a bond within their neighborhood through external consistency.

The Importance of Context:

The discussion of how neighborhoods can be defined theoretically has provided a starting point for understanding research regarding the ecological basis of behavior. Therefore, it now becomes necessary to examine how ecological research first emerged within the fields of criminology and sociology. By understanding the origins of such research, we are better able to structure the current research to focus on the importance of ecology on police use of force behavior.

The Chicago School and Social Disorganization

An ecological understanding of human behavior has its origins in the work of Park and Burgess (1924), who developed the concentric zone theory of cities in order to explain crime causation. The authors noted that cities provided the perfect natural laboratory setting in which to study the process of invasion, dominance and succession of various areas within those cities. Describing cities as consisting of: (1) the central business district; (2) a transition zone; (3) the workingman's district; (4) the residential district; and (5) a commuter zone, Park and Burgess (1924) argued that each of the five zones had a separate structure and organization, with distinct populations and characteristics. Most importantly, in terms of a contextual explanation, the authors found that the transition zone experienced the greatest amount of delinquency, and that this was due to the presence of social disorganization, the latter in turn being due to contextual characteristics, including: (1) population makeup; (2) economic factors; and (3) housing factors.

Shaw and McKay (1942) chose to build on the work of Park and Burgess, arguing that the crime rate was distributed throughout the city, with delinquency being most prevalent in the transition zones nearest the business district. As with previous research, Shaw and McKay found that these areas were characterized by populations that were largely: (1) immigrant; (2) minority; (3) lower class; and (4) accepting of unconventional norms. Using over 50,000 juvenile court records collected between 1900 and 1933, the authors determined that delinquency was an ecological, rather than an individual, phenomenon, as it was the normal response of normal individuals to abnormal social conditions (Shaw and McKay 1942). The authors noted that transition zones, with high rates of residential mobility and racial heterogeneity, had enormous difficulty avoiding becoming socially disorganized.[6] Most importantly, in a theory of cultural transmission, Shaw and McKay argued that traditions of delinquency in transition zones are passed down to successive generations, regardless of changing racial composition and the rate of mobility. Thus, in essence, the authors argued that delinquency is more zone-specific than population-specific, with the development and acceptance of criminal values being a self-perpetuating phenomenon.

After the work of Park and Burgess, and Shaw and McKay, the next advancement in social disorganization theory came from Stark (1987), who developed a series of thirty propositions regarding crime and deviance to outline a theory of deviant places. Many of the latter propositions reflected specific aspects of previous research on social disorganization, and Stark (1987: 893) went so far as to argue that "high rates of crime and deviance can persist in specific neighborhoods despite repeated, complete turnovers in the composition of their populations…[and this] suggests that more than 'kinds of people'

[6] Bursik (1988: 521), following the work of Shaw and McKay (1942), defined social disorganization as "the inability of local communities to realize the common values of their residents or solve commonly experienced problems."

explanations are needed to account for the ecological concentration of deviance..." Stark went on to note that, just as Shaw and McKay had found, areas exhibiting high levels of deviance were characterized by: (1) high population density; (2) high levels of poverty; (3) mixed use; (4) transience; and (5) high degrees of dilapidation. Even more importantly, in the context of the current research, Stark (1987: 902) stated, in Proposition 25, that "stigmatized neighborhoods will suffer from more lenient law enforcement."

The final major research piece regarding social disorganization to be explored here is that of Sampson and Groves (1989), who attempted to directly test the theory as set forth by Shaw and McKay. The authors noted that the general hypothesis was that poverty, racial and ethic heterogeneity, residential mobility, and family instability all lead to community social disorganization, which then leads to crime and delinquency. Using two separate surveys conducted in 1982 and 1984 throughout over 225 areas with approximately 11,000 residents of Great Britain, Sampson and Groves examined the link between community characteristics and criminal behavior. Most importantly, Sampson and Groves found that in addition to the factors described by Shaw and McKay, other external factors which affect social disorganization included: (1) community supervision of teenage gangs; (2) informal friendship networks; and (3) participation in formal organizations. The authors found that between-community variations in these factors, and, by extension, social disorganization, were responsible for much of the effect on rates of both criminal victimization and criminal offending. Sampson and Groves (1989: 775) conclude, then, that "previous macro-level research in crime and delinquency has relied primarily on census data that rarely provide measures for the variables hypothesized to mediate the relationship between community structure and crime."

Donald Black's Theory of Social Control

In addition to the work of the Chicago School, Black (1976) also provided a foundation for ecological research through the promotion of a sociologically-based model of the behavior of social control. In arguing for his theory of social control, Black (1976: 107) noted that "law is stronger where other social control is weaker", and defined the latter as "informal social control in the form of influence exerted by parents, peers, religious and community leaders, and various organizations." Although not explicitly discussed as such, the lack of such informal social control can be considered a form of social disorganization as defined previously. Thus, Black's (1976) model hypothesized that formal social control (i.e. police behavior) would be more prevalent in areas with low informal social control (i.e. those that experience social disorganization). Truly, Black's (1976) theory sought to be the first systematic examination of the application of social control, allowing one to predict police behavior based on the dynamics, including the contextual cues, of an encounter. The argument presented was that factors such as relational distance and social stratification influenced how an officer responded to situations. Bayley and Mendelsohn (1969), agreed, also arguing that increased social distance between police officers and the poor results in more aggressive or punitive police practices in lower-class areas, as well as in high-crime areas, due to the effects of contextual characteristics. Indeed, Black (1980: 7-8) notes that "as the encounter proceeds [the officer] may learn a great deal more about the location and direction of the incident in social space [as] patrol work is different for middle-class people in the suburbs than for lower-class people in the inner city." Black (1980: 11) continues, arguing that "dispute settlement by the police varies with its location and direction in social space, including its relation to race, social class, [and] the social structure..." Again, in light of the current research, it is important to note that Black (1976) argued that the police will exert more coercion against those individuals who have a lower status, such as lower-class individuals, minorities and juveniles.[7]

As we have seen, the work of the Chicago School and later researchers, as well as that of Donald Black, provided a firm foundation for development of the ecological perspective. It is also instructive, however, to examine how more generalized criminal justice research has dealt with the theoretical definitions of neighborhoods as described in the previous section.

Theoretical Definitions of Neighborhoods and Criminal Justice Research

As we have provided a theoretical definition of various aspects of neighborhoods, as well as a discussion of how social disorganization and social control theory have addressed neighborhood / ecological factors, it is now necessary to discuss the burgeoning role of neighborhoods in a general sense throughout the criminal justice and sociology literature. As noted previously, while

[7] Black (1976) also noted that this category of lower-status individuals included those who were impaired (either mentally, or due to drugs or alcohol), and those who were disrespectful of an officer's authority.

neighborhoods obviously can be located in rural areas, this research will concentrate on their development within large cities in America. The population growth in such areas has been almost exponential in nature, resulting in intense geographic concentration (Walker et al. 1996; Wilson 1993). This, in turn, has had a deleterious effect on the individuals residing in these areas, increasing virtually every social-structural problem already present in the inner city. Yet, these areas remain a neighborhood in every sense of the word, as they exhibit the three theoretical characteristics previously described.

With respect to the first theoretical characteristic of neighborhoods, geographic concentration, a number of researchers have taken to using the term "underclass" to describe low-income individuals concentrated in the inner city (see Mann 1993 and Wilson 1993, for examples). Wilson (1993: 14) goes further, noting that the proportion of the poor who reside in the ghetto varies significantly by race, as "almost a third of all metropolitan blacks lived in a ghetto in 1980." As middle-class minority group members leave the city in increasing numbers, these areas have become overwhelmingly populated with those who cannot afford to leave. Goldberg (1993: 188) identifies the postmodern city as a product of the processes of urban renewal and gentrification. While urban renewal revitalizes the "salvageable" areas of the city, lower-income individuals are forced into smaller and smaller "pockets" of ghetto housing, resulting in a concentration of poverty in specific neighborhoods and ensuring the continued presence of the ghetto in American cities. The latter neighborhoods, therefore, are a direct result of the former phenomenon. Goldberg (1993: 191) continues, arguing that "the racial slum is doubly determined, for [it] bears the added connotations of moral degeneracy, natural inferiority and repulsiveness…[and while] the slum locates the lower class, the racial slum [locates] the underclass." Kelling and Stewart (1990: 469) agree, arguing that "the communities of the underclass are plagued by massive joblessness, flagrant and open lawlessness, and low-achieving schools, and…the residents of these areas, whether women and children…or aggressive street criminals, have increasingly been socially isolated from mainstream patterns of behavior." Wade (1993: 52) also notes this phenomenon of perpetuating isolation, noting that "cultural geography is not a natural cultural construction, but derives from dominant ideologies…propagated by the most powerful…" While the latter was used to describe the various regions of Colombia, this description could easily be applied to America's urban environments in which lower class individuals find themselves increasingly concentrated. Indeed, Bell (1992: 4) has argued that "what we now call the 'inner city' is, in fact, the American equivalent of the South African homelands." One important consequence of this segregation is noted by Rossi (1968: 105), who argues that many members of these communities view the police as 'occupation forces' in place to exert the influence of the power elite, and enforce adherence to their normative structure. This is echoed by Jackson (1989: 2), who argues that "police-community relations are fraught with problems of authority…" causing resentment by members of these communities. Walker et al. (1996: 89-90) concur, noting that "low-income people, regardless of race, are…far more likely to see or have contact with the police [as] police departments routinely assign more patrol officers to minority and low-income neighborhoods." This is further supported by Cox (1984: 174), who notes that "[police] administrators allocate a substantial amount of resources to areas inhabited by [lower-class] group members [while] at the same time efforts such as community policing...are rarely implemented in those areas most in need of such efforts." We can see, then, that the phenomenon of geographical concentration of certain populations is one experienced throughout the world, as well as throughout the United States. It is also clear that this phenomenon presents a situation which is vulnerable to police abuses and misinterpretations of legitimate police behavior. The population that remains in these "pockets" is thus localized in an area that is, in the words of Mann (1993: 87), "likely to constitute meaningful frames of reference for social comparisons."

The second characteristic of shared values and beliefs is likely to be the most common conception of neighborhood norms. All societies are composed of individuals that occupy various positions which are defined by the normative structure (e.g. criminal, police officer, "deadbeat dad"). Indeed, it is only though this normative structure that a collective consciousness can be manifested in action (Chambliss and Seidman 1971: 7). As Blau (1964: 60) states, "group cohesion promotes the development of consensus on normative standards and the effective enforcement of these shared norms..." While it is true, as McNamara (1967: 163) has claimed, that urbanization is associated with heterogeneity of normative structures, within particular neighborhoods these values remain relatively homogeneous. Wilson (1987: 14) notes that "values emerge from specific social circumstances and life chances, and reflect one's class and racial position." Thus, certain values adhered to by those residing in low-income minority neighborhoods may not be a part of the structure within low-income white neighborhoods, which, in turn, may differ significantly from the belief system of upper-income white neighborhoods. It has been noted that the black community is "characterized by personal and social disorganization…[and] black ghettoes typically have high crime rates that are disproportionate to white, lower-socioeconomic areas" (Reasons and Kuykendall 1972: 227). Reiman (2001: 160) argues that this perpetuates "an ideological message that: (1) the threat to 'law-abiding Middle America' comes from below them on the economic ladder, not above them; [and] (2) the poor are morally defective, and thus their poverty is their own fault…" However, in general, lower class urban communities operate within norms and systems of social control that reflect a life-style accommodating both conventional and illegal behavior (Reiss 1986: 12). Some researchers have gone further, positing that a cultural tolerance of violence exists within these areas, although this has been disconfirmed in other work. Sampson and Bartusch (1998), for example, found that while these areas actually exhibited lower levels of tolerance, they also experienced greater cynicism regarding police services, indicating a sense of frustration within their social circumstances. As Blau (1964: 231) notes, it is only when this frustration, even opposition, to the power of the criminal justice system is experienced throughout the collective that social values legitimating opposition to that dominance will emerge. Just as values serve to legitimate the social order and the various arrangements that sustain it, so too can they become internalized to validate the principles that are in the best interests of the collective (i.e. opposition to the perceived differential nature of the application of force by police officers).

The third defining theoretical characteristic of a neighborhood is a sense of shared experiences. Wilson (1980: x) argues that "it is difficult to speak of a uniform experience when the…population can be meaningfully stratified into groups whose members range from those who are affluent to those who are impoverished." However, it is equally true that within particular neighborhoods, be they low-income or high-income (or somewhere in between), the majority of individuals share the same daily experiences. In fact, the negative aspects of low-income neighborhoods may make these shared experiences even more salient, as individuals faced with such overwhelming negativity strive to form significant social bonds with one another to provide support. These areas face enduring hardships in the form of weak labor force attachment and unemployment, residential isolation, and poverty (McLanahan and Garfinkel 1993). In order to deal with this situation, ghetto residents (the so-called underclass) must develop a normative structure which allows for positive contacts within the neighborhood. Meares and Kahan (1998: 810-811) support this, noting that "although the characteristics of individuals may have a direct effect [on behavior], the importance of the characteristics of people residing in a neighborhood lies largely in the implications this has for the social organization of a community." Yet, while individuals face enormous external structural pressures, they are also exposed to pressures within the community which act against the development of a normative structure. As McGahey (1986: 247) notes, these areas are disproportionately populated with unstable households in which family members are unable to exercise authority and control over younger generations. Black (1976: 135) mentions the same phenomenon, arguing that traditional family ties have been loosened to the point of falling apart, weakening the neighborhood and making intimacy situational, rather than communal. This leads to the development of norms which accommodate illegal behavior, as discussed earlier. However, while these shared experiences within these areas tend to be negative, they are still *shared*, and thus provide a sense of neighborhood.

Neighborhoods as the Unit of Analysis:

The previous discussion of the theoretical elements of neighborhoods has been a precursor to the fundamental question of this introductory chapter: why study *neighborhoods* (as opposed to individuals) at all? It is thus time to explore the consequences of the context of neighborhoods as it relates to the relationships between individuals. As Chambliss and Seidman (1971: 500) note, the events that shape the law (or its application in the form of the use of force) are an outgrowth of the relationship between the legal order and the social setting. The latter, in turn, provides the context for individual relationships, be they between citizens or between citizens and law enforcement officers. The impact of this contextual influence can be considerable, as research indicates that the ecology of criminal justice decision making has a direct (typically negative) effect on outcomes, particularly for minority group members (McNeely and Pope 1981: 21). Support for this idea is indicated by Black (1998: 35), who notes that individuals may be held collectively liable due to their neighborhood, social class, race, or ethnicity. Thus, law-abiding citizens exhibiting the "wrong" characteristics can become tainted through a process of ecological contamination (Werthman and Piliavin 1967: 79). This was observed by Bittner (1970: 10) as well, who stated that "[this] inevitably entails the consequences that some persons will receive the dubious benefit of extensive police scrutiny merely on account of their membership in those social groupings which…social comparisons locate at the bottom of the heap." Van Maanen (1973) also notes this phenomenon, arguing that police behavior is often based on the generally held (among officers) notion that few of the citizens encountered on the street in such neighborhoods are worthy of respect, and that many of the latter are undoubtedly guilty of some crime. Indeed, it has been noted that "from the front seat of a moving patrol car, street life in a typical lower class neighborhood is perceived as an uninterrupted sequence of suspicious scenes" (Werthman and Piliavin 1967: 56). As Jacobs and Helms (1997: 1366) note, "one result of these uncertainties is that conventional street crime is difficult to control in low-income areas because criminals and the innocent share many characteristics."[8]

Kohfeld and Sprague (1990) were some of the first criminologists to articulate this idea more specifically, arguing that the responses of both police officers and criminals are threshold-triggered behaviors, with the police responding to certain types of crimes only after the activity had reached an

[8] The corresponding corollary here is, of course, that police officers should be more effective at determining criminality in affluent neighborhoods due to the visible differences between residents of those neighborhoods and lower-class criminals.

imaginary line of 'incivility' visible only to the officers themselves.[9] This threshold concept is supported by other researchers, who note that "most illegality is tolerated" (Black 1989: 77) and that "policemen often do not arrest persons who have committed minor offences in circumstances in which the arrest is technically possible" (Bittner 1967: 702). Klinger (1997), in agreement with the latter research, also argues for the idea of a threshold for police response, noting that officers' perceptions of a high-crime area result in fewer arrests for minor illegal activity, as the victims are often considered to be potentially guilty of some other crime. In addition, Klinger (1997) notes that due to the high volume of crime in such areas, the officers assigned to these neighborhoods are more selective in their responses to crime due to time and manpower constraints. Importantly, this has the undesirable effect of increasing the average seriousness of officer-initiated encounters, thus increasing the potential for conflict and violence within such encounters. For police officers, the neighborhood characteristics that are most important for triggering this threshold appear to be ethnicity and socioeconomic status (Dunham and Alpert 1988: 521). Smith et al. (1984: 243) support this, finding that "socioeconomic status rather than suspect race is the axis around which [police behavior] revolves", and they go on to note that police officers are more likely to be punitive toward offenders encountered in lower status neighborhoods. This is particularly significant due to the fact that officers

[9] Obviously, the idea of a threshold-triggered response from police officers contains the caveat that this only applies to less serious (typically property) crimes. No researcher has ever seriously argued that the police are willing to accept a certain amount of rape, aggravated assault or murder before engaging in enforcement efforts.

act as "gatekeepers" for the criminal justice system, in large part determining who is subject to various forms of social control.

There is an inherently dangerous fallacy associated with the process of ecological contamination – the criminal justice system comes to see negative members of certain neighborhoods as representative of the overall neighborhood when this is clearly not the case. Swett (1972: 38), for example, notes that "the propensity for police suspicion to increase according to ethnocentric perception of cultural differences is reinforced by stereotypes" regarding lower-class tolerance of criminal behavior. Yet, Sampson and Bartusch (1998: 784) found that an individual "can be highly intolerant of crime, but live in a disadvantaged context bereft of legal sanctions and perceived justice." Thus, while contextual effects lead actors within the criminal justice system to treat all neighborhood residents as homogeneous based on a few negative contacts, the reality is that the majority of these residents are intolerant of the negative members. However, because the contextual effect, and its corresponding ecological fallacy, is so strong, these individuals remain as targets, albeit improper ones, for the criminal justice system. This leads to cynicism regarding the system, causing these mis-targeted individuals to rely on informal, rather than formal, social control when their need arises. As Dunham and Alpert (1988: 506) note, "police strategies and practices incongruent with the basic culture and values of [a neighborhood] would likely be ineffective and perhaps even counterproductive to maintaining order and controlling crime." The injurious effects of the context of communities, then, result in a breakdown in the consistency of the system of social control.

Clearly, then, it has been demonstrated that neighborhood context, in and of itself, is important for a variety of reasons. It is therefore instructive to examine why neighborhoods are the most appropriate unit of analysis for developing an understanding of police behavior. That is, what does a neighborhood-level analysis provide that an individual-level or county-level analysis does not?[10]

To begin with, numerous researchers have found that introducing neighborhood characteristics into analyses can reveal the importance of linking micro- and macro-social processes together. For example, Sampson and Woolredge (1987) found that, controlling for individual-level effects, burglary victimization was directly related to community-based measures such as unemployment, housing density and residential stability.[11] They conclude that "[i]mportant individual-level differences in lifestyle notwithstanding, the community context of everyday activities is also a crucial theoretical factor in explaining victimization risk" (Sampson and Woolredge 1987: 372). These results were bolstered by Smith and Jarjoura (1989), who noted that burglary victimization varied with characteristics of individual households at the individual level, while victimization rates varied with characteristics of social areas at the aggregate level. The authors go on to state that "[d]ata on 9,006 households in 57 residential neighborhoods...indicate that a more complete understanding of factors influencing victimization risk emerges when both household and

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[10] Note that while this section discusses neighborhoods as the appropriate unit of analysis from a theoretical standpoint based on prior literature, Chapter 3 will provide further discussion concerning the operationalization of neighborhoods as the unit of analysis, as well as information on how neighborhoods were chosen.

[11] Note that although the authors were not explicitly testing social disorganization theory, many of their community constructs can be found in the literature regarding that theory as it has been discussed previously in this chapter.

neighborhood characteristics are included as independent variables" (Smith and Jarjoura 1989: 621).

With respect to specific police behaviors, researchers have also noted the importance of using neighborhood context in conjunction with individual-level variables. Lizotte et al. (1993: 1) note that "[s]ocial scientists see communities as being more than the sum of the individuals that comprise them [as the] community provides the context in which individuals organize their social lives, thus helping to pattern their behavior." It should be clear that this phenomenon extends to police officers who work in these communities, thus influencing their behavior as well. Bittner (1967: 699) was one of the first researchers to explore this complex issue, arguing that "patrolmen have a particular conception of the social order of skid-row life that determines the procedures of control they employ." This clearly illustrates the idea that police officers are thought to behave differently when interacting with marginal populations (i.e. minorities and the poor), reserving one set of police tactics for the well-to-do and another for those less well-off. Meehan and Ponder (2002: 402) confirm this, arguing that "[s]ocial psychological studies provide evidence that the police…apply a 'cognitive schema' that views the ambiguous behaviors [of residents] as suspicious and potentially criminal." Cox and Frank (1992) also find neighborhood effects, noting that over one-quarter of all officers studied made changes in their policing style as neighborhood context changed.

The need for the inclusion of neighborhood context variables, in conjunction with the typically used individual-level variables, has been described above. The final discussion centers on the decision to use neighborhoods as a unit of analysis rather than a larger unit of aggregation (i.e. cities or counties). One of the most prominent examples of the impact of the aggregation decision is found in the work of Ouimet (2000), who studied offending rates and social disorganization theory. Comparing data gathered at two (theoretically) different levels of aggregation (495 census tracts vs. 84 neighborhoods), Ouimet (2000) found that analyses at the neighborhood level provided stronger coefficients and increased predictive power. This is supported by Peterson et al. (2000: 38), who note that "census tracts do not necessarily correspond to neighborhoods in a socially meaningful sense."[12] More importantly, however, Ouimet (2000) went on to note that aggregating to a level higher than neighborhoods would result in problems similar to those found in using a level of aggregation that was too small.[13] As Peterson et al. (2000: 33) note, "[t]he general theoretical rationale for exploring the institutional context of neighborhood...stems from social disorganization theory...which has its foundation in broad social conditions...[and a] local institutional base." The latter, clearly, are an element of neighborhoods, rather than some larger level of aggregation, by their very definition. This is supported by Messner and Tardiff (1986: 297) who argue that "neighborhoods are more appropriate units of analysis...than are larger political and statistical units because neighborhoods are more likely to constitute meaningful frames of reference for social comparisons."

[12] Discussion of why this was inappropriate, given that census tracts are the most valid and reliable measure of neighborhoods, will be presented in Chapter 3.
[13] The same problems stem from using a proxy for neighborhoods, such as in the work of Mastrofski et al. (2002), who use police beats as an operationalization for neighborhoods in two different cities. These issues will be discussed further in Chapter 3.

Given the previous discussion, it can be argued that neighborhoods are large enough to have an impact on, yet small enough to provide a context for, both citizen and officer behavior. Coulton et al. (2001) confirm this, noting that residents experienced a reasonable degree of consensus when asked to define the boundaries of their own neighborhood, indicating that the latter were capable of exerting an influence on their behavior.[14] However, it is unlikely that such consensus would be obtained with regards to the definition of county or city boundaries, as most individuals find it necessary to resort to a map or physical markers to determine the latter. Kelling and Stewart (1990: 460) find the same phenomenon, stating that "residents…construct 'cognitive maps' in which they allocate distinctive places as 'theirs' – their neighborhood." Taylor et al. (1984: 303) argue that these cognitive maps are important due to the fact that "block-level linkages between social ties and territorial attitudes clarify how territorial attitudes reflect, and may contribute to, the development of group-based norms regarding appropriate behaviors in on-block settings." This extends to police officers as well, as Ratcliffe and McCullagh (2001: 333) note that "[t]he geographical nature of policing [in the form of] individual beats, means that an officer has to become intimately familiar with their patrol area…" The authors go on to note that this familiarity influences officer behavior by affecting their perception of the safety of various parts of their beat, and thus the tactics (i.e. the appropriate behaviors) they use within those areas. McGarrell et al. (1997: 489)

[14] It is interesting to note that residents of urban neighborhoods defined areas that were geographically much smaller for their neighborhoods than did residents of suburban neighborhoods for their neighborhoods, although both groups gave relatively detailed descriptions of boundaries (Haney and Knowles 1978).

support this as well, noting that "the neighborhoods categorized [in the study] as high-disorder neighborhoods are those identified by the police and in local lore as the centers of crime and disorder." Walklate and Evans (1999: 21) concur, finding that there was consensus between supervisors, patrol officers, and community members when asked to describe the worst crime problems and the worst crime areas. While a specific city or county can certainly be construed as dangerous, the influence of a dangerous context on an officer's behavior extends only to the immediate surroundings, for it is only in the present location at the present time that an officer is concerned for their safety. The latter study also makes clear that citizen behavior may be influenced by perceptions of neighborhood activities. Indeed, several researchers (Gould and White 1974; Perkins et al. 1992; and Suttles 1972) have found that the construction of cognitive maps can be influenced by an individual's perception of safety or danger within a specific area.

It has been demonstrated that neighborhood context can have a significant, and often negative, impact on the relationships between individuals in lower income areas. Representatives of the criminal justice system, as wielders of social control and the ability to use force, too often respond to the fallacy of ecological contamination. It is thus important both to define neighborhoods appropriately, and to examine the theoretical basis behind the context of neighborhoods. In doing so, researchers can shed light on the role that race and social class, at a neighborhood level, play in determining the subjects of social control, and, more specifically, the use of force. This, in turn, will allow us to make changes on a structural level to the determinants of the police use of force.

A Brief Introduction to the Literature

While Chapter 2 will present a more detailed review of the prior literature regarding research on both neighborhoods and police behavior, it is instructive to first introduce some concepts which have shaped that literature. Many prior studies on the influence of geography have focused on a larger area or region, rather than a neighborhood. These studies identified a subculture of violence as regions in which attitudes toward using force to resolve problems were positive (Hawley and Messner, 1989; Simpson, 1985; Wolfgang, 1978). In contrast, a series of studies emphasized the importance of structural position within those regions as a primary factor influencing violent behavior (Black, 1976; Cao et al., 1998; Luckenbill and Doyle, 1989). Subsequent research went further, arguing that individuals with a lower structural position in such regions were more likely to experience disputatiousness, which necessitated contact with higher levels of violence (Black, 1980; Luckenbill and Doyle, 1989; Perez, 1994; Toch, 1995).

In development of theory tied more closely to neighborhoods as a unit of analysis, prior research has focused on victimization, with the latter studies finding that social disorganization was closely related to criminal victimization (Sampson, 1984; Sampson and Woolredge, 1987; Taylor and Covington, 1988; Velez, 2001). In relation to those works, research has also focused on offending trajectories, finding that social disorganization leads to increased rates of offending for various types of crime (Jang and Johnson, 2001; Land, 2000; Smith and Jarjoura, 1989; Wikstrom and Loeber, 2000). In addition, research focusing specifically on violent crimes has found that neighborhoods higher in social disorganization had higher rates of violent crime (Baumer, 2002; Messner and Tardiff, 1986; Morenoff et al., 2001; Reisig and Parks, 2000; Stewart et al., 2002; Warner and Rountree, 1997).

Prior research on police behavior has also examined the influence of ecological context. For example, studies on police-citizen contact have noted that these contacts occur most often in neighborhoods with low SES, or that have been identified as "bad" by officers (Black, 1980; Crank, 1992; Fyfe, 1997; Mastrofski et al., 1995; McGarrell et al., 1999; Sampson, 1986). In fact, neighborhood composition has been found to affect: (1) rates of traffic stops (Mastrofski et al., 1998; Meehan and Ponder, 2002); (2) level of police patrol (Cox and Frank, 1992; Greenberg et al, 1985); and (3) officer behavior toward citizens (Rossi, 1968; Smith and Frank, 2000; Weitzer, 2000). In addition, the police subculture has also been argued to affect officer behavior, particularly in certain types of neighborhoods, due to an emphasis on 'face-saving' behavior and the maintenance of authority (Black, 1980, 1998; Chevigny, 1995; Goldstein, 1990; Herbert, 1996, 1998; Manning, 1997; Muir, 1977; Skolnick and Fyfe, 1993; Wilson, 1968).

Research has also focused on how neighborhood context can affect citizen behavior toward police officers, including the filing of official complaints. Much of this literature has emphasized dissatisfaction with the behavior of police officers, noting that concentrated disadvantage has a negative effect on satisfaction with the delivery of police services (Cao et al., 1996; Sampson and Laub, 1993; Reisig and Parks, 2000; Weitzer, 1999). A significant proportion have also noted that poor citizen demeanor can influence officer behavior (Klinger, 1994, 1997; Lundman, 1994; Worden et al., 1996; Worden and Shepard, 1996). Studies on citizen complaints have confirmed the negative effects of concentrated disadvantage, noting that neighborhoods high in this measure experienced a greater number of complaints for behavior ranging from disrespect from officers to excessive force (Kane, 2002; Kappeler et al., 1998; Lawton et al., 2001; Mastrofski et al., 1999).

The prior literature on use of force, while generally well-developed, has failed to focus on neighborhood effects. Many of these studies have presented only a simple analysis of associations, and have found that the base rate of force varies widely (Alpert and Dunham, 1995; Edwards, 2000; IACP, 2001; Klinger, 1995; Langan et al., 2001). In multivariate studies of use of force behavior, findings have varied on the influence of numerous officer and suspect characteristics, with the majority finding that suspect antagonism or physical resistance significantly influences the use of force (Bayley and Garafalo, 1989; Engel et al., 2000; Friedrich, 1980; Garner et al. 1995, 2002; Kavanagh, 1997; Phillips and Smith, 2000; Terrill and Mastrofski, 2002; Worden, 1995).

Only two multivariate studies have focused explicitly on neighborhood context and use of force behavior. Smith (1986) found that neighborhood social class influenced arrest, but not use of force, while Terrill and Reisig (2003) found that concentrated disadvantage increased use of force. These two studies represent the foundations of this dissertation.

Summary

This introductory chapter has focused on a discussion of why it is important to consider the effects of neighborhood context on police use of force behavior. However, the research examined here has been of a more general nature than the current study requires. While relevant theoretical positions and concepts have been identified, emphasizing social disorganization theory and Black's theory of social control, the focus was on how the idea of neighborhoods has been developed in prior theories, rather than on how neighborhood context has been utilized in analyses stemming from well-defined research questions. The following chapter will provide a comprehensive review of the literature regarding various neighborhood context studies, as well as relevant use of force research.

Chapter 2: Literature Review

As the introductory chapter has outlined the necessity of using neighborhoods as a variable of interest in well-defined research, the current chapter will identify previous studies which have used neighborhoods in such a manner. While the current research focuses on use of force behavior by police officers, the use of neighborhood as a variable is more common in other areas of criminal justice research. In particular, there has been a relatively recent emphasis on neighborhood found in the literature on adult offending and juvenile delinquency, with some research on police behavior also taking this approach.

Studies Using Neighborhoods as a Variable of Interest

As mentioned above, the number of studies focusing specifically on use of force behavior while also emphasizing the effects of neighborhood on that behavior is very small. In keeping with the beginnings of the emphasis on neighborhoods stemming from social disorganization theory, much of the research after the work of the Chicago School has maintained a focus on adult offending and juvenile delinquency behaviors.

Offending Behaviors by Adults and Juveniles:

Although the Chicago School focused explicitly on neighborhoods, identified as "zones" in much of the early literature on social disorganization, studies that followed in the wake of the Chicago School research initially emphasized higher levels of aggregation. The most concrete examples of this take the form of theoretical descriptions of the subculture of violence, also described as a Southern construct of violence. Wolfgang (1978) noted that this subculture developed in vaguely defined "areas" characterized by residential mobility and a commitment to the use of force by its residents to solve problems. Thus, offending in these areas, particularly violently, is a natural outgrowth of the tolerance, and even outright encouragement, of violence. Simpson (1985), in researching the same issues, found that while social class and levels of inequality did not predict violent crime rates, regional culture and social disorganization factors had a powerful influence on these rates.[15] Luckenbill and Doyle (1989) examine the same phenomenon, noting that the culture of violence is not exclusively the domain of urban residents, nor that of minorities of lower social class. Cao et al. (1996: 379) concur, noting that "a more fruitful search for the root causes of black violence may be…in the structurally disadvantaged position of blacks in the U.S. society." Thus, it is structural position (as argued by Black 1976) that leads to an emergence of violence, rather than individual characteristics such as race. Arguing that disputatiousness, that is, "the likelihood of being offended by a negative outcome and seeking reparation through protest…", is the primary factor explaining a culture of violence in particular areas, Luckenbill and Doyle (1989: 419) noted that research was more effective when conducted at smaller levels of aggregation. More importantly, the latter research noted that structural position was an important factor in how

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[15] Note, however, that these results are disputed by Braithwaite (1981), who, in a meta-analysis of previous studies of social class and criminality, finds that there is a significant relationship between social class of an area and official rates of both adult and juvenile crime. Liska and Chamlin (1984) noted the same phenomena.

disputatiousness developed. That is, the authors argued that individuals whose positions necessitated contact with higher levels of violence were more likely to experience disputatiousness, particularly when in a public setting. However, this research failed to identify police officers as individuals in such a position, and therefore the opportunity to examine use of force behavior from this perspective was lost. Perez (1994: 41) makes an attempt, however, noting that 'the paradox of face' requires "a *believable* threat backed up by a little bit of history" of officer violence in the face of experiencing disputatiousness. Black (1980: 31-32) also discussed use of force as an attempt at 'face-saving', noting that "the most extreme violence seems to occur when a man refuses to submit totally to an officer's authority." Toch (1995: 124; italics in original) concurs, finding that "the officer becomes irritated by what he views as an unforgivable defiance of his authority [leading to] *rep defending*, where violence is the fate entailed in [the officer's] role." Like Luckenbill and Doyle (1989), Hawley and Messner (1989) focused on a subculture of violence and found that smaller units of aggregation were more appropriate for research. In addition, they noted that while "violent behavior is a way to fulfill cultural expectations…[and is] demanded in certain interactions", a more complete explanation of how violent behavior occurs requires a theoretical model integrating cultural and structural factors (Hawley and Messner 1989: 486).

Parallel to the studies of large units of aggregation, a smaller group of researchers focused on neighborhoods as the unit of analysis, although the latter studies occasionally emphasized theoretical propositions rather than focusing on statistical analyses. Representative of this class of literature is the work of Sampson (1984), who found that interracial criminal victimization was positively (and very strongly) related to neighborhood heterogeneity.[16] Sampson and Woolredge (1987) also argue that neighborhood factors are related to victimization. Noting that previous research at the neighborhood level inferred, rather than directly measured, theoretical concepts, the authors find that residential mobility, housing density, and family disruption were all important factors influencing victimization rates. These later studies signaled the beginning of the use of statistical analyses to examine the effects of neighborhood context on various human behaviors. Velez (2001), using a social disorganization model, provides an example, finding that increased levels of public (i.e. informal) social control within the neighborhood lead to decreased numbers of victimizations. Taylor and Covington (1988), in a study of neighborhood context and violence, found that neighborhood SES influenced behavior, noting that neighborhoods with increasing lower class populations[17] experienced increasing violence as stability (used as a proxy for social disorganization) declined.

In addition to the research on generalized victimization risks and offending behavior, there has also been an emphasis on specific types of offenses and offending trajectories. Smith and Jarjoura (1989) firmly established the importance of examining both individual and neighborhood characteristics when

[16] Interestingly, Shihadeh and Steffensmeier (1994) found that income inequality within a racial group (and, presumably within a racially homogeneous neighborhood) can also lead to increased violence and victimization.
[17] Taylor and Covington (1988: 553) used the term "underclass" to describe the minority population in neighborhoods which were increasingly being marginalized after gentrification of surrounding neighborhoods, following the example of Wilson (1993).

studying offending behavior. In a study encompassing over 9,000 households in 57 different residential neighborhoods, the authors determined that burglary rates were related to attributes of individual households, as well as to neighborhood characteristics. Jang and Johnson (2001), in contrast, study the issue of drug use, and find that increased neighborhood disorder leads to increased illicit drug use while high levels of personal religiousity mediate these effects and result in decreased illicit drug use. Wikstrom and Loeber (2000), in a study of offending trajectories, found that low neighborhood SES had a direct impact on late onset of offending for juveniles who had a mix of both risk and protective factors. Land (2000) also studied offending trajectories and found similar results, noting that neighborhood SES had a direct effect on neighborhood social disorganization, which in turn affected the ability of informal social control methods to control the behavior of juveniles in the neighborhood.

The greatest amount of research on specific offenses, however, has focused on violent crimes. Stewart et al. (2002), in a multisite neighborhood study across two states, find that neighborhood affluence decreases childhood violence among the residents of that neighborhood. Interestingly, Baumer (2002: 579) found that neighborhood disadvantage did not affect the likelihood of notifying the police for aggravated assault victimization, while the effect was curvilinear for simple assault victims, with both high-income and low-income victims less likely than middle-class victims to notify the police of victimization.[18]

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[18] Interestingly, Warner and Rountree (1997: 520) note that the rate of being assaulted also varied by neighborhood, with social ties decreasing assault rates in predominantly white neighborhoods, yet having no effect on assault rates in predominantly minority neighborhoods. The authors note that it is unclear if these factors also affect reporting rates.

Messner and Tardiff (1986) also studied the theme of violence and neighborhood context, focusing on homicide levels as related to characteristics of urban areas. Examining 26 neighborhoods in New York City, the authors found that homicide rates were highest in neighborhoods with extreme levels of poverty and high rates of single-parent households. Morenoff et al. (2001) confirm these results, finding that homicide rates were highest in neighborhoods which experienced concentrated disadvantage and low collective efficacy. Reisig and Parks (2000: 6) also note the same phenomenon, finding that neighborhoods high in concentrated disadvantage had a higher homicide rate, resulting in decreased satisfaction with the police from neighborhood residents.

Police Behavior:

In addition to the research focusing on criminal behavior by both adults and juveniles, studies examining the effect of neighborhood context on police behavior have emerged. These studies bring us closer to our core questions concerning use of force behavior and the effects of ecological context. The research to be discussed here typically has focused on arrest practices and police attitudes toward citizens (and vice versa). In light of this, it is interesting to note that a study of patrol work by Whitaker (1982) found that of the two hours per shift in which patrol officers had encounters with citizens, only 45 minutes were spent dealing with problems that were of a criminal nature. Bayley (1994: 17) noted that approximately ten percent, or 45 minutes, of the average shift is spent dealing with dispatched incidents of a criminal nature. Mastrofski (1995:

383) goes further, arguing that overall (i.e. for dispatched and officer-initiated contacts), a relatively small amount of patrol work involves dealing with crime in some manner. Yet, despite, or perhaps due to, the fact that relatively little time is spent dealing with suspects and criminal activity, the issues of arrest practices and police attitudes are viewed as important, as Goldstein (1990: 1) noted, arguing that "efforts to improve policing should extend to and focus on the end product of policing – on the effectiveness and fairness of the police in dealing with the substantive problems that the public looks to the police to handle." The equity of police behavior is particularly important when considering the potential effects of the use of force; however our review of prior works begins here with a look at other police behaviors first.

Sampson (1986), in a study examining delinquency and neighborhood characteristics, found that individuals in neighborhoods with higher SES experienced fewer contacts with police officers, regardless of the amount of criminal behavior. According to Sampson (1986: 877), these results indicated that "a large part of any effect of individual SES on arrests is spurious and reflects an ecological bias in police perceptions rather than a bias directed solely at lower-class juveniles in actual police encounters." This conforms to the previous discussion of ecological contamination in urban neighborhoods (typically low-SES, minority areas). Black (1980: 143) clarifies further, arguing that "discretionary authority often carries with it the possibility of particularistic law enforcement…[but] whether a system of mobilization is reactive or proactive does not determine the probability of discriminatory enforcement [it only] organizes that probability." Smith (1987) replicates this result, finding that low neighborhood SES leads to an increased use of arrest by officers patrolling those neighborhoods. Smith (1987: 768) further argues that this increased arrest rate is a function of "a set of decision heuristics [based on neighborhood context] which influence [an officer's] definition of situations..." McGarrell et al. (1997) provide further evidence for the latter phenomenon, noting that police officers are more likely to identify neighborhoods with high levels of disorder as being "bad."[19] Liska and Chamlin (1984), as well as Crank (1992), continue in this vein, finding that the percentage of non-white residents in a neighborhood is predictive of increased arrest rates. In another example of a study focusing on neighborhood SES, Seron and Munger (1996: 204) argue that "social control is organizaed quite differently to deal with different social classes [and] through policing...the poor, and especially the underclass, experience a special kind of 'government of the poor.'" On the other hand, Sparger and Giacopassi (1986: 25) find that "police officers see the wealthy as possessing different values and being accorded a privileged status by the criminal justice system, resulting in some resentment on the part of the police." The latter study makes clear that police officers may engage in behaviors in high-income areas against its residents out of resentment, a concept clearly at odds with conflict theory's propositions that only the poor are mistreated. This seems to correspond, however, to work conducted by Fyfe (1997: 537), who noted that the overwhelming majority of individuals in an officer-initiated encounter, regardless of race or social class, are

[19] Manning (1997: 199) agrees, noting that "the orientation of officers' [behavior] is limited...by their geographical knowledge."

of poor demeanor because "those who come to police attention do not seek it, but become unwilling clients through the intervention of [others]." It must be noted, however, that the rate of officer-initiated contacts can be affected by departmental philosophy and other organizational constraints. Indeed, Mastrofski et al. (1995) found that officers in departments that emphasized community policing were more selective in making arrests, and were much less influenced by legal variables in behavior reminiscent of the threshold-triggered response discussed earlier.[20]

Similar to arrest rates, traffic stops provide a measure of police behavior. Mastrofski et al. (1987), for example, found that overall, smaller departments tended to initiate more traffic stops per shift than larger departments. The authors argued that this indicated that the pressure to perform on officers was stronger in smaller departments, thus increasing the amount of stops made in an attempt to locate criminal activity. In a later study, Mastrofski et al. (1998) found that traffic stop rates are influenced by officers' perceptions of racial boundaries (i.e. the geographic dividing lines between white and minority neighborhoods), with minority drivers being stopped in mixed race areas at a much higher rate than that for white motorists in those same areas. Meehan and Ponder (2002) note similar results, finding that residential segregation patterns (presumably similar to geographic boundary patterns as discussed by Mastrofski et al. 1998) influence rates of traffic stops performed by officers in those neighborhoods. Departmental

[20] Indeed, this has been one of the greatest criticisms of community policing – in freeing the officer to make decisions based on previous encounters with the individuals or on other situational variables, the officer has also been granted the discretion to make decisions based on extralegal variables (including neighborhood context) in a negative manner.

(and officer) vigorousness can also be considered a measure of police behavior, as Greenberg et al. (1985) demonstrate. The latter study found that neighborhoods with high levels of non-white residents experienced an increase in police strength.[21] With respect to individual officers, Brooks et al. (1993) found that officers assigned to slower (i.e. low-crime) patrol beats held more positive attitudes about their jobs, and, more importantly, about the citizens in the areas they patrolled. Thus, as noted previously, officers in high-crime areas tend to regard the residents of those areas with suspicion, while officers in low-crime areas tend to have more positive attitudes about the residents of those areas. With respect to how police officers and citizens interact within their neighborhood contexts as an outgrowth of their attitudes regarding one another, Cox and Frank (1992) found that high-crime areas experienced an increased level of consistent behavior from the officers assigned to those areas. Interestingly, Rossi (1968) found that neighborhoods with a high percentage of Black residents, regardless of their crime rates, were rated by police officers as harder neighborhoods in which to work, as well as being more hazardous. Smith and Frank (2000), as well as Weitzer (2000), confirm that neighborhood type and racial composition can affect officer behavior, leading to a difference in how officers treat White and Black residents of these areas, although these results were not significant. Weitzer (2000: 129) also notes that "there is substantial agreement across…communities in the belief that police treat blacks and whites differently…" Noting this inconsistency in behavior, Harring and Ray (1999: 70)

[21] The study also found that neighborhoods with high levels of income inequality had higher levels of police strength, although this result was not significant (Greenberg et al., 1985).

argue that "the confrontation between…alert, aggressive police officers and a frightened Black man is inherently dangerous because of the police culture of competitively fighting 'crime wars' in unfamiliar minority neighborhoods."

Focusing on these same issues regarding police culture, many researchers have looked at the police subculture as indicative of poor attitudes, and predictive of police behavior in certain neighborhoods. Indeed, research in the field of criminal justice has long identified the existence of a paramilitary structure within police departments perpetuating an 'us-vs.-them' mentality (see Wilson 1968; Muir 1977; and Goldstein 1990). Manning (1997: 4) was among the first to analyze the subculture, noting that "the driving force of policing is not the regulations and policies, law, politics of public sentiment; the identifying feature is the occupational culture in interaction with these forces." Herbert (1996) concurs, arguing that police behavior is governed by the normative structure of the subculture. The author goes on to note that this structure, while making allowances for bureaucratic regulations and the law, focuses mainly on the realities of policing the street, and particularly on the dangers of policing in high-crime neighborhoods. Thus, the ideas of machismo, safety / danger, competence and morality become the main concern of patrol officers operating in these neighborhoods. Indeed, Weisburd et al. (2000: 3) note that approximately only 4% of police officers believed that their fellow officers used more physical force than was necessary in making an arrest. Herbert (1998) notes that in reality there is an inability of legal and bureaucratic influences to determine officer behavior, with only the ethos of the subculture affecting officer performance and decision-making.[22] However, it should be noted that more recent research has argued against the existence of an overriding police culture, and thus questions the notion of all officers responding to occupational stressors in similar ways (Paoline, 2003, 2004).

The ideas present within the police subculture are often expressed in the 'paradox of saving face'. Skolnick and Fyfe (1993: 95 italics in original) elaborate on this point, arguing that "*the stronger one's reputation for being mean, tough and aggressive, the less iron-handed one actually has to be*." Yet, the authors also note that the subculture sometimes demand forceful action from an officer, particularly in high-crime neighborhoods, noting that "[while] the written rule is clear: cops are to use no more force than is necessary to subdue a suspect, [when] a departmental subculture condoning [officer aggressiveness] prevails, the unwritten rule is: Teach them a lesson" (Skolnick and Fyfe 1993: 13). In a continuing description of the police subculture, Skolnick and Fyfe (1993: 103) also note that "[it is a] police cultural crime [and] a serious transgression in the police cultural statute book…to talk back to a cop." Importantly, Terrill (2005: 110) argues that "officers are socialized to 'maintain the edge' and be 'one up' on citizens not only to establish control, but to ensure proper respect." Chevigny (1995: xi) elaborates, noting that the effects of the police subculture can affect officer behavior to the point that "the police habit of charging the people they beat with standardized crimes even got the name of a mock crime: 'contempt of cop.'"

[22] Note, however, that Waddington (1999) has a somewhat different view, arguing that the police subculture operates differently on the street than it does in concept. In particular, Waddington proposes that officers often engage in subcultural discussions (i.e. glorification of violence, expressing a desire for action) while at the station, but act much differently in the street.

Greenleaf and Lanza-Kaduce (1995) examine a different aspect of the authoritative role of police officers within the subculture, focusing on how suspects respond to that authority. The authors note that "overt conflict [is] more likely when authorities act congruently with their official norms" (Greenleaf and Lanza-Kaduce 1995: 567). Stated differently, the authors propose that when officers are enacting their role of crime-fighter, there is more likely to be resistance on the part of the suspect, and corresponding conflict. Lanza-Kaduce and Greenleaf (2000: 223) support this, noting that "police-citizen conflict will be highest when social norms of deference counter positional authority."[23] This again illustrates the dilemma police officers face when confronting citizens in high-crime neighborhoods: the officers must be firm in order to maintain order and 'save face' for themselves, but it is precisely this type of behavior which will lead to conflict with citizens. It appears, then, that the informal, rather than formal, aspects of the organization are important determinants of police behavior. Patrol officers respond to the demands of their peers voiced within the subculture, and structure their behavior in certain neighborhoods accordingly. Given Black's (1980) theory of social control, these results regarding the effects of the police subculture on officer interactions with individuals in high-crime neighborhoods are not surprising. Indeed, Black (1998: 40) noted that lower status individuals (particularly minorities and the poor) experience less legal protection overall from the police, and more scrutiny, due to their position within the social stratification structure.

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[23] Note, however, that Weidner and Terrill (2005) fail to support the hypothesis that conflict is more likely when an officer's race, age, sex, and wealth deference norms counter their positional authority.

Just as neighborhood context can influence officer behavior and perceptions, so too can it affect how citizens of those neighborhoods themselves perceive the behavior of officers, or how those citizens react to that behavior. Sampson and Bartusch (1998), for example, find that concentrated disadvantage within a neighborhood leads to increased dissatisfaction with police and an air of legal cynicism. Reisig and Parks (2000) replicate this result, noting that concentrated disadvantage has a significant, negative effect on satisfaction with police officers. In further work, Reisig and Parks (2003: 211) also find that "aggressive patrol tactics may be viewed by some as intrusive and inconsistent with community needs, thus further alienating residents in disadvantaged neighborhoods who already report high levels of disaffection with police." The authors go on to note that concentrated affluence within a neighborhood leads to increased satisfaction with police, while the use of alternative patrol (as a measure of community policing efforts) leads to increases in both satisfaction with police officers and in perceived quality of life. In disadvantaged neighborhoods, however, Cao et al. (1996: 4) note that things get progressively worse, arguing that "social and physical disorder send a message that law enforcement has lost control over or consciously abandoned the community." Sampson and Laub (1993) underscore the fact that this "message" serves to perpetuate a cycle of cynicism on the part of officers and residents alike, and leads to further stereotyped attributions that the residents of these areas are a threatening group. The authors note that structural context, particularly the obvious racial inequality in wealth and the concentration of "underclass" poverty, defines the limits of appropriate police action. These limits encompass arrest, but they are also reflected in numerous other police behaviors, including "hassling." Weitzer (1999) argues that neighborhood context therefore affects not only police and citizen behavior, but also the attitudes of the citizens concerning their encounters with the police. Within such a context, it is easy to understand why every encounter between a citizen and a police officer is fraught with tension and anger.

With respect to how neighborhood context has been presumed to affect citizen behavior in response to police officers, various studies have focused on the effects of citizen demeanor. This research ties together aspects of a threshold for police response, as well as aspects of the concepts of honor and 'saving face'. In an ecological analysis of police behavior, Klinger (1997) presented the hypothesis that officers patrolling in high-crime areas were less likely to exert their legal authority (e.g. make an arrest, interview witnesses) due to the factors of: (1) time constraint; and (2) deservedness of victims. Although not explicitly mentioned in the research, one implication of Klinger's (1997) work is that a citizen's demeanor may influence the perception of their deservedness. Indeed, Klinger (1994; 1996) did study whether such a demeanor effect occurs during police-citizen interactions. Over the course of two separate research efforts within in a single police department, Klinger (1994; 1996) found that citizen demeanor was not a predictor of arrest behavior when criminal conduct during the encounter was introduced into the analyses. However, using a different data set, Lundman (1994) found that a demeanor effect on arrest was present, and that the effect relied in large part on model specification. This is supported by Worden et al. (1996: 330) who note that much confusion stems from the fact that "different studies have defined demeanor, both conceptually and operationally, in somewhat different ways." However, Worden and Shepard (1996), in a re-analysis of several data sets across domestic disturbances, traffic stops, and disputes found that the demeanor effect on arrest behavior (i.e. poor demeanor on the part of suspects increased the chances of an arrest) persisted even after considering criminal behavior within the encounter. The concepts of honor and demeanor are even played out between juveniles and police officers, as Fagan and Wilkinson (1998) noted. The authors argued that the high demand for guns in inner city areas was "fueled by an ecology of danger" (Fagan and Wilkinson 1998: 105). In this environment, youths across two New York City neighborhoods were seen to possess guns due to the respect afforded to them by this possession. More importantly, this culture of respect for carrying and using guns significantly altered the interactions between police officers and juveniles, with the latter acknowledging that gun ownership lead to poor demeanor on the part of suspects (Wilkinson and Fagan 2000). In a study which focused more specifically on suspect resistance, Greenleaf and Lanza-Kaduce (1995: 565) found that "after controlling for race, sex, and area of the city, overt conflict between the police and citizens is related to the organization and sophistication of the participants involved." The former factor was composed of elements of victim-suspect relationships, number of arrestees, and number of bystanders, while the latter factor was composed of officer experience, suspect presentation, and the nature of the situation. In a later work, Lanza-Kaduce and Greenleaf (2000: 227) examined the effects of resistance[24] on the arrest decision, and confirmed their previous findings.

A final grouping of research efforts regarding neighborhood context and police behavior brings us even closer to our core research questions. While not explicitly exploring the subject of police use of force, some researchers have focused their efforts on other police behaviors which may be illegal or unethical. Mastrofski et al. (1999), using Black's (1980) theories on the behavior of law, as well as again using the concept of concentrated disadvantage as a neighborhood measure, find that the latter phenomenon resulted in increased disrespect from police officers patrolling those neighborhoods.[25] Kane (2002) found that neighborhoods which experienced considerable structural disadvantage (conceptually similar to concentrated disadvantage measures prevalent in other research efforts) were far more likely to have reports filed regarding police misconduct within those neighborhoods. Importantly, McCluskey and Terrill (2005) find that an officer's complaint rate for force and verbal discourtesy is associated with higher levels of coercion in encounters with suspects. Also regarding complaints against officers, Kappeler et al. (1998: 127) note that "once a justification [for misconduct] has been accepted…subsequent deviance becomes easier for the actor." The authors go on to argue that this process of acceptance of police deviance is more likely to occur when the deviance (i.e. misconduct) has taken place in a high-crime area, noting that "characterizations

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[24] This was operationalized as the presence of any of the following: (1) verbal attack on the officer; (2) physical attack on the officer; (3) refusal to obey a lawful order; or (4) resisting arrest.
[25] It is important to note, however, that this relationship did not reach statistical significance.

of victimized citizens as 'drug users', 'deviants', 'criminals', and 'psychopaths' usually serves [the officer] well" (Kappeler et al. 1998: 126). Lawton et al. (2001), in an analysis with a specific Geographical Information System (GIS) component, found that disadvantaged neighborhoods had a significant, positive effect on the number of complaints filed against police officers patrolling those neighborhoods. This latter study is particularly useful for the current research, as a GIS package is also used here to identify neighborhoods and analyze the effects of their context.

Use of Force Research

The police role is one that is inherently concerned with the threat and application of violence, and violent encounters between police officers and citizens are carefully scrutinized to determine if the police used their powers of coercion inappropriately. Incidents such as those involving Abner Louima and Rodney King have decayed public confidence in their police officers, shattering the mythologized image of the police officer as the helping hand of the law. Indeed, research shows that after a well-publicized incident of police use of force, public opinion of the police takes a sharp downturn (Lasley 1994; Tuch and Weitzer 1997). The effects of such incidents are typically felt more strongly among non-whites, particularly those living in disadvantaged areas (Arthur and Case 1994; Kaminski and Jefferis 1998; Son et al. 1997). Arthur and Case (1994: 167), for example, found that "in 1991 70% of white [and only] 43% of black respondents approve of a policeman striking an adult male citizen under some circumstances." As has been discussed previously, the impacts of these incidents are detrimental to the gains made by community policing programs, and thus their study, and ultimately their prevention, is of great concern to criminal justice researchers. The following section describes a variety of studies which have focused on use of force behavior by police officers in order to provide a foundation for the current research questions.

Studies of Association Examining Use of Force Behavior:

While the issue of use of force behavior is relatively well-studied, particularly in the past two decades, most of these studies either: (1) provide only measures of association between that behavior and some variable; (2) are of a purely descriptive nature, outlining only the base rates of force; or (3) provide only simple regression equations for statistical analyses. Although there are some studies which describe the effects of neighborhoods on behavior, neighborhoods are typically categorized as a sociological variable, and are studied within a more simplistic statistical analysis than the multi-level modeling proposed here. However, these studies, while not as rich in detail as this dissertation, provide a preliminary understanding of how use of force behavior develops.

Much descriptive research has stemmed from government-sponsored data collection efforts. The International Association of Chiefs of Police (IACP), for example, developed the National Database Project on Police Use of Force in order to "reflect operational realities of modern, street-level enforcement, including the very meaning of 'police use of force,' defined as the amount of force required by police to compel compliance by an unwilling subject" (IACP: 2001). These efforts found that for the 26 agencies reporting for the years 1997 and 1998, the overwhelming majority of incidents of use of force behavior occurred in arrest-related situations.[26] In addition, of the 2,264 use of force incidents reported to the IACP, 909 were intraracial and 1,335 were interracial (IACP: 2001). More importantly, a larger sampling of agencies (serving over 30% of the population of the United States) over the years 1991 through 2000 found that the police used force 3.61 times per 10,000 calls for service, a base rate of .04% (IACP: 2001). These results were replicated in the 1999 Police Contact Survey (distributed as an addendum to the National Crime Victimization Survey during that year), which found that of the 44 million people reporting a face-to-face contact with police officers, 422,000 (.96%) experienced either the threat or use of force by the officer (Langan et al. 2001). Note that although the base rate is different (incident reports vs. calls-for-service), the percentage of individuals experiencing use of force in some manner remains below 1%.[27] National data collection efforts also extended to other countries, with the Queensland (Australia) Criminal Justice Commission (Edwards 2000: 1) finding that "20% of the respondents to the 1999 Defendants Survey reported that police had used some kind of force against them." Importantly, the Commission (Edwards 2000: 1) went on to note that "of

[26] A discussion of why the current research chose to sample only arrest events will be presented in detail in Chapter 3.

[27] It is important to note also that this increase from .04% to .96% is possibly due to the extrapolation required by the survey. The PCS was distributed to a nationally representative sample of 6,421 individuals over the age of 12, representing (through extrapolation) 216 million individuals. Of these, 1,308 had a face-to-face contact with police officers (representing 44.6 million individuals), and 14 experienced use of force behavior (representing approximately 450,000 individuals) (Greenfeld et al. 1997).

those respondents who reported that police had taken some physical action (either 'force' or 'restraint'), about a quarter acknowledged that they had resisted arrest..."

Aside from national data collection efforts, some researchers have chosen to focus on one city or a set of cities in order to examine the issue of use of force behavior. One of the earliest efforts was conducted by Milton et al. (1977), who found that in 7 large (i.e. over 750,000 people) cities, while the rate of minorities shot by police was much greater than their proportion in the general population, this rate was consistent with the arrest rate of minorities for serious crimes. In fact, Geller and Scott (1992: 153), note that many earlier studies of use of force behavior found a strong relationship between minority arrest rates for serious felonies and the percentage of shooting victims who are minorities. They go on to note, however, that many of these studies have failed to include important contextual information. It is also important to note that more recent studies have found that minorities *are* disproportionately the victims of police shootings. Goldkamp (1982), for example, finds that low-income suspects, regardless of race or minority arrest rates, were more likely to be shot by police officers. This is supported by Locke (1996: 135), who argues that "persons of color are disproportionately represented among those subjected to police use of force where the discharge of a firearm is involved." In an analysis of the Metro-Dade Police Department in Miami, Alpert and Dunham (1995: 19) found that while in 31% of the cases of a firearm discharge a white officer shot at a Black suspect, in only 1.37% of the cases did a Black officer fire a shot at a white suspect.

Interestingly, in an analysis of the same department, Klinger (1995) found that the base rate of physical force was 17%, a rate almost double that of any previously published studies. Holmes (2000: 343), in an analysis of civil rights complaints against police departments, also found an effect for race, noting that "measures of the presence of threatening people (percent Black, percent Hispanic [in the Southwest], and a majority/minority income inequality) were related positively to average annual civil rights criminal complaints."

Cloninger (1992) also conducted analyses using aggregate, city-level data. In the analysis, the author found that there were a number of city characteristics which accounted for the rate of deadly force, notably: (1) the number of police officers in the city per violent offense; (2) the probability of arrest and conviction in the city; (3) the number of non-homicide violent offenses; (4) the number of homicides per capita; and (5) the number of police killed per violent offense. Using a much larger data set, two separate sets of researchers also examined use of force (notably deadly force) using city-level data. Jacobs and O'Brien (1998) conducted an analysis of 170 cities to examine police killings between 1980 and 1986[28] in all cities with a 1980 population of greater than 100,000, while Sorensen et al. (1993) perform analyses on 169 cities to study police killings between 1980 and 1984 in all cities with a 1980 population greater than 100,000. With a total of 1,231[29] cases, the latter authors find four variables to be statistically significant, namely: (1) Southern geographic location; (2) the

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[28] The authors report that the mean *number* of police killings for all 170 cities in this period is 9.68, while the mean *rate* per 100,000 for this period is 1.99 (Jacobs and O'Brien 1998: 846-847).

[29] These cases represent all instances where the use of force by a police officer resulted in the death of a felon.

violent crime rate; (3) percent Black in the city; and (4) the degree of economic inequality. Jacobs and O'Brien (1998) also find four variables (out of 12 inserted in the model[30]) to be significant: (1) city population size; (2) the divorce rate in the city; (3) the murder rate in the city; and (4) the increase in the proportion of Black to White populations.

In addition to those studies focusing on city-level or national data, there are numerous efforts which present data only on non-lethal force options. In an example of the latter, Klinger (1995: 175) studied over 100 officers from three patrol districts of the Metro-Dade County (Florida) Police Department and found that in slightly over 60% of police-citizen encounters, the officers did not use any force. Klinger (1995) went on to note that in most instances where force was used, the officer used no level greater than simple verbal commands. In a study specifically focused on verbal commands, MacDonald et al. (1985) found that if one considers the potential for abuses based on the average number of encounters multiplied by the number of officers multiplied by the number of shifts, physical and verbal abuse if not a problem. However, the authors also found that two groups of officers contributed disproportionately to the negative incidents reported to the department. The first group, making up between 10 to 20% of all officers, was characterized by consistently negative attitudes toward the public, resulting in verbally abusive and rude behavior on the part of the officers in their contacts with the public (MacDonald et al. 1985: 299). The second group, comprising 10 to 15% of all officers, was characterized by an intense involvement

[30] Note that Jacobs and O'Brien (1998) estimate two separate models – one for police killings of Black suspects, and one for police killings of all suspects.

with the policing function in conjunction with disenchantment with the organizational restraints of police work. This group was found to be overrepresented in incidents of ‘curbside justice’, where suspects where subjected to force but not arrested (MacDonald et al. 1985: 309). Upon further reflection, then, one could say that between one-fifth and one-third of police officers in the study engaged in some form of abuse of citizens, and thus it is unusual that MacDonald et al. (1985) would claim that abuse was not problematic within this department. Indeed, White (1994) argues that while most police agencies officially prohibit obscene language in contacts with citizens, the concept of ‘command presence’ is taught at the police academy as an effective means of controlling the situation. The author goes on to note that “profanity and obscenity [are used] by officers in…contacts as a form of aggression” (White 1994: 230).

Of the studies focusing on non-lethal force options, some researchers have moved up the continuum of force from verbal commands to look at the use of chemical tactics. Holmes et al. (1998) used vignettes in a survey of 662 officers to assess the effects of training on the officers’ ability to predict threat from a suspect and react accordingly. The authors estimate three separate models – the first with the ability to predict threat as the dependent variable, the second with the number of verbal warnings given to the suspect as the dependent variable, and the third with the application of force as the dependent variable (with the perceived threat level and the number of warnings included as independent variables) (Holmes et al. 1998: 90-91).[31] After testing both the Threat Level and Verbal Warning models, the authors find that the majority of independent variables found to be statistically significant in the first model remain so in the second model, and thus they estimate the Force Level model.[32] In the latter, Holmes et al. (1998) found 7 of 13 variables to be significant, namely: (1) the number of warnings given to a suspect; (2) the perceived level of threat from the suspect; (3) suspect resistance; (4) suspect gender; (5) the officer carried chemical spray; and (7) years of service in the department. In another study regarding these tactics, Kaminski et al. (1999) estimated three separate models, with dependent variables of: (1) "OC spray eased arrest"; (2) "the suspect was incapacitated"; and (3) "OC has minimally effective effects". Focusing solely on the use of oleoresin capsicum (OC) spray, the authors collected surveys from officers regarding 174 incidents of use between July 1993 and March 1994, which they supplemented with 878 official reports from incidents between April 1994 and December 1996.[33] After estimating all three models, Kaminski et al. (1999) determine that the only variables which are statistically significant are the following: (1) the suspect was drinking; (2) the suspect was on drugs; (3) the age of the suspect; and (4) the suspect was between 5 and 20 feet away from the officer at the time of OC use. In an attempt to determine the effectiveness of

[31] The authors use the standard dictionary definition of threat to define their dependent variable as "involving the intention on the part of the suspect to injure the officer or other citizens" (Holmes et al. 1998: 90).

[32] It is important to remember that Model 3 only asks officers how they would respond with force given certain situations, thus measuring their attitudes and beliefs regarding their own actions, rather than measuring those actions directly.

[33] The authors note that they eliminated from the analysis encounters involving crowd situations, animals, misses, or OC canister malfunctions. More importantly, they also note that incidents with multiple officers using OC, or multiple suspects on whom OC was used, were randomly sampled so that either only one officer or one suspect was used in the analysis. The resulting number of cases in the final analysis was 690.

defensive tactics in a more general sense, including the use of OC spray, Kaminski and Martin (2000) surveyed 600 officers from a large West Coast municipal department in June 1998. The authors estimated six different models focusing on officer attitudes towards defensive training tactics and use, particularly in relation to assaultive and resistive suspects. Over these six models, the following variables emerge as significant: (1) the rank of the officer; (2) the age of the officer; (3) the officer received additional academy training; and (4) the officer had been assaulted during the previous year.

What is most important to note about the group of studies on non-lethal force options just discussed here is their lack either of including context variables or of finding these variables to be significant. Indeed, the closest any of these research efforts come to a contextual analysis is the inclusion of a "location" variable in the regression equation (Klinger 1995; Holmes et al. 1998). In these instances, not only is the variable included as a nod to sociological influences on officer behavior in a flat regression equation, rather than a more appropriate multilevel model, the variable is not even found to be significant (most likely due to the use of inappropriate statistical techniques), thus obscuring any possible real effects that context might have on non-lethal force behaviors by police officers.

The studies described above concerned themselves with less-than-lethal force options, yet they used a variety of measures to define their dependent variables. In addition, as Desmedt (1984: 170, italics in original) notes, the use of these options is often not clearly defined by departmental policies. He goes on to point out, however, that "there are clear limits placed on officer's right to use *deadly* force", stemming mainly from the Supreme Court decision in Tennessee v. Garner, widely known as the "fleeing felon" rule. One of the implications of this statement is that criminal justice scholars are more likely to study the use of lethal force as it is easier to identify and delineate as justifiable or excessive. In one such study, Sherman and Blumberg (1981) found no differences in the use of lethal force based on officer education, with a sample consisting of 36% of officers with one year of college and 6% of officers having completed an undergraduate degree. Importantly, the authors go on to argue that "the legal opportunities for police officers to kill people probably occur far more often than either the rate of shooting or the number of citizens killed suggests, which would make the decision to shoot a highly discretionary one" (Sherman and Blumberg, 1981: 318). In an attempt to identify the factors affecting such a highly discretionary decision, some research has argued that it is how officers perceive and respond to their work environment which structures the use of deadly force. Matulia (1985), for example, argues that the use of deadly force is related to the levels of crime and violence in the community. Studying homicides by police officers in 57 cities over a 14-year period, the author finds that the use of lethal force is significantly correlated with the violent crime rate. Interestingly, Matulia (1985) also finds that the application of deadly force is significantly correlated to the number of police officers murdered in the line of duty. The latter finding is reminiscent of the earlier discussion regarding the police subculture, which often justifies police use of force as a defensive tactic in dangerous areas. In addition, Geller and Karales (1981) have referred to the use of force as a "split-second" decision, and further research has consistently supported the notion that officers rarely have the luxury of examining all of the aspects of a particular encounter before engaging in the use of force (Copeland 1986; Fyfe 1982b; Vila and Morrison 1994; Waegel 1984b). Thus, the use of deadly force can be seen to be affected by general (i.e. contextual) characteristics, rather than by the characteristics of specific encounters.

The final group of preliminary research studies of the use of force, as opposed to the multivariate analyses to be discussed in the following section, includes numerous instances of definitions of the continuum of force, studies which merely provide base rates of force, and some purely theoretical works. Many of these studies focus primarily on the definition of force behavior itself, as this is a discussion which is critical to any research on the topic. The IACP (2001), for example, defines force as: (1) physical force (the use of hands or feet); (2) chemical force (the use of OC spray or mace); (3) electronic force (the use of Tasers or stun guns; (4) impact force (the use of batons and flashlights); and (5) lethal force (the use of a firearm. Note that while relatively detailed, this study does not consider verbal commands by the officer to be a use of force behavior, nor does it attempt to cover the use of K-9 officers or patrol vehicles as instruments of force.[34] In the Police Contact Survey, Langan et al. (2001) defined force as any contact in which an officer pushed, grabbed, kicked or hit another individual. Importantly, this research differed from that of the IACP by including

[34] Most notably, the IACP explicitly states that it does not consider routine handcuffing during transport, field questions or investigation, as a use of force behavior. This will be further explored in Chapter 3.

bites from a K-9 unit, as well as the threat by an officer to use any type of force. Typically, however, the force continuum has been regarded as consisting of: (1) officer presence; (2) verbal commands; (3) control / restraints techniques; (4) chemical agents; (5) impact weapons; and (6) deadly force, in increasing order of potential for injury to the target.[35] Klinger (1995: 172), for example, notes "that as one moves from verbalization to deadly force the level of physical discomfort or injury that citizens may likely experience as the result of officers' actions increases." Carter (1984: 226) expands upon this notion, arguing that in addition to the continuum of force behavior, there are various types of inappropriate force behaviors, specifically: (1) physical abuse / excessive force; (2) verbal / psychological abuse; and (3) legal abuse. Alpert and Dunham (1995: 2) present a somewhat different model, arguing that "to calculate the force factor, one must measure both the suspects' level of resistance and the officers' level of force, both measured on the same scale."

When considering those studies which provide base rates of the use of force, one notes a significant amount of variation. Indeed, Geller and Scott (1992: 23) note that "perhaps the greatest pitfall in interpreting studies on [use of force behavior] is attempting to compare data [as] the reporting categories of different police agencies vary, and the methodologies and definitions of key terms and events differ or are unstated in many studies." In a study of complaints against officers, for example, Perez (1994: 129) notes that a civilian review board found that there was officer misconduct in 17% of all cases, and in 20% of all cases

[35] Note that the continuum has also been defined in terms of legality, as Adams (1997) proposes, ranging from: (1) deadly force; (2) police brutality; (3) excessive force; (4) excessive use of force; (5) illegal use of force; and (6) improper, abusive, illegitimate, unnecessary use of force.

involving allegations of excessive force.[36] These results are similar to those found by Holmes (2000). Yet, these studies focus only on complaints, and are thus not instructive in analyzing the totality of use of force behavior. In examining police contacts, Herz (2001: 58) found that "51% of police contacts that involved the threat of or use of force involved juveniles between the ages of 12 and 19 [yet] juveniles ranked fourth (19%) in overall contacts with police." It is important to note, however, that the use of force was not the primary focus of this study, and thus the definitions of force behavior were vague and widely defined. In studying arrests, Adams (1996: 61) notes that approximately 6% of all arrests involve the application of some amount of force by police officers. Garner et al. (1995), in contrast, found that officers used some amount of physical force in 22% of all arrests. Overall, previous studies have found base rates of force ranging from some type of force in under 5% of incidents or arrests (Friedrich 1980; Croft 1985; Worden 1995; Engel et al. 2000; Langan et al. 2001) to some type of force in over 20% of incidents or arrests (Smith 1986; Garner et al. 1995; Klinger 1995; Edwards 2000; Terrill and Mastrofski 2002). The lowest base rate of force noted was .8% (Langan et al. 2001), while the highest base rate of force was 58.4% (Terrill and Mastrofski 2002). Clearly, then, there are significant issues regarding measurement and methodologies among previous studies of the use of force. While this is one of the main weaknesses of studies on use of force behavior, it is one that extends to both quantitative and qualitative studies, both old and new research, and both studies of association and multivariate

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[36] It is interesting to note that these rates for the civilian review board were not much higher than those from the internal affairs review board (Perez, 1994: 129).

research efforts. Nonetheless, the multivariate research studies discussed in the next section provide a significant advantage in that their measures of force are used in conjunction with regression equations which take into account the effects of the sum total of all independent variables.

Multivariate Studies on Use of Force Behavior:

Despite the presence of numerous studies of use of force behavior covering the past two and a half decades, there are few studies that use multivariate statistical techniques. Of these, only two focused specifically on a neighborhood analysis, and thus these will be discussed separately. The remaining studies (Bayley and Garafalo 1989; Engel et al. 2000; Friedrich 1980; Garner et al. 1995; Garner et al. 2002; Kavanagh 1997; Phillips and Smith 2000; Terrill and Mastrofski 2002; Worden 1995) will be discussed here, in order to identify: (1) specific measures of use of force behavior; (2) theoretical orientations of the research; (3) samples used in the research; and (4) results concerning independent variables found to have an effect on use of force behavior.

The first multivariate study of police officer use of force was an analysis by Friedrich (1980) of data from Reiss' (1971) study conducted in high-crime areas in Chicago, Boston and Washington, D.C. Using 1,091 cases of the larger sample of 5,391 encounters, Friedrich focused only on a dichotomous "force – no force" distinction for the dependent variable. Finding a base rate of 5.1% for any type of force used by an officer, Friedrich used an ordinary least squares regression analysis. Testing variables from psychological, sociological and organizational perspectives, Friedrich (1980) found the following independent variables to exhibit a statistically significant, and positive, effect on use of force behavior: (1) poor suspect demeanor;[37] (2) "agitated" suspect; (3) suspect was not sober (i.e. under the influence of either drugs or alcohol); (4) the number of citizens present at the encounter; and (5) the number of officers present at the encounter.

Bayley and Garafalo (1989), observing only the 4pm-midnight shift over 350 hours in 3 different precincts in New York City, describe their dependent variable as Potentially Violent Mobilizations (PVMs). The latter is further defined as: (1) police-citizen encounters involving disputes; (2) intervention of the police to apply law against specific individuals; and (3) all police attempts to question suspicious persons. The authors also noted that they were specifically interested in examining any differences in behavior between officers identified by their peers as "skilled" and other officers. However, while the former used force in 9% of PVMs, the latter did so in only 6% of PVMs. More importantly, Bayley and Garafalo (1989) noted that all of the variables found to be statistically significant predictors of force behavior were significant for both skilled and control officers, thus indicating only minor differences between the two groups. Of the independent variables included in their ordinary least squares regression model, the following were those found to be statistically significant: (1) the suspect was

[37] Of the suspect sample, 186 individuals were considered "deferential", 1011 were considered "civil", and 295 suspects were considered "antagonistic".

verbally antagonistic; (2) the suspect had a weapon; and (3) there was conflict at the scene when the officer arrived.

Garner et al. (1995) examine officer use of force behavior, using 1,585 officer surveys completed by officers in the Phoenix Police Department after an arrest.[38] While the authors operationalize force in three different ways (physical force, a continuum of force, and maximum force), they note that some form of physical force occurred in 22% of all arrests studied (Garner et al. 1995: 157). After coding over 50 independent variables into six categories (the arrest situation, the arrest location, officer mobilization, officer characteristics, suspect characteristic, and an interaction of officer and suspect characteristics), the authors go on to estimate a regression equation for each of the three dependent variables. After estimating these regression equations, Garner et al. (1995) find 11 of the independent variables to be statistically significantly related to the use of force. Specifically, these are: (1) the use of a contact and cover tactic; (2) an increase in the number of police officers; (3) the arrest was officer-initiated; (4) the presence of a male officer; (5) the presence of a male suspect; (6) the presence of bystanders; (7) the suspect had committed a violent offense; (8) the suspect was impaired by alcohol; (9) the suspect was known to be resistive or carry a weapon; (10) the suspect was known to be involved with a gang; and (11) the suspect used force against the officer. It is important to note that all of these independent variables are consistent predictors (i.e. either across 2 or all 3 of the

[38] The authors note that they only sampled arrests, acknowledging that the use of force can obviously occur in numerous situations where an arrest is not made. The authors go on to state that official records indicate that 1,826 adults were taken into custody during the study period, indicating a response rate of 86% for the surveys.

models tested) of *either* police use of force, suspect use of force, or both. However, as the suspect's use of force is the strongest predictor of the use of force by an officer, these variables can all be considered to predict use of force by officers (albeit some of them in an indirect manner).

In an attempt to examine variables from the three theoretical perspectives (psychological, sociological and organizational), similar to that of Friedrich (1980), Worden (1995) used observational data from 5,688 police-citizen encounters collected during the Police Services Study in Rochester, New York, St. Louis, Missouri and Tampa / St. Petersburg, Florida (Ostrom et al. 1977). Restricting the sample to only those encounters between officers and individuals identified as suspects, Worden (1995) examines 1,528 such encounters with a three-category force variable – no force, reasonable force, and unreasonable force. Overall, the author finds a base rate of 3.9% for some force used during an encounter, with 2.4% being reasonable force and 1.5% being unreasonable force. Using a multinomial logistic regression analysis, with separate models for reasonable and unreasonable force, Worden (1995) finds the following variables to be statistically significant predictors of either one or both types of force: (1) the suspect had committed a violent crime; (2) the encounter involved a car chase; (3) the suspect was a minority; (4) the suspect was male; (5) an increased number of bystanders; (6) the suspect was intoxicated; (7) the police department was considered "bureaucratic"; and (8) the suspect was hostile toward the police officer. The latter was expressly noted by Worden (1995) as having the greatest effect on police use of force behavior within the sample.

Kavanagh (1997) examines instances of resisting arrest in 1,108 police-citizen arrest encounters at the Port Authority Bus Terminal in New York City between July 1990 and July 1991. Using data from arrest reports, call logs, police injury reports, officer personnel files, officer surveys and personal observations, the author developed a model with "any physical force"[39] as the dependent variable. Note, however, that the definition of any physical force includes force used by either the officer or the arrestee (1997: 19)[40]. The author notes that the occurrence of physical force during the encounter was measured by the presence of the crime of "resisting arrest"[41] among those with which the suspect was charged, in addition to an indication in the officer's report that the resistance was active, rather than passive. In terms of operationalization of the dependent variable, Kavanagh also notes that it was required that the arrest come at the hands of an on-duty, uniformed patrol officer in situations in which no supervisor was present. Overall, Kavanagh finds a base rate of 17.2% of arrests involving the use of force by either an officer or a suspect. In all, Kavanagh (1997) estimates 39 separate logistic regression models, substituting a variety of independent variables in and out of the main model. After such extensive analyses, the author concludes that none of the 38 models present any statistically significant differences over the main model, and thus it is most

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[39] Kavanagh (1997) notes that "any physical force" was chosen as the dependent variable because it is simpler to define and measure objectively than illegal or unnecessary force.

[40] While it is unlikely that an officer would refrain from using force after a suspect has used physical force, it is less clear whether a suspect would necessarily provide physical resistance after an officer has used force. In either case, Kavanagh (1997) fails to provide descriptive statistics concerning the correlation between both types of force.

[41] Kavanagh (1997: 19) states that the crime of resisting arrest is defined in the New York State Penal Code as "intentionally prevent[ing] or attempt[ing] to prevent a police officer from effecting an authorized arrest."

instructive to examine the latter more carefully. The main model contains 22 independent variables, of which 10 were found to exhibit a statistically significant effect on the dependent variable, with 3 of those only statistically significant at the .10 level. Specifically, the presence of physical force during an arrest encounter (by either the officer or the arrestee) was predicted by the following: (1) an officer's belief in the need to "save face" (.10 level); (2) the height of the arrestee (.10 level); (3) the arrestee is Hispanic (.10 level); (4) the seriousness of the crime[42]; (5) the presence of other violence during the encounter; (6) disrespect from the arrestee[43]; (7) the arrestee was intoxicated; (8) the arrest took place during the day[44]; (9) the arrest was officer-initiated; and (10) there were other arrestees present (Kavanagh 1997: 22).

More recently, Engel et al. (2000) conducted another multivariate analysis using data from the Police Services Study (as did Worden 1995) to examine the effects of encounter-specific variables in interactions with suspect demeanor. Here the authors make a point to note that the sample is not random, with the three cities (Rochester, New York; St. Louis, Missouri; and Tampa / St. Petersburg, Florida) chosen to represent a cross-section of various organizational styles and service conditions in urban neighborhoods. Focusing on 60 different neighborhoods spread across these departments, with 15 shifts sampled in each neighborhood, the study originally compiled data on 5,688 police-citizen encounters. As did Worden (1995), Engel et al. (2000) narrow the

[42] Operationalized as felony vs. misdemeanor.
[43] Disrespect was considered as the suspect either verbally abusing the officer, refusing to stop and talk to the officer, or refusing to be handcuffed.
[44] In an unexpected turn, the presence of a night-time arrest actually decreased the incidence of the use of force.

sample, focusing only on those encounters between officers and individuals identified as suspects which were not traffic stops, resulting in a final sample of 1,461 cases. Using a dichotomous dependent variable of "force – no force", the authors find a base rate of 3.4% of encounters involving the use of some amount of force.[45] While Engel et al. (2000) go on to estimate nine different logistic regression equations to test the demeanor interactions, none of the latter prove significant, and thus the analysis is best understood by examining the direct model.[46] Defining the dependent variable as instances in which an officer: (1) hit or swung at the suspect with a weapon that was not a firearm; (2) used force to make the suspect comply; or (3) used physical force that involved more than handcuffing, Engel et al. (2000: 243) estimate a direct effects logistic regression model.[47] From this direct effects model, the authors find only 5 variables to be statistically significant predictors of the use of force: (1) alcohol or drug use by the suspect; (2) poor demeanor exhibited by the suspect[48]; (3) an increasing number of bystanders; (4) the suspect fighting with the officers; and (5) the seriousness of the offense.[49] Importantly, while noting that verbally disrespectful or resistant suspects are almost 6 times more likely to have force used against

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[45] Note that despite the difference in sub-samples, these results correspond closely to those of Worden (1995), who also used the PSS data. Interestingly, in a later work, Engel (2000: 276) finds that of the entire sample of 5,179 citizens, 22% were arrested, and 9% had some force used against them.

[46] Note also that the variables found to be significant in the direct model remain significant in every other model tested; thus, considering the non-significance of the interaction terms, nothing is gained and model parsimony is lost in estimating anything other than the direct model. Engel et al. (2000), however, argue that collinearity may exist within the sex/demeanor interaction term, thereby obscuring its effects.

[47] While the authors themselves note that the assumption of independence has been violated by using encounter-level variables in an analysis based at the individual (suspect) level, they argue that the larger sample size diminishes any potential biases (Engel et al. 2000: 245).

[48] The authors define a hostile demeanor as any noncompliance or verbal (to the exclusion of physical) resistance on the part of the suspect.

[49] Offense seriousness was broken down by the authors into a five-category variable, with 0="no crime", 1="minor property crime", 2="minor violent or major property crime", 3="moderate violent crime", and 4="major violent crime" (Engel et al. 2000: 246).

them than are suspects who are civil, the authors failed to include contextual (i.e. neighborhood characteristic) variables which may have an effect both on suspect demeanor, as well as how that demeanor is perceived by the officer given the characteristics of the neighborhood in which the encounter occurred.

Phillips and Smith (2000), in a multivariate analysis based on structuration theory of time and space dynamics, looked at 217 complaint forms filed by citizens against on-duty police officers between July 1990 and June 1994 in Queensland, Australia.[50] It is important to note, however, that these were only allegations, with the citizen asserting that force was used improperly by the officer in question. However, the authors noted that they only included those allegations which were judged to exhibit strong evidence. The criteria for such evidence was as follows: (1) the alleged assault was referred to Queensland Police Service Misconduct Tribunal or the Director of Prosecution; (2) formal action was taken against the officer(s); (3) the officer(s) admitted to the alleged assault; (4) officer(s) who witnessed the alleged assault supported the account provided by the victim; (5) citizen(s) who witnessed the assault supported the account provided by the victim; or (6) there was physical evidence of an assault (Phillips and Smith 2000: 482). Phillips and Smith focused their efforts on the effects of time and space on the use of force, dividing the former into a dichotomous "day – night" variable, while separating the latter into a three-category "public, private or police" locale. The dependent variable was also dichotomous, with the presence of any of the following types of force: (1) push /

[50] Note that the original data set included 973 complaints where assault was the major allegation. Of these, a random sample of 350 cases was selected, which was subsequently reduced to 217 cases through the exclusion of cases where the evidence for the allegations was considered to be weak.

poke; (2) grab / grapple, coded as "0", and any of the following: (3) punch; (4) kick; or (5) baton hit, coded as "1" (Phillips and Smith 2000: 487).[51] The authors go on to estimate two separate logistic regression models, the first with time and space included only as separate main effects, and the second with time-space interactions. Other than this distinction, the two models are identical with respect to the variables included in the analysis. In both models, 17 other variables are presented as predictors, with 9 of these achieving significance. Specifically, the authors find that the following variables are positively related to the use of force and statistically significant: (1) the presence of 4 or more additional officers; (2) an increasing number of bystanders (broken down into 1 bystander, 2-3 bystanders, or 4 or more bystanders); (3) the officer was a plainclothes officer; (4) all of the involved citizens were male (although this was significant only at the .10 level); (5) all of the involved citizens were under the age of 25; (6) the citizen had a mental or physical disorder; (7) the citizen fought with the police officers (Phillips and Smith 2000: 488).[52] With respect to their primary hypotheses, the authors found that there were no significant main effects for the time and space variables in the first model. They did, however, find support for their notion that "citizens define night-time public space as a zone of fun, while police define it as a zone of danger" (Phillips and Smith 2000: 490). Specifically, the authors note that the night-public interaction is a statistically significant predictor of the use of

[51] Note here that the authors explicitly excluded the use (either unholstering or firing) of firearms, as well as that of OC spray. The authors argue that this particular dichotomy, coupled with the operationalization described above allowed them to both claim that force *was* used, and that its use was at least *perceived* as unwarranted.

[52] The authors note that they excluded officer age, length of service, and officer duties from the analysis due to an unacceptably high number of cases with missing data for these variables.

force. However, it is important to note that in this instance the authors have relaxed the standard of significance, as the interaction is only significant at the .10 level. Notably, even obtaining such a result (albeit with a less stringent requirement of significance), Phillips and Smith (2000) fail to extend the "space" argument to the logical conclusion of a neighborhood contextual effect on use of force behavior.

Terrill and Mastrofski (2002) used data from an observational study conducted during the summer of 1996 in Indianapolis, Indiana and the summer of 1997 in St. Petersburg, Florida. The Project on Policing Neighborhoods (POPN) studied over 200 officers for over 5,700 hours through approximately 1,000 patrol shifts in 24 police beats encompassing 80 different neighborhoods. In an analysis of 3,116 police-suspect encounters, Terrill and Mastrofski (2002) used a four-category measure of force (no force, verbal force, restraint techniques, and impact techniques) and find that some force was used in 58.4% of all encounters studied, with verbal force accounting for 37.4%, restraint techniques accounting for 18.9% and impact techniques accounting for 2.1%.[53] The authors went on to use an ordered probit analysis with almost 30 independent and control variables. Of the latter, Terrill and Mastrofski (2002) found the following variables to be statistically significant predictors of increased use of force behavior: (1) the suspect was a minority; (2) the suspect was young; (3) the suspect was of low social class; (4) the suspect was intoxicated; (5) the suspect resisted the officers;

[53] It is important to note here that Terrill and Mastrofski (2002) include "pat-downs" and handcuffing as use of force behaviors falling within the restraint technique category of force. This may be a significant reason for the resulting extremely high base rate of force, which doubles the next highest base rate found in previous research. Reasoning for why the current research chose to exclude these behaviors will be discussed in Chapter 3.

(6) the officer had fewer years of education; (7) the officer had fewer years of experience; and (8) the officer worked in Indianapolis. The last finding is important, in that it demonstrates a contextual effect (albeit based on city, rather than neighborhood), but Terrill and Mastrofski (2002) do not use multilevel modeling to disentangle the effects of neighborhood level variables.[54]

The final multivariate study to be discussed here is that of Garner et al. (2002), who used a similar methodological approach to Garner et al. (1995) to examine use of force behavior. Garner et al. (2002) collected data from every precinct across every shift in the following six cities: (1) Charlotte, North Carolina; (2) Colorado Springs, Colorado; (3) Dallas, Texas; (4) St. Petersburg, Florida; (5) San Diego, California (Police Department); and (6) San Diego County, California (Sheriff's Department). Between the summer of 1996 and early spring 1997, Garner et al. (2002: 721) collected data on 7,512 adult custody arrests. The authors constructed two measures for the use of force, with the first being a measure of prevalence (i.e. a "force – no force" dichotomy), and the second being a measure of severity. The former measure included the use of weapons, weaponless tactics, and restraint techniques, while excluding threats of force, gentle holds, weapon displays, and handcuffing. The latter measure was constructed through a series of surveys given to officers in which those officers ranked numerous police behaviors on a scale of 1 to 100 based on their own experiences. Garner et al. (2002: 724) reported that across all six jurisdictions, 17.1% (1,283 arrests) of arrest encounters included the use of force as defined

[54] In a later work, Terrill and Mastrofski (2003) estimate separate ordered probit models for Indianapolis and St. Petersburg to examine coercion, and find thirteen independent variables to be statistically significant in both models, with only four variables differing between the two models.

by the prevalence measure.[55] With regards to the severity measure, the authors noted that "across all 7,512 arrests, the average rank of the maximum-force measure is 30.4" (Garner et al. 2002: 726). Noting that they were focusing on situational characteristics, Garner et al. (2002) grouped independent variables into five domains: (1) the type of location; (2) the nature of the offense; (3) police mobilization; (4) the characteristics of the officer; and (5) the characteristics of the suspect. The authors tested the effects of these variables using three regression models – a logistic regression analysis of the prevalence measure without consideration of suspect resistance was Model 1, a logistic regression analysis of the prevalence measure with suspect resistance included was Model 2, and a generalized linear regression analysis of the severity measure with suspect resistance included was Model 3. Overall, Garner et al. (2002) found that 15 of the independent variables were predictors of increases in both the prevalence and severity of force. These variables were as follows: (1) the officer was in the St. Petersburg Police Department; (2) the arrest occurred on a weekend; (3) the suspect was not already in custody upon arrival of the officer; (4) the officer was dispatched to a priority call; (5) the officer approached using lights and sirens; (6) an increasing number of officers; (7) the officer called for backup; (8) the officer was younger; (9) the officer was male; (10) the officer had received prior injuries on-duty; (11) the suspect was male; (12) there were bystanders of an unknown relationship to the suspect present; (13) the suspect had a reputation for carrying weapons; (14) the suspect was antagonistic; and

[55] While this is the overall proportion, within sites the proportion varied from 12.7% in Colorado Springs to 22.9% in St. Petersburg.

(15) the suspect used physical resistance against the officer. The latter two findings are the most instructive, as Garner et al. (2002: 738) note that "when suspects who display an antagonistic demeanor toward the police (but no physical force) are compared with suspects who display a civil demeanor, the odds of the police using physical force increase by 163% [and] when suspects who use physical force against the police are compared with suspects who display a civil demeanor, the odds of the police using physical force increase by 1800%." Most importantly, given the emphasis of the current research, Garner et al. (2002: 721-722) noted that although differences between the six sites were tested and found to be significant, there was no attempt to explain the cause of this variation through the inclusion of neighborhood differences.[56]

As we have seen, prior research has used varying methodologies (i.e. sampling), statistical techniques, and measures of force to study the effects of numerous types of independent and control variables (see Table 1). Of the multivariate studies presented here, however, there remain some consistent effects of independent variables despite these differences. In general, those variables found to have the most consistent effects on use of force behavior are: (1) suspect race; (2) suspect gender; (3) suspect demeanor or hostility; (4) suspect sobriety; (5) number of bystanders; (6) number of officers; (7) seriousness of the offense; and (8) suspect physical resistance. Yet, even given the consistency of these effects, researchers have found an astoundingly wide range of base rates for use of force behavior (see Appendix A, Table A-1). Of

[56] Garner et al. (2002) correctly note that multilevel modeling could not be used to discern differences between cities due to the small sample size of only 6 cities.

these independent and control variables presented in Table A-1 (Appendix A), a suspect's demeanor and physical resistance are relatively well-documented as having an effect. In fact, all eight of the multivariate studies discussed in this section find that either poor suspect demeanor (i.e. antagonism or verbal resistance on the part of the suspect) or physical resistance by the suspect significantly increase the prevalence of use of force behavior by police officers.

Table 1: Measures of Force, Methodologies and Sample Sizes

Study	Measure of Force	Statistical Method	Sample Size
Friedrich (1980)	No force – force (dichotomy)	OLS	1,091 encounters
Bayley and Garafalo (1989)	No force – force (dichotomy)	OLS	467 potentially violent mobilizations
Garner et al. (1995)	(1) No force – force (dichotomy) (2) Continuum of force (3) Maximum force ranking	LR / OLS	1,585 officer surveys
Worden (1995)	No force / Reasonable force / improper force	MNL	1,528 police-citizen encounters
Kavanagh (1997)	No force – force (dichotomy)	LG	1,108 arrests
Engel et al. (2000)	No force – force (dichotomy)	MNL	1,461 non-traffic police-citizen encounters
Phillips and Smith (2000)	No force – force (dichotomy)	LR	217 complaints
Terrill and Mastrofski (2002)	No force / verbal force / restraint techniques / impact techniques	OP	3,116 police-citizen encounters
Garner et al. (2002)	(1) No force – force (dichotomy) (2) Maximum force ranking	LR / GLM	7,512 arrests

Note: OLS = Ordinary Least Squares, LR = Logistic Regression, MNL = Multinomial Logistic Regression, LG = Logit, OP = Ordered Probit, GLM = Generalized Linear Model

In addition, a majority of the studies find that an increasing number of bystanders (Engel et al. 2000; Friedrich 1980; Garner et al. 1995; Garner et al. 2002; Phillips and Smith 2000; Worden 1995) or a suspect in an altered state (i.e. drunk or on drugs) (Engel et al. 2000; Friedrich 1980; Garner et al. 1995; Kavanagh 1997; Terrill and Mastrofski 2002; and Worden 1995) also significantly increase the prevalence of the use of some method of force by police officers. The effects of the remaining variables outlined in Table A-1 (Appendix A) are less clear, with only four studies reporting a statistically significant effect for: (1) a violent or felony offense (Engel et al. 2000; Garner et al. 1995; Kavanagh 1997; and Worden 1995); (2) an increasing number of police officers at the scene (Friedrich 1980; Garner et al. 1995; Garner et al. 2002; and Phillips and Smith 2000); and (3) a male suspect (Garner et al. 1995; Garner et al. 2002; Phillips and Smith 2000; and Worden 1995). The evidence for a race effect is even less clear, with only three studies reporting a statistically significant increase in force behavior when encountering a minority suspect (Kavanagh 1997 [only for Hispanics]; Terrill and Mastrofski 2002; and Worden 1995). It is important to note here, however, that these effects were obtained by estimating individual-level models with encounter-level variables included. In the next section we will discuss two research efforts which have made specific attempts to study the effects of neighborhood variables in a neighborhood-level model.

Use of Force Research and Neighborhood Context:

As discussed previously, while prior research has focused on numerous forms of use of force behavior using a variety of independent variables, the overwhelming majority of these studies have focused on individual characteristics, or inappropriately placed encounter-level characteristics in an individual-level model. The following two studies are the only research efforts identified in this literature review as having used neighborhood-level models to examine use of force behavior by police officers. Clearly, then, these studies are the closest in design and analysis to the current research proposed here.

The first of these studies was conducted by Smith (1986) using the Police Services Study data (Ostrom et al. 1977), which collected data on over 450 officers during 900 patrol shifts in 60 different neighborhoods in the cities of Rochester, New York, St. Louis, Missouri, and Tampa / St. Petersburg, Florida during the summer of 1977. Of the 5,688 police-citizen encounters originally observed, Smith (1986) limited his study to 762 encounters with "non-dangerous" (i.e. unarmed) suspects. Focusing on neighborhood context as the primary orientation to the study, the author defined "coercive authority" as any situation in which "police use[d] force or threaten[ed] a suspect with arrest, surveillance, or physical harm" (Smith 1986: 318), and found a base rate of 30% for the use of coercion in all encounters with non-dangerous suspects. Smith (1986: 314) went on to define "neighborhoods" as "small residential areas within cities that are defined on the basis of police beats, census block groups, or enumeration districts." However, while Smith (1986) initially estimated separate neighborhood-level and encounter-level models, the main model tested included neighborhood-level variables in an individual-level model. Using a maximum-likelihood probit analysis, Smith (1986) found the following variables to be predictive of an increased use of force: (1) the neighborhood had a higher proportion of minority residents; (2) the suspect was antagonistic; (3) the suspect was male; and (4) the encounter took place in a private setting. Most importantly, in terms of its relation to the current research, Smith's (1986) work found that in the neighborhood-level analysis, suspects encountered by the police in lower-class neighborhoods were three times more likely to be arrested (although not to have force used against them) than those encountered in high-status neighborhoods, controlling for seriousness of the crime, race of the suspect, and the suspect's demeanor. Although this result did not translate to use of force behavior, Smith (1986) correctly noted that social context potentially had been masking the effects of certain variables in previous research, while amplifying the effects of others. Thus, where previous research has found an effect for suspect race, it is possible that this relationship was spurious, with social context providing the real effect. Similarly, where research has found a null effect for demeanor, it is possible that context, rather than demeanor, drove these results. For example, an officer might be more willing to ignore the negative demeanor of a suspect encountered in a lower-class neighborhood in order to allow the suspect to "save face" in front of other citizens, thereby hopefully ensuring cooperation from that suspect in the future. Alternatively, an officer might ignore a display of negative demeanor from a suspect encountered in an upper-class neighborhood due to the desire to avoid a lawsuit alleging harassment on the part of the officer. Yet, while the results of the neighborhood-level model are interesting, and Smith (1986) argues an intelligent point regarding the possibility of context either falsely obscuring or amplifying relationships between other variables and the use of force, the lack of a multi-level model (i.e. one using multi-level modeling techniques such as hierarchical linear modeling) again causes one to question the validity of these results.

The second, and only other, study to examine the influence of neighborhood context on use of force behavior was that of Terrill and Reisig (2003), who used data from the Project on Policing Neighborhoods (POPN) conducted during the summer of 1996 in Indianapolis, Indiana and the summer of 1997 in St. Petersburg, Florida. Noting that the overall data sample was reduced to 3,330 police-suspect encounters in 80 neighborhoods[57], Terrill and Reisig (2003: 300) defined force as any of the following: (1) verbal (issuing commands or threats; (2) physical restraint (pat downs, firm grip, handcuffing[58]; and (3) impact methods (pain compliance techniques, takedown maneuvers, strikes with the body, and strikes with external mechanisms. Thus, force was measured as a four-category construct, with 1=no force, 2=verbal force, 3=physical restraints,

[57] The authors note that of over 11,000 encounter / activities observed, only 3,544 involved a suspect. Of the latter, 136 were eliminated because they could not be geocoded (and thus could not be assigned to a neighborhood), and 78 were eliminated because they occurred in neighborhoods with too few cases overall, leading to the exclusion of those neighborhoods (Terrill and Reisig 2003).

[58] The authors note that their definition of force is based on the National Academy of Science's definition of violence as "acts that threaten or inflict physical harm" on suspects (Terrill and Reisig 2003: 299). Accordingly, they argue that the appropriate measures of force are not the same for studies of excessive force as they are for studies of the prevalence of any type of force, and thus they include handcuffing as falling under the NAS definition. Yet, clearly the mere act of handcuffing does not necessarily either threaten or inflict physical harm, and thus it remains unclear why the authors chose to include it in their measure. This will be further explored in Chapter 3.

and 4=impact methods, and the authors found a base rate of 58% for use of force behavior (37% verbal, 19% restraint techniques, and 2% impact techniques) (Terrill and Reisig 2003: 300). Noting that "the research reported here examines the degree to which forceful authority toward suspects is influenced by the type of neighborhood in which police-suspect encounters occur", Terrill and Reisig (2003: 292) included two neighborhood-level variables – concentrated disadvantage, a construct used in previous research (Sampson et al. 1997), and the homicide rate.[59] Terrill and Reisig (2003) also included a wide variety of encounter-level variables, such as suspect characteristics, officer characteristics, suspect behavior (i.e. demeanor, physical aggression, sobriety), and control variables used in the majority of previous use of force research. The authors also noted that five of the predictor variables included in the model (suspect disrespect, suspect resistance, the occurrence of an arrest, the presence of a weapon, and conflict between citizens) were time-dependent, and thus were coded according to when they occurred during the encounter in order to ensure causal order. Terrill and Reisig (2003) then presented three separate regression equations to examine neighborhood effects on force in a variety of ways. In the first model, a weighted least squares regression analysis found that increased levels of force were used against suspects encountered in neighborhoods that were high in concentrated disadvantage, as well as those encountered in neighborhoods that had high homicide rates. Noting that this model did not include encounter-level variables, the latter are added in Model 2,

[59] The authors note that they use the homicide rate as a measure of crime due to the fact that "it is considered by criminologists to be the most reliable measure of crime that is least sensitive to underreporting" (Terrill and Reisig 2003: 301).

which was tested using ordinary least squares regression analysis. These analyses found that increased levels of force were used against suspects who were: (1) male; (2) minorities; (3) younger; and (4) lower-class. Noting that the results of the first two models "support[ed] [the] contention that a true test concerning the effects of neighborhood context on level of force should include...encounter-level variables, such as suspect sociodemographic characteristics, to control for within-neighborhood variance", Terrill and Reisig (2003: 303) then estimated a fixed-effects hierarchical linear regression model. Overall, the authors noted that the effects observed in Model 1 remain in Model 3, finding that increased levels of force are used against suspects encountered in neighborhoods high in concentrated disadvantage, as well as those encountered in neighborhoods with high homicide rates, independent of suspect and officer characteristics, or of suspect behavior.[60] Importantly, Terrill and Reisig (2003: 306) found that using the more appropriate multilevel modeling approach to estimate the separate effects of neighborhood and encounter-level variables reduced the effect of race on the use of force. That is, the authors noted that the significant effect of race found in Model 2 had, in reality, been confounded by the effects of neighborhood context, as the effects of race were reduced below levels of significance in Model 3. Terrill and Reisig (2003: 306) also noted that when neighborhood effects were estimated in the multilevel model, the effects of sex, age and class persisted, with males, younger individuals and lower-class individuals more likely to have force used against them. It is clear, then, that the

[60] In later research, Reisig et al. (2004), using the same POPN data, note that: (1) elevated levels of police force can induce suspect disrespect, which in turn can lead to increased levels of force; and (2) suspects in disadvantaged neighborhoods are more likely to show suspect disrespect.

results of the work conducted by Terrill and Reisig (2003) provide a firm foundation for the current work. The latter authors appropriately included both encounter-level and neighborhood-level variables in a hierarchical linear regression model in order to estimate the true effects of these variables given the effects of neighborhood context on use of force behavior by police officers.

Limitations of Prior Studies

While the studies discussed in this chapter have provided the field of criminal justice with a vast array of useful findings, they remain incomplete, both theoretically and methodologically. In order to illustrate the value of the current proposal, then, it is important to review these limitations. This allows us to identify shortcomings of prior research (although still addressing their value) while emphasizing the unique contributions of the current work.

As has been mentioned within the current work, previous research efforts have tended to focus either on only one theoretical orientation (i.e. psychological, sociological, organizational) in examining use of force behavior, ignoring neighborhood context, or on neighborhood context, ignoring its potential effects on use of force behavior. From a theoretical standpoint, then, only the efforts of Smith (1986), and Terrill and Reisig (2003) have combined an emphasis on neighborhood context with research on use of force behavior. Although many scholars have made contributions in these areas, it is the latter two works which stand out as the closest in theory to the current work. Yet, even these works are lacking in certain aspects of theoretical development. Smith (1986: 314), for example, defined neighborhoods as areas similar to police beats or to census block groups. This presents a confusing picture of the nature of neighborhood context, as police beats are substantially dissimilar from census block groups, and thus both types of areas cannot be considered "neighborhoods" (see the previous discussion in this chapter for an explanation of how prior research has operationalized neighborhoods). Terrill and Reisig (2003), on the other hand, introduce a source of error in their theoretical understanding of use of force behavior. The authors choose to include 'pat-downs' and handcuffing as instances of the use of force within their study. This is puzzling, considering that the International Association of Chiefs of Police, as well as the National Institute of Justice, specifically exclude handcuffing from use of force studies (IACP 2001; Greenfeld et al. 1997; Langan et al. 2001).

Perhaps more important than vague or puzzling theoretical orientation is the presence of methodological shortcomings in the prior literature. As has also been discussed previously, the majority of previous research efforts have used multivariate (occasionally only bivariate) models to examine neighborhood-level effects. This results in numerous difficulties ranging from biased coefficients to incorrect conclusions based on mis-specific models. Smith (1986), for example, while detailing an explicit model of the effects of neighborhood context, fails to use hierarchical linear modeling techniques. Terrill and Reisig (2003), in the sole use of force study which does use HLM, fail in two aspects: (1) the authors estimate a fixed-effects model, which does not allow individual-level characteristics to vary across the second level of the model; and (2) they fail to account for spatial autocorrelation. Prior research has also succumbed to a confusing multitude of issues concerning the validity of measures. As noted, Terrill and Reisig (2003) present two concerns regarding validity, in their definition of force (with its inclusion of handcuffing), as well as in their choice of police beats as a proxy for neighborhoods. In addition, Terrill and Reisig (2003) use demographic data from the 1990 Census, a choice which is unusual in that the data in the POPN study was collected during 1996 and 1997 (thus making the 2000 Census more appropriate). Smith (1986), in addition to the confusion regarding the operationalization of neighborhood, suffers from an extrapolation of a random sample of neighborhood residents (interviewed by phone) to form aggregate demographic statistics for each neighborhood studied.

The last methodological critique to be made of previous studies centers around the selection criteria, both for the area of the study, as well as for the individuals observed. Smith (1986) noted that the sample was limited only to those suspects who were unarmed. While perhaps easier relative to sampling the entire arrestee population, this nevertheless limits the study, particularly when one considers that the presence of a weapon can have a significant impact on officer behavior (Bayley and Garafalo 1989; Garner et al. 1995; Garner et al. 2002). The work of Terrill and Reisig (2003) suffers from two sampling issues which further call into question the validity of their results. The first issue stems from the sampling criteria for suspects, as the latter were defined as individuals who: (1) were identified as suspects by the police; (2) were interrogated by the police; (3) were searched by the police; (4) were threatened or warned by the police; (5) were arrested or cited by the police; (6) admitted they were wrongdoers; or (7) had force used against them to prevent or stop criminal activity (Terrill and Reisig 2003: 298). As the authors themselves correctly note, the latter definition is, in effect, sampling on the dependent variable, which introduces a source of bias. In addition, the Project on Policing Neighborhoods (POPN) Study, the data from which are used by Terrill and Reisig (2003) purposefully over-sampled disadvantaged neighborhoods in order to ensure that an adequate amount of data on police-citizen encounters was collected. While this sampling method did indeed provide Terrill and Reisig (2003) with a significant amount of data, the fact that none of the most affluent neighborhoods in both cities were included in the sampling design limits the validity and generalizability of their results.

Variables of Interest from Prior Studies

While a more detailed presentation of the variables to be included in the current research will be presented in Chapter 3, it is useful to clearly delineate the reasons for the inclusion of these variables. In particular, specific prior research efforts (which have been discussed throughout Chapter 2) will be summarized with attention to the theoretical orientation of their independent variables. This allows the current work to present a theoretically-driven model of dependent and independent variables within a multilevel modeling framework.

In terms of the dependent variable, the current research will focus on two separate measures, one of prevalence and one of severity, in order to capture the full range of use of force behaviors. This approach is more consistent with recent research on use of force, which has acknowledged the need for multiple dependent variables (Garner et al. 1995; Garner et al. 2002). With respect to the independent variables, those used here fall within one of three categories: (1) those based on social disorganization theory; (2) those based on Black's (1976) theory of social control; and (3) those introduced as control variables.

The first group of independent variables to be examined is that which falls under the domain of social disorganization theory. The primary variable of interest here is concentrated disadvantage, which a variety of researchers have used as a measure of social disorganization (Kane 2002; Morenoff et al. 2001; Reisig and Parks 2000; Sampson and Bartusch 1998; Sampson et al. 2002). Social disorganization theory, however, also discusses the ability of neighborhood residents to organize themselves. In this regard, variables concerning citizen organization are also introduced. For example, Greenleaf and Lanza-Kaduce (1995) propose that the latter concept can be measured by: (1) the relationship between the victim and the suspect; (2) the number of suspects; and (3) the presence of bystanders. While including all three of these variables, other researchers have identified other measures of organization, namely: (1) the number of bystanders (Engel et al. 2000; Garner et al. 1995; Worden 1995); (2) the demeanor of bystanders (Garner et al. 1995); (3) the number of officers (Friedrich 1980; Garner et al. 2002; Phillips and Smith 2000)[61]; and (4) the relationship between the suspect and bystanders (Garner et al. 2002).

[61] In later research, McCluskey et al. (2005) noted that peer groups' (i.e. other officers') attitudes toward aggressiveness influenced use of force. Specifically, the authors noted that encounters involving 'low-

Black's (1976) theory of social control also provides a theoretical foundation, both for prior research as well as the current work. Of primary importance to the current study is the concept of social distance, with Black (1976; 1980) arguing that officers are more likely to be penal (i.e. coercive) towards suspects who are located at the bottom of the scale in terms of social distance. Thus, the current work examines the effects of suspect characteristics on police behavior, as Black (1976) hypothesizes that males, younger individuals, and minority individuals are located at the bottom of the social structure. Numerous researchers have examined these issues, alternatively focusing on one or more of the following: (1) gender (Phillips and Smith 2000; Smith 1986); (2) age (Garner et al. 2002; Terrill and Reisig 2003); and (3) race (Garner et al. 2002; Terrill and Mastrofski 2002; Worden 1995). However, social control also hypothesizes that officers will be more penal towards those individuals who are farther away in relational distance from the officers themselves, and thus research has also focused on officer characteristics, notably: (1) gender (Garner et 1995); (2) age (Garner et al. 2002); and (3) race (Kavanagh 1997). In addition to individual characteristics, there are a number of other variables which can locate either suspects or officers within the social space. Greenleaf and Lanza-Kaduce (1995), for example, argue that the sophistication of a suspect can be measured by: (1) the presence of conflict when the officer arrives; and (2) the suspect's level of intoxication. The latter has been found to be a significant predictor of use of force behavior in several studies

aggressive patrol peer group officers" were less likely to result in force when confronted with a disrespectful suspect than encounters involving "high-aggressive patrol peer group officers".

(Engel et al. 2002; Friedrich 1980; Kavanagh 1997; Terrill and Mastrofski 2002). Greenleaf and Lanza-Kaduce (1995) also note that a suspect's sophistication stems from issues of visibility and approach, as well as the seriousness of the offense. With respect to visibility, Smith (1986) and Garner et al. (2002) have tested the effects of actual visibility (i.e. the ability to perceive given the surrounding lighting during an encounter), as well as of a public-private space dichotomy (i.e. did the encounter occur within a suspect's home). The concept of approach is designed to explain how an officer's introduction to the situation may affect how the officer locates the suspect in the social space. Garner et al. (1995), as well as Garner et al. (2002) focus on the distinction between proactive and reactive encounters, as well as emphasizing how the officer actually proceeded to an encounter (e.g. with lights and sirens on). Offense seriousness, although somewhat discounted by Black (1976), has also emerged as a significant predictor of use of force behavior (Engel et al. 2002; Garner et al. 1995; Worden 1995). A final process by which suspects are located within the social space is through their behavior, and thus numerous research efforts have focused on suspect presentation. The effects of poor suspect demeanor and physical resistance on the part of the suspect, for example, are well-documented (Bayley and Garafalo 1989; Engel et al. 2002; Friedrich 1980; Garner et al. 1995; Garner et al. 2002; Kavanagh 1997; Phillips and Smith 2000; Smith 1986; Terrill and Mastrofski 2002; Terrill and Reisig 2003; Worden 1995). However, suspect presentation may also include the following: (1) whether the suspect is known to carry a weapon; (2) whether the suspect is known to be assaultive; and (3) whether the suspect is a known gang member (Garner et al. 1995; Garner et al. 2002).

The final group of variables to be examined is that of the control variables, often introduced by researchers into regression equations as 'common sense' variables. With respect to issues surrounding use of force behavior by police officers, many of these control variables have focused on the potential dangerousness of specific areas or specific situations. For example, Garner et al. (1995), as well as Garner et al. (2002), examine the effects of: (1) known hazardous locations; (2) known criminal locations; (3) whether the offense occurred on a weekend; and (4) whether the suspect was already in custody when the officer arrived on the scene. All four of these variables represent some measure of opportunity for conflict, either by the potential consequences of entering a previously violent location or by the sheer numbers of individuals encountered by the officer. The crime rate has been examined in even greater detail, although its effects have been split among researchers studying the homicide rate (Sampson and Raudenbush 1999; Terrill and Reisig 2003) and those studying the violent crime rate (Sampson et al. 1997). The role of jurisdiction has also been examined to determine any city-specific effects on use of force behavior (Garner et al. 2002; Terrill and Mastrofski 2002; Terrill and Reisig 2003). Garner et al. (2002) also focused on variables related to specific officers and their potential for conflict by examining: (1) prior medical attention to the officer; (2) the number of arrests made by the officer; (3) the officer's duty status (i.e. on-duty or off-duty at the time of the encounter); and (4) the officer's use of back-up. The remaining control variable to be used in the current work is that of officer demeanor, which is meant to capture an officer's general attitude toward the suspect. Previous research has found that an officer's demeanor toward suspects, particularly in the form of 'face-saving' behavior on the part of the officer, can have a significant effect on other aspects of officer behavior (Fyfe 1997; Herbert 1996; Skolnick and Fyfe 1993), including the use of force (Kavanagh 1997).

Summary

With only a few exceptions, the literature examined here has used only one of the available perspectives to analyze the causes of police behavior. Even more importantly, much of the latter research has either ignored or mis-specified the inclusion of contextual variables, particularly within use of force studies. This rigid adherence to a particular theoretical orientation, or the lack of such an orientation at all, has resulted in a confusing picture of the factors affecting use of force behavior by police officers. By their lack of estimating neighborhood effects, prior research has effectively closed a viable pathway of knowledge in this important criminal justice arena. The limitations of the work examined in this literature review are significant enough that they must be dealt with in an intelligent, empirically sound manner. The current research seeks to do so by presenting an integrative theoretical model, using Black's ideas regarding social distance, as well as social disorganization variables, within a hierarchical linear model in order to estimate the true effects of neighborhood context on use of force behavior.

Chapter 3: Data and Methods

The current research proposes the theories of social control (as defined by Black 1976) and social disorganization as the appropriate frameworks for analyzing police use of force behavior. Within these theoretical frameworks, an emphasis is placed here on the effects of neighborhood context on that behavior, in the hopes of establishing a more comprehensive model of use of force activity by police officers. As indicated at the beginning of the current work, this research will *not* look to differentiate between reasonable and unreasonable (or excessive) force in terms of the legality of those distinct behaviors. Moreover, as has been noted throughout, this dissertation focuses only on use of force behavior, to the exclusion of other police activities such as traffic stops, arrests, or field interrogations. Rather, the purpose of this study is to test for the various factors which affect police use of force behavior within an arrest encounter. After determining the validity of using hierarchical linear modeling techniques, the following research questions will be addressed: (1) Do encounter-level factors affect use of force behavior?; (2) Do neighborhood-level factors affect use of force behavior?; and (3) do the effects of encounter-level factors vary across neighborhoods?[62]

This research represents an important extension of the previous literature by analyzing the relationship between encounter-level and neighborhood-level variables in determining use of force behavior. As noted previously, only two studies (Smith 1986; Terrill and Reisig 2003) were found which specifically examined neighborhood-level models and use of force behavior, with only one of

[62] Specific factors and directions of expected effects will be discussed later within this Chapter.

those (Terrill and Reisig 2003) estimating an HLM equation. Yet, as previous research has also demonstrated, it is important to consider these relationships, as prior studies have generally found that neighborhood-level variables can have significant effects on the behavior of police officers. Thus, given the importance of the latter findings, coupled with the lack of comprehensive, methodologically-sound studies examining this issue, the current work seeks to make an important contribution to the literature on police use of force.

The Police Use of Force (PUF) Study Data

The following section will provide a detailed description of the data collection procedures used during the Police Use of Force Study (hereafter referred to as PUF), as well as a discussion of the characteristics of the data sample. This introduction to the data will provide an understanding of the dependent and independent variables to be used in the current study.

Data Collection Procedures:

After contacting 24 sites to determine interest in participation, PUF began data collection in the six jurisdictions which were able to participate: (1) Charlotte, North Carolina; (2) Colorado Springs, Colorado; (3) Dallas, Texas; (4) St. Petersburg, Florida; (5) City of San Diego, California (Police Department); and (6) San Diego County, California (Sheriff's Department). Table 2 presents the relevant characteristics of each jurisdiction and their corresponding law enforcement agencies.

Table 2: Characteristics of Six Jurisdictions						
	Charlotte	**Colorado Springs**	**Dallas**	**St. Petersburg**	**San Diego PD**	**San Diego SO**
US Census 2000						
Total population	540,828	360,890	1,188, 580	248,232	1,223, 400	2,813, 833
Percent Black	32.7	6.56	25.91	22.36	7.86	5.63
Percent <18	26.02	27.91	29.55	22.66	25.55	27.17
Percent on public assistance	2.58	2.75	2.93	3.27	3.95	3.57
Percent unemployed	3.96	3.09	4.33	3.21	3.79	3.61
Percent poverty	10.62	8.70	17.78	13.26	14.60	12.43
Percent female-headed households	13.17	10.14	14.67	13.54	11.07	11.35
Square Miles	242.3	185.7	342.5	59.6	324.3	4,204
UCR 1997						
Violent crime rate per 100,000	1,452	229	1,404	589	624	295
Index Crime rate per 100,000	9,231	5,824	9,892	7,430	4,782	2,104
LEMAS 1997						
Number of sworn officers	1,286	528	2,817	511	1,964	1,861
Officers per 100,000 citizens	237.7	146.27	236.92	206.05	160.59	66.16
Officers per square mile	5.31	2.84	8.22	8.57	6.06	.44
Hours of training	667	720	1,186	720	928	718

While the Uniform Crime Reports (UCR) and Law Enforcement Management and Administration Statistics (LEMAS) were taken from 1997 to correspond to the data collection timeframe, Census data was taken from the 2000 Decennial Census in order to provide a closer estimate than that provided by the data from the 1990 Decennial Census.

During meetings with police administrators in each of the six jurisdictions, Garner et al. (1995) developed two-page surveys[63] for arresting officers to be completed after every arrest.[64] Focusing on arrests as the unit of observation, the researchers noted that this design maximized their ability to obtain a large number of representative incidents in which force could potentially be used. This has two implications for the current study: (1) a large proportion of all adult custody arrests were sampled within each jurisdiction, ensuring that the samples are representative of all adult arrests made in these jurisdictions; and (2) any use of force which did not result in an arrest of the suspect is not captured within this data.

Estimating that a sample of between 900 and 1,200 arrests was needed from each jurisdiction to obtain reliable estimates of use of force behavior, Garner et al. (1995) sampled arrests over the summer, fall and winter of 1996 through 1997. Data collection began in Colorado Springs in August of 1996, and

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[63] While most criticisms of survey research focus on the issue of response desirability (i.e. an officer responding that force was not used in order to appear to be a 'good cop'), it is unlikely that this was the case, as Garner et al (1995) still found that some physical force was used in 22% of all arrests. In addition, concerns about telescoping (the process of responding with an event that had occurred outside of the study time frame) were alleviated by having the officers fill out the survey almost immediately after having made an arrest.

[64] Note that these surveys included identifying information about the arrest incident, including the identification of the arresting officer, and thus were not anonymous. However, the officers were informed that completed surveys were confidential research materials protected from legal proceedings (i.e. subpoena) under 42 U.S.C. §3789(g).

ended in Charlotte in February 1997. Overall, 7,512 usable surveys were completed, taking just two weeks to capture data on 1,192 arrests in Dallas, and almost two months to capture data on 1,249 arrests in Colorado Springs. After determining that there were no significant differences between arrests in which a survey was completed and arrests without such a survey, the authors concluded that the large size and representative nature of the sample provided a firm foundation for an analysis of use of force behavior (Garner et al. 1995: 29).

Based on the surveys completed by arresting officers, Garner et al. (1995) identified specific characteristics of five variable domains: (1) Nature of the Offense; (2) Location of the Arrest; (3) Police Mobilization; (4) Characteristics of the Officer; and (5) Characteristics of the Suspect. Using information from the surveys, Garner et al. (1995) also identified five elements of force (weapons, tactics, restraints, motion, and voice), and used these to construct four measures of force: (1) physical force; (2) physical force plus threats; (3) the continuum of force; and (4) maximum force.

The simple physical force measure was a dichotomy of whether or not force was used at some point during the arrest, and included any use of a weapon or weaponless tactic, including the use of severe restraints (e.g. prone cuffing, hobbles, body cuffing, leg cuffing).[65] While this measure is useful, Garner et al. (1995) noted that many measures of criminal and police behavior, including the FBI's Uniform Crime Reports, include threats of violence as an indication of violence. Accordingly, the second measure (physical force plus threats) is a more

[65] Note that a corresponding dichotomous measure of suspect force included any of the following as an instance of force: (1) use of any weaponless tactic; and (2) use, threatened use, or possession of a weapon.

comprehensive one, and thus more suitable for the current analyses.[66] This measure includes all of those contained within the simple physical force measure, as well as the addition of any display or threatened use of a weapon. Many researchers, however, have argued that dichotomous measures have several disadvantages, most notably that they assign the same relative importance to the use of restraints as they do to the discharge of an officer's firearm, with both being assigned a '1' as indicative that some physical force was used. Noting this, Garner et al. (1995) also developed the third measure, continuum of force, to address these issues. The latter measure more clearly delineates the ranking of several different types of force, as defined by the six participating jurisdictions.[67] As is evident in Table 3, these rankings vary between the six jurisdictions, and thus it is not acceptable to combine cases from each jurisdiction into one overall measure of police use of force on the continuum. Notably, the continuum of force across all six jurisdictions ranges from a low of five force options in Dallas and the City of San Diego to a high of nine force options in St. Petersburg. The latter includes distinctions between restraint techniques, takedowns and countermoves, while the former two agencies move from a minimal control mechanism to the use of intermediate weapons. Clearly, then, there are significant differences in the measures available to officers through their department's force continuum. In addition, as Garner et al. (1995) note, the primary disadvantage of the force continuum is that it implies that the

[66] It is important to note that Garner et al (1995) eliminated the mere possession of a weapon as a threat, due in large part to the fact that in the jurisdictions studied it was often legal for an arrested suspect to have possessed a weapon, including concealed firearms.

[67] Each arrest was coded only for the highest amount of force used within the continuum by both the suspect and the officer.

difference in force moving from 'Officer Presence' to 'Verbal Control' is the same as the difference in force moving from 'Impact Weapons' to 'Lethal Force' (in the case of Colorado Springs).

Table 3: The Force Continuum Across Jurisdictions

	Charlotte	Colorado Springs	Dallas	St. Petersburg	San Diego PD	San Diego SO
Officer Presence	1	1	1	1	1	1
Verbal Direction / Control	2	2	2	2	2	2
Soft Control	3	3	3			3
Chemical Measures	4					4
Control and Compliance / Restraint		4		3	3	
Transporter				4		
Take Downs				5		
Hard Control / Pain Compliance	5	5		6		5
Countermove				7		
Intermediate / Impact Weapons	6	6	4	8	4	6
Lethal Force	7	7	5	9	5	7

In response to this, a fourth measure, that of maximum force, was created on a scale of 1-100, with '1' being the least forceful action and '100' being the most forceful action. This scale was created by asking 503 officers to rank hypothetical force behaviors on a scale from 1-100 based on their own personal experience. The resulting scale had face validity, as officer presence and the use of verbal commands were located near the bottom of the scale, while the use of weapons (particularly firearms) was located near the top of the scale. After determining if each of these specific behaviors occurred within the sample of 7,512 arrests, any behaviors present in the sample were then weighted according to the rankings of the officer-created scale.

Sample Characteristics:

As noted previously, the sample used in this dissertation is police-citizen arrest encounters in the six jurisdictions. More specifically, information was collected from officer self-reports on all adult custody arrests, leading to a sample size of 7,512 usable surveys representing every precinct and every shift from within the six jurisdictions studied. Thus, instances in which officers used force against a suspect but did not subsequently arrest that suspect are not reported here. However, the large sample size, as well as the practitioner-grounded nature of the dependent variables, ensures that a representative range of behaviors and encounters are captured within this research. In addition, it is important to note that prior research has found that instances of the use of force outside of arrest situations are an extremely rare phenomenon (IACP 2001). This, taken with the fact that the current research seeks only to explain police behavior during arrest situations, leads us to be confident in the contributions of the current work.

Within the six jurisdictions, many officers were responsible for multiple arrests over the course of the data collection period. Thus, in St. Petersburg, 278 officers returned a usable survey after a total of 1,547 arrests (the most arrests made in a jurisdiction during collection), while in the city of San Diego, 466 officers returned a usable survey after a total of 947 arrests (the fewest arrests made in a jurisdiction during data collection). The numbers for the remaining four jurisdictions are as follows: (1) in Charlotte, 371 officers and 1,314 arrests; (2) in Colorado Springs, 289 officers and 1,290 arrests; (3) in Dallas, 626 officers and 1,456 arrests; and (4) in San Diego County, 314 officers[68] and 958 arrests.

An additional aspect of the data sample deserves consideration here, and that is the issue of defining use of force behavior. As discussed previously, the current work uses data collected from the PUF Study, during which the researchers made an explicit decision to exclude handcuffing behaviors as an example of the use of force. While there has been considerable debate over this topic in recent years, the research efforts described here follow the lead of Garner et al. (1995; 2002) in excluding handcuffing. This exclusion is due to a variety of reasons. Adams (1997: 3), for example, notes that "broad definitions of use of force, such as those that include grabbing or handcuffing a suspect, will produce higher rates than more conservative definitions." The author goes on to note that "the BJS pretest of the 1996 Police-Public Contact Survey found close to 500,000 people subjected to the threat or use of force [but] when handcuffing was included, the number was close to 1.2 million" (Adams 1997: 3). This effect is notable when one considers the multivariate studies on use of force behavior described in the previous chapter. Using data from the POPN study, Terrill and

[68] Although law enforcement agents employed by the San Diego County Sheriff's Department are legally "Deputies", the current research refers to all law enforcement agents in the six jurisdictions as "officers" for the sake of semantic simplicity.

Mastrofski (2002), as well as Terrill and Reisig (2003), find a base rate of force of 58% when including handcuffing in their definitions. In both instances, the researchers state that they have followed the National Academy of Science definition of violence as “acts that threaten or inflict harm” on suspects (Terrill and Reisig 2003: 299), and they argue that handcuffing falls under the NAS definition. Yet, it is unclear that simply handcuffing a suspect threatens or inflicts physical harm on that individual. While verbal commands are rightly considered a use of force in that there is an understanding that physical force can be used if the command is not followed, and thus *threatening* to handcuff someone may constitute use of force behavior, the act of handcuffing in and of itself neither threatens nor inflicts bodily harm to the suspect (except, potentially, in cases where handcuffs are applied too tightly). The IACP (2001: 20) agrees, specifically noting that handcuffing during transport or questioning is not included in its measures of force, although it also fails to include verbal commands. Langan et al. (2001: 2) also exclude handcuffing behaviors, while including verbal commands, grabbing, and bites from a K-9 officer. While Terrill and Mastrofski (2002: 231, fn15) argue that the inclusion of an ‘arrest’ variable allows them to control for the effects of mandatory handcuffing when taking a suspect into custody, it is unclear that this provides a true estimate of handcuffing as force behavior, particularly when one considers that the authors themselves acknowledge that handcuffing did not occur during every arrest, and that not every act of handcuffing was followed by an arrest. Thus, absent data regarding the actual number of arrests without handcuffing and handcuffing without arrest, it is impossible to disentangle these effects. This is a serious problem when one considers that Terrill and Mastrofski (2002) find that the use of restraints (a category which included handcuffing) occurred in 18.9% of all police encounters with suspects, leading to an overall base rate of force of 58%.

The Operationalization of Neighborhood:

As has been discussed throughout this dissertation, the concept of neighborhood is one that has varied in definition across numerous studies. In an analysis of forty peer-reviewed studies that were published in the last half of the 1990s, Sampson et al. (2002: 457) found that there was "very little consistency across studies…in the way neighborhood [units] were operationalized or theoretically situated." More specifically, the authors noted that there was difficulty in comparing outcomes from different studies due to the wide variety of 'neighborhood' units of analysis used. Sampson et al. (2002) found that overall, the use of U.S. Census tracts as a measure of neighborhood was the most common, with 19 studies in their meta-analysis using that designation. Other studies used the following as measures: (1) Neighborhood clusters – 7 studies; (2) Postal sectors / Zip codes – 5 studies; (3) U.S. Census block groups – 4 studies; (4) Enumeration Districts / Political Districts – 4 studies; (5) Face blocks – 1 study; and (6) Police beats – 1 study. With regard to the latter measure, Terrill and Reisig (2003: 298) noted that the sites within the Project on Policing Neighborhoods (POPN) study (Indianapolis, Indiana and St. Petersburg, Florida) had drawn their police beats to reflect existing neighborhood boundaries. Reisig and Parks (2003: 46), also using the POPN data, elaborated, stating that the 62 observed neighborhoods contained 130 U.S. Census tracts. Again, however, it is unclear that this use of police beats as a proxy measure for neighborhoods is the correct one, or, at the very least, is generalizable to other jurisdictions. In particular, given the description presented by Reisig and Parks (2003), one could say that in those jurisdictions in the POPN data there were an average of two census tracts per police beat (i.e. their 'neighborhood' measure). Yet, as discussed earlier, Ouimet (2000) gathered data on 84 neighborhoods containing 495 census tracts in a different jurisdiction, for an average of almost six census tracts per neighborhood. New York City, on the other hand, has 292 recognized neighborhoods covering five counties and 2,281 census tracts, for an average of nearly 8 census tracts per neighborhood. In addition, New York City also covers 75 police precincts and 185 zip codes within those 292 neighborhoods, for an average of 30 census tracts per police precinct (Infoshare 2004). Thus, it should be clear that neighborhood definitions based on census tracts and police beats, while both potentially valid measures, are widely varied within the literature. This stems primarily from the fact that U.S. census tracts are defined to include approximately 5,000 residents, which in New York City is a relatively small geographic area due to crowding conditions while in St. Petersburg and Indianapolis this may be a significantly larger area. In both instances, the census tract is a well-defined demographic unit of analysis. However, in situations where the census tract is much larger due to the fact that the 5,000 residents of the tract live well-spaced apart from one another, the tract may be divided into numerous police beats for reasons of manpower allocation and response time. In contrast, in situations where the census tract is much smaller due to the fact that the 5,000 residents of the tract live in relatively crowded conditions, one police beat may actually encompass several census tracts.

Given the variation in neighborhood definitions, and even the variation within those definitions as discussed above, Sampson et al. (2002: 445) note that "administratively defined units such as census tracts and block groups are reasonably consistent with the notion of overlapping and nested ecological structures." In addition to the latter study, several other researchers have found that census tracts provide the geographic unit closest in conception to a neighborhood unit. Coulton et al. (2001), for example, note that when 140 residents of seven different census tracts were asked to draw maps of their own neighborhood, these maps corresponded highly with the official boundaries of those census tracts. Leventhal and Brooks-Gunn (2000) concur, noting that residents' reports of neighborhood boundaries are consistent with the size (in square miles) of census tracts in those areas. More importantly, Duncan and Aber (1997) note that census tract boundaries are typically drawn with the aid and advice of local community boards and planning commissions, and include prominent physical features, such as major thoroughfares, which are easily recognizable by residents. Messner and Tardiff (1986: 303) also note this phenomenon, arguing that "in almost all instances, there are readily observable census tracts boundaries which can be matched very closely with...neighborhood boundaries." This is important, as Messner and Tardiff

(1986: 301) note, due to the fact that "widely recognized and labeled neighborhoods, rather than being mere 'statistical aggregates,' are population groupings with meaning to the constituents." This is bolstered by numerous other studies which find that residents of particular neighborhoods are both capable of defining those neighborhood boundaries clearly (often in line with drawn census tract boundaries), as well as developing a sense of meaning and purpose within those neighborhoods (Bursik and Grasmick 1993; Kelling and Stewart 1990; Taylor et al. 1984). In light of the research indicating that census tracts match up very favorably both with local administrative boundaries as well as with residents' conceptions of their own neighborhoods, the current research will use U.S. Census tract data to represent neighborhood-level processes.

With respect to the use of U.S. Census tract data, the ArcView ArcMAP 8.2 software package, a Geographic Information System, was used to locate arrest points within a specific neighborhood through a process known as geocoding. A specific address or street intersection for each arrest made within the PUF Study was provided by the arresting officer on an arrest report. Using commercially available street maps of the six jurisdictions as reference points, these addresses were geocoded (i.e. placed on a map) within the appropriate jurisdiction. Based on their spatial representation on these maps, with their corresponding latitude and longitude (X and Y coordinates), ArcMAP then allows one to merge a database of attributes to the database of mapped addresses. In terms of the current research, then, ArcMAP has mapped the arrest addresses to their corresponding census tracts, and were then used to merge demographic data for those census tracts to the mapped arrest points. This process is extremely efficient, as ArcMAP allows the user to set the tolerance limits for address matching as high as 100% (in which case the address as written down for an arrest would have to match an address in the commercially available database exactly). As a matter of practicality, tolerance is often set at 80%, and any resulting 'potential matches' are then matched by the researcher against the arrest address to ensure that the latter is mapped correctly.

Specific Hypotheses

The literature review presented in Chapter 2 suggests that use of force behavior by police officers is affected in large part by the nature of the arrest encounter (i.e. how the citizen behaves, as well as the circumstances surrounding the arrest). However, there have also been well-designed individual-level studies which have found that suspect characteristics such as race and gender affect the application of force. The most statistically sound study to date, that of Terrill and Reisig (2003), has found that although the effect of race is likely confounded by the effects of neighborhood SES and social disorganization, the gender effect remains. However, the latter study has several methodological problems which have been discussed. These problems are, most importantly: (1) the defining of simple handcuffing as a use of force activity; and (2) the use of police beats, rather than census tracts, as proxies for neighborhoods. In addition to these issues, however, Terrill and Reisig (2003) failed to make a significant distinction regarding other individual-level characteristics potentially varying at the neighborhood level. With an emphasis on the impact of neighborhood socio-demographic characteristics on police use of force behavior, the authors note that they were unable to consider whether such variability at the encounter (individual) level existed due to limitations of the data, and thus estimated a fixed-effects model (Terrill and Reisig 2003: 318, en13). Yet, given the discussion of Black's theories regarding social distance presented earlier (one which was also touched upon by Terrill and Reisig 2003), it is possible that officer and suspect characteristics, when not mis-specified in a fixed-effects model, may vary in their effects on use of force behavior across different neighborhoods. In light of the preceding discussion, the current research seeks to examine the effects of neighborhood characteristics on use of force behavior, while acknowledging that such individual characteristics may also play a role. Accordingly, the discussion to this point leads us to expect the following outcomes:

H1: Officers will use more force in neighborhoods which are higher in concentrated disadvantage;

H2: Minority officers will use less force than white officers in neighborhoods which are higher in concentrated disadvantage, due to their decreased social distance from residents.

H3: Officers will use more force against suspects with poor demeanor who are encountered in high-crime neighborhoods, due to the officer's need to 'save face' and maintain control in such areas.

H4: Officers will use more force against suspects with poor demeanor in neighborhoods which are higher in concentrated disadvantage, due to the officer's need to 'save face' and maintain control in such areas.

H5: Officers will use less force against minority suspects in neighborhoods higher in concentrated disadvantage, due to the ecological contamination hypothesis and the concept of tolerance.

Specification of Variables of Interest

Dependent Variables:

The dependent variables of interest are two of the measures of force developed within the context of the multi-site PUF study. These two measures are: (1) the use of physical force plus threats; and (2) the maximum amount of force used. As noted previously, recent research on police use of force has acknowledged that the threat of violence (i.e. force) is an act of violence in and of itself. Indeed, legally, individuals may be arrested for making threats of several types, and thus including threats as a form of violence by police officers is consistent with these legal definitions.[69]

Prevalence of Force

The first dependent variable to be used in this research is simply a dichotomous measure of the prevalence of force. This variable distinguishes between arrests in which physical force, or the threat of such force, was or was

[69] Note that although various definitions refer to force as 'violence', or use the terms interchangeably, the occurrence of a violent act (i.e. forceful behavior on the part of a police officer) in no way implies wrongdoing on the part of the officer.

not used by an officer in one of the six jurisdictions. As is common with dichotomous variables, an arrest was assigned a value of zero (0) if no force was used or threatened during the arrest encounter, and a value of one (1) if physical force was either used or threatened during an arrest. In the PUF study, an arrest was coded as having contained an instance of physical force if any of the following were used or threatened: (1) weapons; (2) weaponless tactics; and (3) severe restraints. Overall, the use or threatened use of physical force so defined occurred in 17.1% of all arrest encounters (N = 1,283). Table 4 presents a more detailed listing of the specific actions encompassed by the use of force instrument for the prevalence of force measure.

Table 4: Items within Prevalence of Force Measure

Tactic	Data Item	N	%
Use of a Weapon			
	None	7,354	97.9
	Baton	6	0.1
	Canine	14	0.2
	Chemical Agent	79	1.1
	Flashlight	23	0.3
	Handgun	6	0.1
	Motor Vehicle	9	0.1
	Rifle / Shotgun	2	0.0
	Other	19	0.3
Weaponless Tactics			
	No physical contact	6,328	84.2
	Bite / scratch	1	0.0
	Carotid hold	18	0.2
	Control hold	153	2.0
	Grab	589	7.8
	Hit	12	0.2
	Kick	3	0.0
	Pressure hold	48	0.6
	Push / shove	80	1.1
	Spit	21	0.3

Table 4 (cont'd)			
	Twist arm	98	1.3
	Wrestle	91	1.2
	Other tactic	70	0.9
Use of Restraints			
	Leg cuffs	67	0.9
	More severe restraints	29	0.4
Prevalence of Force			
	Weapons	158	2.1
	Weaponless Tactics	1,184	15.8
	Severe Restraints	96	1.3
Total Physical Force		1,283	17.1

Severity of Force

The second dependent variable to be used in this research encompasses a ranking of various police actions. As discussed previously, the PUF study asked a total of 503 officers across all six jurisdictions to rank hypothetical police behaviors on a scale of 1 to 100 based on their personal experiences, and then weighted these rankings based on the occurrence of these actions within the actual data collected over 7,512 arrests. This measure of severity, then, operationalized as the maximum amount of force used in the encounter, ranges from zero (0) for no action reported, to ninety-nine (99) for a fatal discharging of a firearm.[70] Overall, the average maximum force ranking for all 7,512 arrests was 30.4, a ranking between the use of leg restraints (hobbles) and the threatened use of a flashlight. Importantly, this ranking was higher than the simple use of handcuffs, which was given a ranking of 28.2 by the officers, and occurred in 82.3% (N = 6,182) of all arrests, providing more impetus for the exclusion of

[70] It is important to note that the list of behaviors produced by these officers included nearly all of the behaviors which previous research has defined as use of force activity. The only notable exception was 'pat-downs', which Terrill and Reisig (2003), as well as Terrill and Matrofski (2002), used in their research.

handcuffing as a use of force behavior by police officers. Table 5 provides a more detailed listing of the specific actions encompassed by the use of force instrument for the maximum force measure.

Table 5: Items within Maximum Force Measure				
Police Action	**Rank**	**N**	**%**	**Cumulative %**
No action reported	0.0	62	0.8	0.8
Conversational tone	15.6	153	2.0	2.8
Gently hold suspect	15.9	83	1.1	3.9
Two officers present	20.6	668	8.9	12.8
Command suspect	22.0	99	1.3	14.1
Shout / curse at suspect	22.5	3	0.0	14.1
Spit on suspect	23.2	2	0.0	14.1
Chase suspect (helicopter)	24.0	1	0.0	14.1
Verbally threaten suspect	25.4	5	0.1	14.2
Push suspect	26.7	0	0.0	14.2
Use handcuffs	28.2	4,305	57.3	71.5
Chase suspect (foot pursuit)	29.3	95	1.3	72.8
Use leg restraints	30.0	14	0.2	73.0
Threaten to use flashlight	30.9	0	0.0	73.0
Threaten to use chemical agent	31.7	1	0.0	73.0
Possess canine officer	31.9	10	0.1	73.1
Threaten to use baton	32.0	1	0.0	73.1
Grab suspect	33.0	461	6.1	79.2
Display baton	34.6	4	0.1	79.3
Use pressure hold	34.7	10	0.1	79.4
Twist suspect's arm	35.1	98	1.3	80.7
Use other tactic	35.2	32	0.4	81.1
Display chemical agent	37.0	7	0.1	81.2
Use severe restraints	37.1	17	0.2	81.4
Bite suspect	37.7	0	0.0	81.4
Display flashlight	37.8	7	0.1	81.5
Use choke hold	38.9	78	1.0	82.5
Possess shotgun	40.2	640	8.5	91.0
Kick suspect	40.6	1	0.0	91.0
Hit suspect	40.8	2	0.0	91.0
Chase suspect (car)	41.4	137	1.8	92.8
Use chemical agent	45.9	31	0.4	93.2

Table 5 (cont'd)				
Threaten to use car as weapon	46.0	0	0.0	93.2
Threaten to use canine officer	46.1	5	0.1	93.3
Wrestle with suspect	48.2	184	2.4	95.7
Use flashlight	49.9	23	0.3	96.0
Threaten to use rifle / shotgun	51.8	1	0.0	96.0
Use canine	52.1	12	0.2	96.2
Threaten to use handgun	52.4	2	0.0	96.2
Use baton	53.0	6	0.1	96.3
Use other weapon	53.1	15	0.2	96.5
Display handgun	55.4	165	2.2	98.7
Use carotid hold	56.0	31	0.4	99.1
Display rifle / shotgun	57.4	23	0.3	99.4
Use car as weapon	69.4	10	0.1	99.5
Use rifle / shotgun	79.2	2	0.0	99.5
Use handgun	81.7	6	0.1	99.6

Independent Variables:

The independent variables used in previous research have generally fallen into one of several categories: (1) the nature of the encounter / offense; (2) suspect characteristics; and (3) officer characteristics. More recent research that has examined contextual effects has also explored: (1) the nature of the arrest location; and (2) neighborhood-level socio-demographic variables. Based on these two sets of literature, the current research incorporates variables falling within these five categories as well. Although the focus here is primarily on strengthening previous results regarding the effects of neighborhood context, as well as presenting evidence for the effects of social distance on the behavior of minority police officers, the consistent significant findings regarding other variables must be addressed in addition to an array of statistical control variables.

Neighborhood-Level Variables

Neighborhood structure within the six jurisdictions was determined through the use of 2000 U.S. Census data at the census tract level. Specifically, at the census tract level, the following data items were submitted to a factor analysis in order to create a measure of concentrated disadvantage: (1) percent Black; (2) percent under 18 years of age; (3) percent below poverty level; (4) percent unemployment; (5) percent female-headed households; and (6) percent on public assistance. It should be noted here that the factor score was created across all census tracts within all six jurisdictions for the current analysis. This is due to four reasons: (1) the original PUF sample contained all possible neighborhoods within the six jurisdictions, and thus there is 100% coverage within the sample despite the fact that not all census tracts experienced an arrest during the study period; (2) the demographic similarities of census tracts across the six jurisdictions increase the likelihood of generalizability; (3) utilizing only those census tracts in which an arrest was made would result in a loss of statistical power due to smaller sample size; and (4) utilizing only those census tracts in which an arrest was made results in the inability to calculate a Moran's I as a measure of spatial autocorrelation, due to the resulting geographic "holes".[71] In addition to concentrated disadvantage, one neighborhood-level measure of crime is

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[71] Further description of the census tracts used for, and excluded from, the analyses can be found in Appendix F.

included in the analysis. By aggregating crime data for all arrests within the sample to the appropriate census tracts, a neighborhood measure of all Index I crimes per 100,000 residents was computed. While this provides measures of arrests, rather than total offenses reported, this aggregation is similar to the FBI's Uniform Crime Reports data, with the added benefit of being available at the neighborhood level. In addition, the jurisdiction is included as a series of dummy-coded variables, with each of the following coded as zero (0) for a 'No' response and coded as one (1) for a 'Yes' response: (1) Colorado Springs, CO (as the reference category); (2) Charlotte, NC; (3) Dallas, TX; (4) St. Petersburg, FL; and (5) San Diego (city and county), CA.[72] The jurisdiction variable is included to control for the potential effects of agency-specific factors.[73]

Encounter-Level Variables

As discussed previously, a number of encounter-level variables have been included in prior research, either as statistical controls or in order to estimate their effects upon use of force behavior by police officers. All of the variables included in the current research were first tested for their bivariate correlations with both dependent variables (see Garner et al., 2002 for more detail). In addition, multivariate analyses with these variables were conducted using only those variables within each "domain" (i.e. suspect characteristics, officer

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[72] Due to the geographic "holes" resulting from separating the San Diego Police Department and the San Diego Sheriff's Office, GeoDa was unable to calculate a measure of spatial autocorrelation for either jurisdiction, and thus these were combined into one jurisdiction for all subsequent analyses.
[73] Note, however, that a true measure of the effects of jurisdiction would require a 3-level model with jurisdiction as one level. Given the fact that only six jurisdictions were studied, there are not sufficient degrees of freedom to conduct such an analysis, and therefore jurisdiction is used as a neighborhood-level variable.

characteristics, nature of the encounter and offense, and nature of the encounter location) with both dependent variables. From these analyses, only those independent variables which were statistically significant at the .01 level were selected for inclusion in the final models. These variables will now be examined more closely, as they are included in the current research as well.

<u>Suspect Characteristics</u>

Prior research on the use of force, including the only study to use multilevel modeling (Terrill and Reisig 2003), has often found various suspect demographic characteristics to have an effect on the application of force. Accordingly, the current research will include the following suspect characteristics as independent variables: (1) suspect gender; (2) suspect age; and (3) suspect race. Suspect gender is a dichotomy, with females coded as zero (0) and males coded as one (1), with females as the reference category. Suspect age is the actual age of the suspect. Suspect race is a series of dummy coded-variables coded as zero (0) for 'No' and one (1) for 'Yes' for: (1) Black; (2) Hispanic; (3) Other; (4) Missing and (5) White (as the reference category).

In addition to these demographic variables, other aspects of the suspect's behavior and status are included as control variables, namely: (1) suspect sobriety; (2) suspect disrespect / antagonism; (3) suspect physical resistance; (4) suspect is known to carry a weapon; (5) suspect is known to be assaultive; (6) suspect is known to be a gang member; (7) suspect's relationship to the victim; and (8) suspect's relationship to bystanders. Suspect sobriety is coded as 0 if the suspect is sober and as 1 if the suspect is intoxicated due to either drugs or alcohol. Suspect antagonism and suspect physical resistance are both dichotomous variables, coded as zero (0) for a 'No' response (i.e. suspect was not antagonistic / suspect was not physically resistant) and coded as one (1) for a 'Yes' response. The next three control variables ('suspect known to carry a weapon', 'suspect known to be assaultive', and 'suspect known to be a gang member') are all also dichotomous variables, coded as zero (0) for a 'No' response and as one (1) for a 'Yes' response. The suspect's relationships to the victim and to bystanders are both a series of dummy-coded variables, coded as zero (0) for a 'No' response and as one (1) for a 'Yes' response, for: (1) strangers (as the reference category for victims); (2) friends; (3) family; (4) unknown relationship; or (5) none (as the reference category for bystanders, indicating that there were no bystanders present at any time.

Officer Characteristics

Officer characteristics have typically been included as a matter of comprehensiveness on the part of researchers, with little emphasis on their potential effects. Indeed, as noted earlier, previous studies have failed to allow the effects of officer characteristics, notably race, to vary across neighborhoods. The current research seeks to rectify the latter issue, while also including other officer characteristics. Officer gender and officer race are coded in the same manner as the corresponding variables for suspects. Officer age is also the actual age of the officer. In addition to these demographic variables, other police officer characteristics are included as controls, namely: (1) officer demeanor toward the suspect; (2) prior medical attention given to officer; and (3) the number of surveys completed by the officer. Officer demeanor is a dichotomous variable, coded as zero (0) for a 'No' response (i.e. the officer was not antagonistic) and one (1) for a 'Yes' response. Prior medical attention is a variable used to determine if the officer has been injured in the line of duty on a prior occasion, and is coded as zero (0) for a 'No' response (i.e. the officer has never received medical attention for an injury sustained while on duty) and as one (1) for a 'Yes' response. The number of surveys completed by the officer provides an indication of the overall aggressiveness of the officer in performing policing functions, as officers who have completed more surveys have made more arrests than their peers.

Nature of the Encounter and Offense

In general, prior researchers have included variables regarding the nature of the offense, as well as the nature of the encounter (i.e. how the encounter came about), as control variables. The current research follows this protocol by introducing the following variables into the model: (1) the offense type; (2) whether the offense occurred on a weekend; (3) the number of suspects; (4) the custody status of the suspect; (5) the officer's duty status; (6) the officer's approach to the encounter; (7) the officer's use of back-up officers; (8) the officer's mobilization; (9) the number of officers present; (10) the demeanor of bystanders toward the officer; and (11) the number of bystanders. Offense type is a dichotomous variable coded as zero (0) for a non-violent offense and as one (1) for a violent offense. The timing of the arrest was coded as zero (0) if the arrest took place during the week, and coded as one (1) if the arrest took place during the weekend, defined as 6pm on Friday nights until 6am on Monday mornings. The total number of suspects is included as a measure of dangerousness during the encounter, as any situation in which suspects outnumber the officer increases the officer's potential for injury. The custody status of the suspect is a dichotomous variable, coded as zero (0) if the suspect was not in custody at the time the officer arrived and as one (1) if the suspect was already in custody at the time the officer arrived. The officer's duty status is also a dichotomous variable, coded as zero (0) if the officer was on-duty at the time of the arrest and as one (1) if the officer was off-duty at the time of the arrest. The officer's approach to the encounter is a series of dummy-coded variables which describe how the officer proceeded to the encounter after having been dispatched, with each of the following coded as zero (0) for a 'No' response and coded as one (1) for a 'Yes' response: (1) routine approach (as the reference category); (2) priority call; (3) lights and sirens; and (4) unknown approach. The officer's use of back-up officers is a dichotomous variable coded as zero (0) if the officer did not call for back-up at any point, and coded as one (1) if the arresting officer called for back-up. The arresting officer's mobilization is also a series of dummy-coded variables which reflect the different ways in which a police officer may have come into contact with a citizen regarding a specific encounter, with the following coded as zero (0) for a 'No' response and coded as one (1) for a

'Yes' response: (1) officer was dispatched to the scene (as the reference category); (2) citizen initiated the encounter; (3) officer initiated the encounter; and (4) unknown how the encounter was initiated. The number of officers present during the encounter, as well as the number of bystanders, is introduced as a measure of the officer's level of safety. The final variable to be introduced here as a control is the demeanor of bystanders toward the officer, coded as zero (0) if the bystanders were not antagonistic, and coded as one (1) if the bystanders were antagonistic toward the police officers present during the encounter.

Nature of the Encounter Location

The final class of control variables deals with the nature of the location in which the encounter took place. In terms of the current research, these variables are: (1) location is known for criminal activity; (2) location is known to be hazardous; (3) the arrest occurred inside; and (4) visibility at the arrest location. The first two variables ('location known for criminal activity' and 'location known to be hazardous') are both dichotomous variables, coded as zero (0) for a 'No' response (i.e. the location is not known for criminal activity, or the location is not known to be hazardous) and coded as one (1) for a 'Yes' response. The location of the actual arrest is also a dichotomous variable, coded as zero (0) if the arrest took place at a location other than inside the suspect's home, and coded as one (1) if the arrest took place inside the suspect's home. Finally, the visibility variable is an ordinal variable describing the officer's ability to distinguish the suspect's movements and surrounding features, with categories from 1-10, with 1=poor, 4=moderate, 7=good, and 10=excellent.

Analysis Procedures

Spatial Autocorrelation:

As can be seen from the discussions of the data collection procedures and the theoretical emphases of the current work, the effect of neighborhood context on police use of force behavior is viewed as a spatial phenomenon. Accordingly, GIS software is used to link U.S. Census data to the appropriate census tracts (the operationalization of "neighborhood" in the current research) in order to provide a graphical representation of all arrest cases within the study which can also be used for analytical purposes. Given that the current work seeks to determine neighborhood effects, prior research has suggested that the most serious obstacle to the latter is the issue of spatial autocorrelation (Baller et al. 2001; Leventhal and Brooks-Gunn 2000; Morenoff and Sampson 1997; Morenoff et al. 2001; Smith and Jarjoura 1989). At its essence, spatial autocorrelation refers to the tendency of geographical areas to be susceptible to similar events (in this case, use of force during arrests), based in large part on their proximity to one another. This susceptibility violates the assumption of independence (i.e. the random distribution) between events. As Baller et al. (2001: 562) note, "if spatial processes operate and are not accounted for, inference will be inaccurate and estimates of the effects of independent variables may be biased…" Messner et al (1999: 427) note the same phenomenon, stating that "ignoring spatial dependence and/or spatial heterogeneity in the model may lead to false indicators of significance, biased parameter estimates, and misleading suggestions of fit." Several researchers have noted that there is a distinction between two types of spatial autocorrelation – spatial effects (also called a spatial lag) and spatial disturbance (also called a spatial nuisance or spatial error) (Anselin, 1988; Doreian 1980; Doreian 1982). Baller et al. (2001) note that in the case of a spatial lag, a weighted average of values for the dependent variable in adjoining neighborhoods is introduced as a spatial dependence covariate in the model. In the case of a spatial nuisance, the spatial dependence is incorporated into the regression error term (Baller et al. 2001: 563-566). In estimation of their model regarding neighborhood inequality and collective efficacy, Morenoff et al. (2001: 522) explicitly state that "neighborhoods are interdependent and characterized by a functional relationship between what happens at what point in space and what happens elsewhere." However, Magalhaes et al. (2000: 6) correctly point out that "units...have, for instance, different sizes, shapes, densities, and these differences can generate measurement errors that can cause heteroskedasticity." Langford et al. (1999) note that multilevel modeling can address these issues of heteroskedastic errors. More importantly, Battage et al. (2001: 1) appropriately note that heterogeneity across units (i.e. differences between neighborhoods) is modeled with an error component (i.e. spatial nuisance) model. Thus, the current work uses a spatial error (or spatial nuisance) model for one methodological reason (i.e. in conjunction with multilevel modeling techniques, the spatial error model alleviates concerns regarding heteroskedasticity), and one theoretical reason (i.e. the characteristics of surrounding neighborhoods, as opposed to incidents of use of force in those neighborhoods, are thought to influence use of force behavior within a particular neighborhood).

Once one has determined which model of spatial autocorrelation will be used, it is still necessary to discover if the problem exists within the current dataset. The test most often used to determine the presence of spatial autocorrelation is the Moran coefficient, which is similar to a Pearson correlation coefficient. The Moran coefficient is "based on the spatial autocovariance of a variable standardized by the overall mean of that variable, [which] can be compared to the mean value of the coefficient under the assumption of a random spatial pattern, [after which] a 'Z' score can be calculated to assess the statistical significance of the observed spatial autocorrelation" (Messner and Tardiff 1986: 307). More importantly, Anselin and Kelejian (1997: 153-154) note that "Moran's I…is the only acceptable [test] in the presence of spatially lagged dependent variables…[and furthermore] is an exact test."

While the Moran coefficient provides a measure of spatial autocorrelation, an issue of great concern to researchers using neighborhood-level data, until very recently it has not worked within the confines of hierarchical linear modeling (HLM) software. In fact, Morenoff et al. (2001: 532) noted that "software that can simultaneously handle…random effects of neighborhoods and spatial dependence" was not available at the time of their research. This resulted in the estimation of a hierarchical generalized linear model without a spatial dependence term in order to "compute posterior modes[74] of neighborhood-specific log-homicide rates given the data, the grand mean estimate for Chicago, and the estimated between-neighborhood variance in the true log-rates" (Morenoff et al. 2001: 532). These posterior modes were then introduced into a regression model as an independent variable. While this two-step process is viable, Morenoff et al. (2001) correctly note that this provides only an approximation of the effects of spatial dependence.

Recently, Anselin (2003a) has introduced a software package designed to more faithfully incorporate spatial dependence terms within hierarchical linear modeling (HLM) software. The GeoDa software package was designed to combine the interactive capabilities of GIS software (such as ArcView) with the statistical abilities of analytical software (such as SPSS or HLM). As Anselin (2003b) notes, this produces a Moran autocorrelation statistic as follows:

$$I^i_{kl} = z^i_k \Sigma_j w_{ij} z^j_l \qquad \text{[Equation 1]}$$

where z^i_k and z^j_l are variables observed within the given neighborhoods, and w_{ij} is the spatial weights matrix. The Moran coefficient is then viewed as a scatterplot, with the spatially lagged variable on the vertical axis and the original variable on the horizontal axis (Anselin 2003b). In order to determine which data points are within a critical distance (yet still in another neighborhood) of the initial event, GeoDa uses contiguity-based rates constructed from the shape files present in

[74] The posterior modes n_i^* for neighborhood i was calculated as a weighted average of the log-homicide rate for each neighborhood, and the overall mode of the homicide rates estimated from all neighborhoods.

the mapping software. These rates can be based on either the rook criterion, which is constructed from only those neighborhoods sharing a common linear boundary with the neighborhood of interest, or on the queen criterion, which is constructed from all neighborhoods sharing either a common linear boundary or a common vertex with the neighborhood of interest. Prior research (Messner et al. 1999; Morenoff et al. 2001; Reisig et al. 2004) has used the rook criterion when examining spatial dependence within neighborhood effects. However, given that the current research uses a spatial error model of spatial autocorrelation, there is no theoretical reason to believe that this process is stronger for neighborhoods sharing common linear boundaries than for neighborhoods sharing common vertices. Thus, the queen criterion is used here, as it is believed that the characteristics of all the immediate surrounding neighborhoods will exert an effect on use of force behavior within the neighborhood of interest. Given the strengths of the software, then, GeoDa will be used to introduce a well-defined spatial autocorrelation term (as a spatial error) based on the queen criterion into the hierarchical linear model.

Hierarchical Linear Modeling:

Given the nested nature of the data (arrests nested within neighborhoods), the appropriate statistical technique to be used is hierarchical linear modeling. The latter will be used to simultaneously regress each dependent variable (separately) on neighborhood-level and encounter-level independent variables. As Bryk and Raudenbush (1992: 20) note, the initial step in estimating an HLM is to determine whether hierarchical modeling is appropriate for these data. In its most basic form, the relationship between the dependent variable and the independent variables at the first level is described as follows:

$$Y_{ij} = \beta_{0j} + \beta_{1j}(X_{ij} - X_{.j}) + r_{ij} \qquad \text{[Equation 2]}$$

where Y_{ij} is the i^{th} dependent variable in the j^{th} neighborhood, β_{0j} is the intercept of the j^{th} neighborhood, β_{1j} is the slope of the j^{th} neighborhood, X_{ij} is the i^{th} independent variable in the j^{th} neighborhood, $X_{.j}$ is the mean of the independent variable in j^{th} neighborhood, and r_{ij} is the error term for the i^{th} independent variable in the j^{th} neighborhood.

The relationship between the dependent variable and the independent variables at the second level can be described as follows:

$$\beta_{0j} = y_{00} + y_{01}W_j + u_{0j} \qquad \text{[Equation 3]}$$

where β_{0j} is the intercept of the j^{th} neighborhood taken from Equation 1, y_{00} is the mean of the intercept across neighborhoods, y_{01} is the difference of the means of the independent variables, W_j is the value of the independent variable in the j^{th} neighborhood, and u_{0j} is the unique effect of the j^{th} neighborhood on the mean of the intercept and

$$\beta_{1j} = y_{10} + y_{11}W_j + u_{1j} \qquad \text{[Equation 4]}$$

where β_{1j} is the slope of the j^{th} neighborhood taken from Equation 1, y_{10} is the mean of the slopes of the individual-level independent variables (i.e. the main effect of the independent variable from Equation 1), y_{11} is the interaction term between the individual-level independent variables and the neighborhood-level independent variables, W_j is the value of the independent variable in the j^{th} neighborhood, and u_{1j} is the unique effect of the j^{th} neighborhood on the mean of the slopes.

These equations in combination represent the simplest example of a random-intercepts model, in which only the first level intercept coefficient, β_{0j}, is viewed as random. In the current research, as described earlier, it is hypothesized that the effects of officer race will vary across neighborhoods, thus requiring the use of a random-coefficients model, in which both β_{0j} and β_{1j} (the slope for officer race) are allowed to vary, and both y_{01} and y_{11} are constrained to be null. The latter is required due to the fact that when cross-level interactions are present, the regression coefficient of the direct independent variable estimates the effect of that variable when the other independent variable in the interaction is zero (Bryk and Raudenbush 1992: 20). This leads to the following simplified equations:

$$\beta_{0j} = y_{00} + u_{0j} \text{ and } \quad \beta_{1j} = y_{10} + u_{1j} \text{ [Equation 5 and Equation 6]}$$

where y_{00} is the average intercept across neighborhoods, y_{10} is the average slope across neighborhoods, u_{0j} is the unique effect of the j^{th} neighborhood on the intercept, and u_{1j} is the unique effect of the j^{th} neighborhood on the slope.

Again, at the most basic level, then, all of these equations can be combined to yield:

$$Y_{ij} = y_{00} + y_{10}(X_{ij} - X_{.j}) + u_{0j} + u_{1j}(X_{ij} - X_{.j}) + r_{ij} \qquad \text{[Equation 7]}$$

This model implies that the dependent variable, Y_{ij}, is a function of the average regression equation, $y_{00} + y_{10}(X_{ij} - X_{.j})$, added to a random error term with three components: u_{0j}, the random effect of the j^{th} neighborhood on the mean; $u_{1j}(X_{ij} - X_{.j})$, where u_{1j} is the random effect of the j^{th} neighborhood on the slope β_{1j}; and r_{ij}, the encounter-level error term (Bryk and Raudenbush 1992: 21).

Having established the basic model used in hierarchical linear modeling, it is now necessary to describe the process the current research will undertake in order to estimate the proper model using the PUF study data. Preliminary models will be estimated using a one-way ANOVA model for the dependent variable at the encounter level in order to obtain descriptive statistics which will test whether or not HLM techniques are appropriate for these data. This ANOVA model will produce the following equation:

$$Y_{ij} = y_{00} + u_{0j} + r_{ij} \qquad \text{[Equation 8]}$$

which is a one-way ANOVA model with a grand mean (y_{00}), a neighborhood effect (u_{0j}), and an encounter-level effect (r_{ij}), and has a variance of:

$$Var(Y_{ij}) = Var(u_{0j} + r_{ij}) = \tau_{00} + \sigma^2 \quad \text{[Equation 9]}$$

where τ_{00} represents the within-neighborhood variability, and σ^2 represents the between-neighborhood variability. The latter two parameters allow us to calculate the intraclass correlation coefficient as:

$$\rho = \tau_{00} / (\tau_{00} + \sigma^2) \quad \text{[Equation 10]}$$

where ρ is the intraclass correlation coefficient. The latter is defined as a measure of group homogeneity. If the intraclass correlation is zero, the clustering of the data has no effect on the relationships between the variables of interest, and the assumption of independent observations is not violated. This, in turn, indicates that linear modeling techniques may be used. If the intraclass correlation coefficient is not equal to zero, then the assumption of independence is violated, and using linear modeling techniques would result in: (1) reduced reliability of parameter estimates; (2) increased probability of Type I errors; and (3) underestimation of the standard error of the coefficients. In this situation, linear modeling is clearly not appropriate, and HLM techniques must be used. In effect, the intraclass correlation coefficient reveals the proportion of variance between neighborhoods in the dependent variable. In addition to using this value to determine if HLM is appropriate, analysis of the χ^2 statistic will be used to reject the null hypothesis that there is no difference in the dependent variables between neighborhoods. The intraclass correlation coefficient and the χ^2 statistic together are expected to confirm that the data captured in the PUF study are amenable to analysis through HLM techniques.

It is important to note here that the binary dependent variable of physical force plus threats requires the use of hierarchical generalized linear models (HGLM), which take a slightly different form than the basic HLM equations described above. In HGLM, the Level-1 model consists of three parts: (1) the sampling model for a binary outcome; (2) the link function; and (3) the structural model. The sampling model takes the form:

$$E\,(Y_{ij} \mid \Phi_{ij}) = m_{ij}\Phi_{ij} \qquad \text{[Equation 10]}$$

and

$$Var\,(Y_{ij} \mid \Phi_{ij}) = m_{ij}\Phi_{ij}\,(1-\Phi_{ij}) \qquad \text{[Equation 11]}$$

where i represents an individual arrest, j represents a specific neighborhood, m_{ij} represents number of trials for the i^{th} arrest in the j^{th} neighborhood (equal to 1 in the present Bernoulli case, as use of force was only measured once per arrest), and Φ_{ij} represents the probability of "success" for the i^{th} arrest in the j^{th} neighborhood.

The link function (the logit-link in this case) takes the form:

$$n_{ij} = \log(\Phi_{ij} / (1 - \Phi_{ij})) \qquad \text{[Equation 12]}$$

where n_i represents the log-odds of success for the i^{th} arrest in the j^{th} neighborhood.

The structural model takes the form:

$$n_{ij} = \beta_{0j} + \beta_{1j}X_{1ij} + \beta_{2j}X_{2ij} + \ldots + \beta_{pj}X_{pij} \qquad \text{[Equation 13]}$$

where n_{ij} is the predicted log-odds of success for arrest i in neighborhood j, β_{0j} is the log-odds of success for an arrest in neighborhood j when all of the independent variables have a value of zero, β_{1j} is the effect of the first independent variable on the log-odds of success in neighborhood j, X_{1ij} is the value for the i^{th} arrest in the j^{th} neighborhood for the first independent variable, β_{2j} is the effect of the second independent variable on the log-odds of success in neighborhood j, X_{2ij} is the value for the i^{th} arrest in the j^{th} neighborhood for the second independent variable, β_{pj} is the effect of the last independent variable on the lof-odds of success in neighborhood j, and X_{pij} is the value for the i^{th} arrest in the j^{th} neighborhood for the last independent variable.

Furthermore, in HGLM, the intercepts and slopes of the Level-1 model become the outcome variables of the Level-2 model, leading to the following equations:

$$\beta_{0j} = Y_{00} + u_{0j} \qquad \text{[Equation 14]}$$

where Y_{00} is the average log-odds of success across neighborhoods for the average arrest and u_{0j} is the unique effect of neighborhood j on the log-odds of success for the reference category, as well as:

$$\beta_{1j} = Y_{10} + u_{1j} \qquad \text{[Equation 15]}$$

where Y_{10} is the mean over neighborhoods of the effect of the first independent variable on the log-odds of success and u_{0j} is the unique effect of neighborhood j on the effect of the first independent variable on log-odds of success in neighborhood j, as well as:

$$\beta_{2j} = Y_{20} + u_{2j} \qquad \text{[Equation 16]}$$

where Y_{20} is the mean over neighborhoods of the effect of the second independent variable on the log-odds of success and u_{0j} is the unique effect of neighborhood j on the effect of the second independent variable on log-odds of success in neighborhood j.

Summary

Overall, this chapter has presented a discussion of the data collection procedures, sample characteristics, variables of interest, and plans for statistical analyses. Based on the data sample collected in the PUF study, as well as the consistency of effects of particular independent variables throughout prior research, two dependent variables and an array of independent variables were chosen for analysis. Based on the work of Smith (1986) and Terrill and Reisig (2003) regarding neighborhood effects on use of force behavior by police officers, it is anticipated that the data in the current research will be best utilized within an analytical scheme focused on hierarchical linear modeling techniques. A description of this technique has been provided, as well as a discussion of preliminary steps to be taken to ensure that these techniques are indeed appropriate for the data. The following chapter will present the results of these analyses.

Chapter 4: Results

The purpose of this dissertation was to assess the effects of neighborhood-level variables on use of force behavior by police officers. Using hierarchical linear modeling techniques, the research questions test the extent to which neighborhood characteristics, as well as individual characteristics allowed to vary at the neighborhood level, increase or decrease the use of force by police officers during arrest situations. The research sample used 7,512 police officer surveys filled out subsequent to every arrest in the six study sites between August 1996 and February 1997. Of these 7,512 officer surveys, 656 were eliminated from the analysis due to an inability to be geocoded using ArcView ArcMAP software, leaving a sample size of 6,856. Of the latter cases, 924 were then eliminated due to the fact that they occurred in a census tract where too few arrests overall were observed, leaving the final sample size of 5,932. [75] In addition to the latter issues with the data, it should be noted that several cases were missing data on one or more of the independent variables. Traditionally, social scientists have dealt with missing data by: (1) constructing a dummy variable for missingness; (2) performing logistic regression to predict missingness using covariates; and 3) reporting whether any variables are significant predictors of missingness. This approach has a number of disadvantages, including a lack of theoretical justification, as well as biased parameter estimates and standard errors. The approach of simple listwise deletion is also often used, but in situations where more than 5% of the cases are

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[75] The criterion for too few observed arrests within a census tract was 4 or fewer, based on previous research efforts which have identified 5 or more cases within a Level-2 unit as an acceptable sample size in hierarchical linear modeling (Cueto et al. 2003).

missing this leads to a serious loss of statistical power where the data are missing-at-random (MAR) or missing-completely-at-random (MCAR), and to biased parameter estimates where the missing data are observed-at-random (OAR).[76] In these situations, it is preferable to use any of the following methods: (1) direct maximum-likelihood estimation; (2) Bayesian modeling with Markov Chain Monte Carlo methods; (3) multiple imputation; and (4) regression-based imputation (Allison 2002; Jones 1996; Little and Rubin 1987). Of the latter methods, only regression-based imputation is currently available in widely-used pre-packaged software such as SPSS, and thus it is this method which was used for missing data analyses. Using an OLS regression model for continuous variables, and a logit regression model for binary variables, regression-based imputation uses cases in the sample with complete information to predict data for the missing variables of interest.[77] Thus, Table 6 presents the sample characteristics for the individual-level independent variables for the 5,932 cases used in the analyses, with all missing values replaced through a regression-based imputation method.[78]

[76] Data for this dissertation were missing on only 10 of the 31 variables used in the analyses. Although in some instances data were only missing for 1.5% of all cases, the variable for officer race, which is of considerable importance to the hypotheses of the current work, was missing data in 5.4% of all cases.

[77] It should be noted here that regression-based imputation does suffer from slightly biased standard errors due to the fact that it ignores significant variability. However, considering the nature of the data, as well as the availability of alternative imputation methods, it was felt that this method was adequate for the purposes of conducting a hierarchical linear model analysis focusing primarily on the effects of Level-2 (i.e. neighborhood) variables.

[78] Note that in Table 6, the values for REPEAT (the number of surveys completed by the officer), NUMBERSO (the number of suspects present at the completion of the arrest), NUMBERPO (the number of officers present at the completion of the arrest), OFF1AGE (the actual age of the arresting officer), and SUSPAGE (the actual age of the suspect), are not included, as this would require too much space within the table. This information is available in the Appendix (Table D-1).

Table 6: Sample Characteristics (Level-1 Independent Variables)

VARIABLE NAME	CATEGORY	VALUE	N	MEAN	SD
NATURE OF THE LOCATION					
Location Known for Criminal Activity			5932	0.43	0.49
	No	0	3405		
	Yes	1	2527		
Location Known to be Hazardous			5932	0.18	0.38
	No	0	4885		
	Yes	1	1047		
Arrest Took Place Inside			5932	0.34	0.47
	No	0	3938		
	Yes	1	1994		
Visibility at Arrest Location			5932	7.6	2.43
	Poor	1	89		
	Somewhat Poor	2	130		
	Less than Moderate	3	206		
	Moderate	4	359		
	More than Moderate	5	466		
	Acceptable	6	551		
	Good	7	754		
	Fairly Good	8	756		
	Very Good	9	498		
	Excellent	10	2123		
NATURE OF THE ENCOUNTER					
Violent Offense			5932	0.18	0.39
	No	0	4838		
	Yes	1	1094		
Weekend			5932	0.38	0.49
	No	0	3669		
	Yes	1	2263		
Bystander Demeanor toward Officer			5932	0.06	0.24
	Not Antagonistic	0	5602		
	Antagonistic	1	330		
Number of Suspects			5932	1.4	1.22
POLICE MOBILIZATION					
Custody Status of Suspect			5932	0.14	0.35
	On Street	0	5109		
	In Custody	1	823		

Table 6 (cont'd)

Officer Dispatched to Scene			5932	0.44	0.5
	No	0	3296		
	Yes	1	2636		
Citizen Initiated Encounter			5932	0.04	0.21
	No	0	5670		
	Yes	1	262		
Police Initiated Encounter			5932	0.37	0.48
	No	0	3717		
	Yes	1	2215		
Unknown Encounter Initiation			5932	0.14	0.35
	No	0	5113		
	Yes	1	819		
Routine Approach to Scene			5932	0.78	0.42
	No	0	1333		
	Yes	1	4599		
Priority Call Approach to Scene			5932	0.17	0.38
	No	0	4910		
	Yes	1	1022		
Lights and Sirens Approach to Scene			5932	0.1	0.29
	No	0	5371		
	Yes	1	561		
Unknown Approach to Scene			5932	0.11	0.32
	No	0	5256		
	Yes	1	676		
Duty Status of Officer			5932	0.04	0.18
	On Duty	0	5726		
	Off Duty	1	206		
Officer Used Back-Up			5932	0.25	0.43
	No	0	4432		
	Yes	1	1500		
Number of Officers			5932	2.52	1.81
OFFICER CHARACTERISTICS					
Officer Age			5932	32.4	6.57
White Officer			5932	0.77	0.42
	No	0	1394		
	Yes	1	4538		

Table 6 (cont'd)

Black Officer			5932	0.14	0.34
	No	0	5131		
	Yes	1	801		
Hispanic Officer			5932	0.08	0.26
	No	0	5490		
	Yes	1	442		
Other Race Officer			5932	0.03	0.16
	No	0	5781		
	Yes	1	151		
Officer Gender			5932	0.89	0.31
	Female	0	628		
	Male	1	5304		
Officer Demeanor toward Suspect			5932	0.01	0.08
	Not Antagonistic	0	5892		
	Antagonistic	1	40		
Prior Medical Attention to Officer			5932	0.1	0.3
	No	0	5327		
	Yes	1	605		
Number of Surveys Completed by Officer			5932	4.81	3.8
SUSPECT CHARACTERISTICS					
Suspect Age			5932	31.19	9.81
White Suspect			5932	0.39	0.49
	No	0	3638		
	Yes	1	2294		
Black Suspect			5932	0.45	0.5
	No	0	3271		
	Yes	1	2661		
Hispanic Suspect			5932	0.15	0.5
	No	0	5072		
	Yes	1	860		
Other Race Suspect			5932	0.02	0.14
	No	0	5815		
	Yes	1	117		
Missing Race Suspect			5932	0.04	0.2
	No	0	5678		
	Yes	1	254		

Table 6 (cont'd)

Suspect Gender			5932	0.8	0.4
	Female	0	1172		
	Male	1	4760		
Suspect Known to be Assaultive			5932	0.07	0.25
	No	0	5543		
	Yes	1	389		
Suspect Known to Carry Weapon			5932	0.05	0.21
	No	0	5655		
	Yes	1	277		
Suspect Known to be a Gang Member			5932	0.11	0.31
	No	0	5305		
	Yes	1	627		
Suspect is Intoxicated			5932	0.62	0.49
	No	0	2259		
	Yes	1	3673		
Victim is Stranger to Suspect			5932	0.51	0.5
	No	0	2886		
	Yes	1	3046		
Victim is Friend to Suspect			5932	0.27	0.44
	No	0	4340		
	Yes	1	1592		
Victim is Family to Suspect			5932	0.22	0.41
	No	0	4638		
	Yes	1	1294		
Victim has Unknown Relationship to Suspect			5932	0.5	0.5
	No	0	2985		
	Yes	1	2947		
No Bystanders Present			5932	0.56	0.5
	No	0	2626		
	Yes	1	3306		
Bystanders have Unknown Relationship to Suspect			5932	0.07	0.26
	No	0	5514		
	Yes	1	418		
Bystanders are Strangers to Suspect			5932	0.15	0.35
	No	0	5070		
	Yes	1	862		

Table 6 (cont'd)

Bystanders are Friends to Suspect			5932	0.15	0.35
	No	0	5055		
	Yes	1	877		
Bystanders are Family to Suspect			5932	0.08	0.27
	No	0	5463		
	Yes	1	469		
Suspect Demeanor toward Officer			5932	0.21	0.41
	Not Antagonistic	0	4694		
	Antagonistic	1	1238		
Suspect Physical Resistance			5932	0.12	0.33
	No	0	5211		
	Yes	1	721		

In addition to the Level-1 variables described in Table 6, the analyses of this dissertation make use of several Level-2 (i.e. neighborhood-level) independent variables. As discussed previously, the following variables were submitted to a factor analysis: (1) percent African-American population within the census tract; (2) density of individuals 17 years and younger within the census tract; (3) percent of individuals within the census tract living below the poverty level; (4) percentage of individuals over age 16 in the labor force who are unemployed within the census tract; (5) percentage of female-headed households within the census tract; and (6) percentage of individuals within the census tract receiving public assistance income.[79]

[79] Results of the factor analytic process can be found in Appendix B, which provides the correlation matrix for the six variables used in the process, the component matrix demonstrating factor loadings, and the traditional Kaiser-Meyer-Olkin and Bartlett's tests for measuring the adequacy of the factor analytic model.

Table 7: Sample Characteristics (Level-2 Independent Variables)

VARIABLE NAME	VALUE	N	MEAN	SD
Concentrated Disadvantage Factor Score		385	0	1
Index I Crime Rate (per 1,000 Census Tract Residents)		385	11.96	155.57
Census Tract Located in Colorado Springs, CO		385	0.12	0.33
	No	337		
	Yes	48		
Census Tract Located in the City of San Diego, CA		385	0.16	0.37
	No	323		
	Yes	62		
Census Tract Located in Dallas, TX		385	0.23	0.42
	No	296		
	Yes	89		
Census Tract Located in the County of San Diego, CA		385	0.16	0.37
	No	324		
	Yes	61		
Census Tract Located in Charlotte, NC		385	0.19	0.39
	No	312		
	Yes	73		
Census Tract Located in St. Petersburg, FL		385	0.14	0.34
	No	333		
	Yes	52		

Results

Having presented the sample characteristics for the data used in this dissertation, it is now appropriate to focus on the results of the multilevel analyses performed within the HLM 5.05 software package. The hierarchical linear modeling process enables the researcher to use a stage modeling procedure for linear regression models, such as that used for the dependent variable of maximum force. These results will be discussed first, followed by a discussion of the non-linear regression model for the dependent variable of physical force plus threats. It should be noted here that although results are presented in the following tables for the 6-site model as well as for all five sites individually, only the results for the 6-site model are discussed below. This is due to the fact that the results are generally consistent across all models, and thus model parsimony and issues of generalizability lead to a focus on the 6-site model.

Dependent Variable Analyses for Maximum Force:

As is appropriate for multilevel data, this dissertation used hierarchical linear modeling techniques to determine the effects of encounter-level and neighborhood-level variables on the dependent variable, maximum force. In order to estimate these effects properly and assess the utility of the hierarchical modeling process, HLM 5.05 allows the user to essentially engage in step-wise modeling of the dependent variable. The initial step in this procedure is to estimate an unconditional means model, which is equivalent to a one-way analysis of variance (ANOVA), for maximum force at the encounter level. This model includes the intercept for the encounter-level model as the only parameter (with the intercept of the Level-1 intercept, designated as G_{00}, as a Level-2 parameter)[80], effectively testing neighborhood variance in the mean level of maximum force. The unconditional means model provides this dissertation with several multilevel diagnostic statistics which are necessary for determining the

[80] Note that G_{00}, while included in the model, is rarely of interest as it only determines whether the grand intercept of maximum force is significantly different from zero.

validity of using a hierarchical model given the data. The first of these diagnostic statistics is the reliability estimate, which measures the average reliabilities across neighborhoods (i.e. the Level-2 units) to determine if the sample mean is a reliable indicator of the true neighborhood mean. This statistic is calculated as: $\lambda = T_{00}/[T_{00} + (\sigma^2/n_j)]$, where T_{00} is the neighborhood-level variance, σ^2 is the encounter-level variance, and n_j is the n^{th} arrest in the j^{th} neighborhood. The reliability estimate obtained for maximum force ($\lambda = .67$) indicates that using HLM with these data would result in modeling neighborhood-level effects with a high degree of precision.

The second diagnostic statistic provided by the unconditional means model is that of the intraclass correlation coefficient (ICC), which must be manually calculated as: $\rho = T_{00}/(T_{00} + \sigma^2)$, where T_{00} is the variance component of the neighborhood mean, and σ^2 is the variance component of the Level-1 effect. For the maximum force model, the ICC was .17, indicating that 17% of the total variance of maximum force is between neighborhoods. While this is a large enough proportion of the variance to be of interest, Terrill and Reisig (2003: 305) correctly note that the question remains as to whether there is enough variation in maximum force between neighborhoods to accurately model as a function of Level-2 variables (i.e. neighborhood characteristics). This question is answered by the Chi-square statistic ($X^2 = 1648.59$), which is statistically significant ($p < .000$) for the unconditional means model. This result allows us to reject the null hypothesis of no difference in maximum force between neighborhoods. Taken together, the reliability estimate, intraclass correlation coefficient, and Chi-square value clearly indicate that the data is amenable to HLM analyses.

After determining that the data are amenable to HLM analyses, the final step is to estimate the full model. The latter, then, predicts maximum force from all of the Level-1 (i.e. encounter-level) variables and Level-2 (i.e. neighborhood-level) variables, with special attention paid to the cross-level interactions between neighborhood characteristics and officer race, neighborhood characteristics and suspect race, and neighborhood characteristics and suspect demeanor. This full model, described as an intercepts-and-slopes-as-outcomes model, also provides us with several diagnostic statistics. The first of these is the test of homogeneity of Level-1 variance, which determines if estimates are biased due to homogeneous Level-1 coefficients. The Chi-square statistic provided by HLM ($X^2 = 49.02$) is statistically significant ($p < .000$), indicating that the data are not homogeneous, and thus there is significant variation between neighborhoods. Further confirmation is provided by the summary of model fit which provides a comparison between homogeneous and heterogeneous variances. The Chi-square statistic for this diagnostic test ($X^2 = 1112.04$) is also statistically significant ($p < .000$), indicating that the model with heterogeneous variance is preferable. Accordingly, the parameter estimates and standard errors reported here are from the latter model. As noted throughout this dissertation, the effects of officer race, suspect race and suspect demeanor are hypothesized to vary between neighborhoods for a variety of theoretical reasons. The final diagnostic statistic is the Chi-square of the variance component estimates for these random effects. The Chi-square for Black officers is not statistically significant ($X^2 = 1.59$; $p > .500$), nor is the Chi-square for officers of the "Other" racial category significant ($X^2 = 7.97$; $p > .500$). However, the Chi-square value for Hispanic officers is significant ($X^2 = 9.38$; $p = .050$). With respect to suspect race, the Chi-square value for Black suspects ($X^2 = 14.66$; $p = .006$) is significant, while the Chi-square values for Hispanic suspects ($X^2 = 7.13$; $p = .128$) and suspects of the "Other" ($X^2 = 7.58$; $p = .107$) or "Missing" ($X^2 = 5.92$; $p = .204$) racial category are not significant. Finally, the Chi-square value for suspect demeanor ($X^2 = 28.67$; $p < .000$) is significant. These results allow us to reject the null hypothesis that there is no significant variation among the slopes. This confirms that these Level-1 independent variables are appropriately modeled as having slopes that vary randomly with respect to the Level-2 independent variables of interest.

As the validity of the full model with two Level-1 random effects has been determined through a number of diagnostic statistics, Table 8 presents the results of the HLM analyses for the appropriate model.

Table 8: Full Model for Maximum Force

VARIABLE	6-SITE MODEL	SD	CMPD	CSPD	DPD	SPPD
Level-1						
Intercept	**25.49***	**29.04***	**21.59***	**20.30***	**24.98***	**32.97***
NATURE OF THE LOCATION						
Location known for criminal activity	**0.39***	-0.1	-0.08	0.14	0.54	0.28
Location known to be hazardous	-0.08	0.17	0.74	**2.29***	-0.52	0.25
Incident took place inside	0.13	-0.35	0.21	**1.15***	**1.16***	0.09
Visibility	**-0.14***	-0.12	-0.11	**-.23***	-0.1	**-.18***

Table 8 (cont'd)

NATURE OF THE ENCOUNTER						
Violent offense	**0.72***	**1.19***	0.83	**1.72***	-0.16	**.88***
Incident took place on a weekend	0.15	0.08	0.28	0.06	0.83	-0.36
Bystander demeanor	-0.03	0.67	-1	0.26	0.12	0.41
Number of suspects	-0.01	**0.38***	0.22	0.27	**.40***	**-.41***
POLICE MOBILIZATION						
Suspect already in custody	-0.36	-0.98	**-1.40***	0.21	**-1.68***	-0.17
Citizen-initiated incident	0.26	0.42	0.62	0.07	-0.16	0.48
Police-initiated incident	0.20	-0.4	**1.38***	0.87	0.28	0.07
Other initiation to incident	-0.41	**-1.59***	**-4.45***	-0.19	0.1	-0.49
Priority approach to incident	**1.14***	**1.82***	**2.38***	0.37	**1.69***	0.62
Lights and sirens approach to incident	**1.22***	**1.79***	0.49	1.41	**1.84***	**1.25***
Other non-routine approach to incident	-0.22	0.1	1.16	**-2.47***	-0.01	0.01
Officer off-duty	**1.08***	-0.7	0.11	1.52	1.69	**-1.73***
Officer called for back-up	**1.05***	**1.31***	**1.31***	1.19	**1.14***	**1.15***
Number of officers	**0.72***	**.54***	**.53***	1.63	**.34***	**.58***
OFFICER CHARACTERISTICS						
First officer age	**-.06***	-0.02	-0.02	-0.04	-0.03	**-.08***
African-American officer	-0.20	-0.37	-0.26	-0.9	-0.14	0.18
Hispanic officer	-0.38	0.45	**-7.35***	-1.6	0.73	-1.34
Other officer race	1.32	1.11	**12.41***	-0.21	-2.2	1.57
Male officer	**0.56***	0.14	0.78	1.33	0.55	0.32
Officer demeanor toward suspect	2.12	-1.51	4.53	-2.27	**3.87***	**5.60***
Officer received prior medical attention	0.33	-0.44	**2.76***	1.05	-0.56	0.61
Number of surveys completed	-0.02	-0.03	0.14	-0.008	0.07	-0.028
SUSPECT CHARACTERISTICS						
Suspect age	-0.02	0.002	-0.03	0.02	-0.02	-0.02
African-American suspect	.09	-0.91	0.54	0.08	-0.33	**.72***
Hispanic suspect	0.54	0.28	#	0.62	0.01	0.28
Other suspect race	0.60	-0.2	2.64	0.37	-1.95	1.42
Missing suspect race	-0.02	-2.75	#	0.07	0.93	-1.18
Male suspect	**0.93***	-0.1	**1.41***	0.7	**1.14***	**1.20***
Suspect believed to be assaultive	0.26	0.11	-0.51	-0.28	-0.36	0.11
Suspect known to carry weapon	**1.65***	**3.83***	0.98	**7.20***	2.31	1.24
Suspect known to be a gang member	0.52	-0.51	0.5	1.87	-1.25	**-1.54***

Table 8 (cont'd)

Suspect intoxicated	0.29	0.08	0.47	0.54	0.55	0.53
Victim is friend to suspect	**-0.59***	-0.17	**-1.42***	0.21	-0.99	**-.69***
Victim is family to suspect	**-0.51***	**-1.33***	**-1.88***	-0.97	-0.55	-0.45
Victim has unknown relationship to suspect	-0.13	0.1	-0.98	-0.78	0.42	-0.13
Bystanders have unknown relationship to suspect	0.74	-0.01	1.47	-2.32	1.97	-0.29
Bystanders are strangers to suspect	**0.44***	**1.22***	0.63	0.76	0.56	-0.29
Bystanders are friends to suspect	0.23	0.77	0.54	0.21	0.51	-0.22
Bystanders are family to suspect	0.01	0.59	0.17	-0.11	0.89	-0.44
Suspect demeanor toward officer	**1.61***	0.79	0.2	**5.49***	**1.63***	**.98***
Suspect uses physical force	**5.92***	**5.82***	**8.67***	**10.20***	**8.09***	**1.33***
Level-2						
Colorado Springs, CO	#	#	#	#	#	#
Charlotte, NC	0.30	#	#	#	#	#
Dallas, TX	**3.77***	#	#	#	#	#
St. Petersburg, FL	**10.32***	#	#	#	#	#
San Diego, CA	**4.44***	#	#	#	#	#
Violent crime rate	-0.0005	-0.0002	-0.0003	**.17***	0.000002	**-.10***
Concentrated disadvantage	-0.05	0.03	-0.87	-0.22	0.39	0.51
Spatial Error Term	-0.04	**-1.14***	0.23	0.54	-0.07	-0.39
Interaction Effects						
African-American officer ** Concentrated Disadvantage	0.30	-0.04	1.08	1.90	0.14	-0.29
Hispanic officer ** Concentrated Disadvantage	-0.07	0.09	-3.32	0.37	-0.83	-0.001
Other officer race ** Concentrated Disadvantage	0.19	-0.62	-3.79	-1.20	-1.30	0.71
African-American suspect ** Concentrated Disadvantage	0.12	0.42	0.75	1.08	0.22	-0.09
Hispanic suspect ** Concentrated Disadvantage	0.16	0.13	#	0.50	-0.13	0.07
Other suspect race ** Concentrated Disadvantage	-0.06	0.21	-1.64	1.41	0.47	-1.95
Missing suspect race ** Concentrated Disadvantage	0.46	1.24	#	-0.31	-0.40	2.36
Suspect demeanor toward officer ** Concentrated Disadvantage	0.002	0.001	-0.0003	**-0.40***	0.00008	0.04
Suspect demeanor toward officer ** Violent Crime Rate	0.003	0.29	0.04	-1.34	0.03	0.33

* $p < .05$ # variable removed from model

Significant Findings from the Maximum Force Model

The coefficients presented in Table 8 represent some interesting findings concerning the predictors of the maximum level of force used by police officers during arrest situations. The intercept, that is, the level of maximum force when all other variables are constrained to be null, is 25.49 which falls between "officer verbally threatens suspect" and "officer pushes suspect" on the maximum force ranking. With respect to neighborhood-level variables, the dummy-coded variables for PUF study site predict that, relative to Colorado Springs, CO, the four other study sites experience significantly higher levels of maximum force (Charlotte, NC = .30; Dallas, TX = 3.77; St. Petersburg, FL = 10.32; San Diego, CA = 4.44). Clearly, the most notable of these effects is for the St. Petersburg, FL police department, which had a level of maximum force 10.32 points higher than Colorado Springs on the force ranking, equivalent to an average maximum force of 35.81 (falling between "officer uses other tactic" and "officer displays chemical agent"). More importantly, in the context of this dissertation's hypotheses, the coefficients for the Index I crime rate (-.001) and concentrated disadvantage (-.05) were not statistically significant at the .05 level, nor was the spatial error variable (-.04). These findings demonstrate that neighborhood characteristics which represent social disorganization (e.g. high levels of crime, high levels of concentrated disadvantage) do not, in and of themselves, increase the average level of maximum force between neighborhoods, controlling for all encounter-level independent variables.

With respect to the encounter-level variables used in this dissertation, the HLM analyses provide some interesting findings as well. With respect to those encounter-level variables representing the nature of the arrest location, there are several significant predictors of maximum force. The coefficient for a known criminal location (.40) was statistically significant, demonstrating that as an officer's sense of safety diminishes, there is a predicted increase in the average level of maximum force. This is bolstered by the coefficient for visibility at the arrest location (-.14), which predicts that as visibility improves (thereby potentially increasing an officer's sense of safety), the average level of maximum force decreases. However, the coefficient for the arrest occurring inside (.13) and for a known hazardous location (-.08) were both not statistically significant.

There were also several encounter-level variables which focused on the nature of the encounter that were found to be statistically significant. The coefficient for whether the arresting offense was a violent crime (.72) was statistically significant, again demonstrating the idea that an officer's concerns regarding personal safety predict higher levels of force. The coefficients for the remaining variables related to the nature of the encounter were not statistically significant. Thus, whether the offense occurred on a weekend (.15), the demeanor of bystanders toward the police (-.03), and the number of suspects (-.01) did not have a significant effect on the maximum level of force used during the encounter.

The next grouping of variables is concerned with how the police officers were mobilized, approached the situation, and responded to the situation from an organizational standpoint. The coefficient for the custody status of the suspect (-.36) was negative, predicting that when a suspect is already in custody when an officer arrives, the average level of maximum force decreases relative to when the suspect is not already in custody, but was not statistically significant. With regards to how the officers came to be involved in the encounter, the coefficients for citizen initiation of the encounter (.26), officer initiation of the encounter (.20) and an unknown method of mobilization (-.41) were not statistically significant. Regarding the officers' actual approach to the encounter, a priority approach (1.14) and the use of lights and sirens (1.22) were both statistically significant predictors of an increase in the maximum level of force, while the coefficient for an unknown (non-routine) approach to an encounter (-.22) was not statistically significant. The duty status of the officer (1.08) was a significant predictor of the level of force used in an encounter, predicting that officers on duty experience increased levels of force. In addition, the use of back-up officers (1.05) and the total number of officers at the encounter (.72) were both statistically significant, again predicting that when an officer fears for their safety the level of force used increases.

Within the maximum force model, the HLM analyses also revealed several significant officer characteristics. The coefficient for officer age (-.06) was negative and statistically significant, predicting that older officers use a lower level of average maximum force across neighborhoods. With respect to officer race, the coefficients for Black officers (-.20), Hispanics officers (-.38), and officers of the "Other" racial category (1.33) were not statistically significant, indicating that the race of the officer did not have an effect on the average level of maximum force. However, the coefficient for male officers (.56) was statistically significant, thus predicting that male officers use higher levels of maximum force than female officers. Finally, the coefficients for officer demeanor toward the suspect (2.12), whether or not the officer had received prior medical attention (.33), and the total number of surveys completed by the officer (-.02) were not statistically significant, with the latter two demonstrating that an officer's activity level was not related to their levels of maximum force.

In regards to suspect characteristics, there are several significant predictors of maximum force. The coefficient for the suspect's age (-.02) was not significant. More importantly, the coefficients for a Black suspect (.09), a Hispanic suspect (.54), a suspect in the "Other" racial category (.60), and a suspect of unknown race (-.03) were also not statistically significant, indicating that a suspect's age and race do not have an effect on the maximum level of force used during an encounter. However, the coefficient for a male suspect (.93) was statistically significant, predicting that male suspects have a higher level of maximum force used against them than do female suspects. Other suspect characteristics were also found to have a statistically significant effect on the average level of maximum force used in an encounter. In particular, if a suspect was known to carry a weapon (1.65), was a statistically significant predictor of the maximum level of force, while if the suspect was intoxicated (.29), if the suspect was believed to be assaultive (.26), and if a suspect was known to be a gang member (.52) were not statistically significant. In terms of their relationships to victims and bystanders at the encounter, the coefficients for a suspect and victim who were friends (-.59), a suspect and victim who were family (-.51), and a suspect and bystanders who are strangers (.44) were all statistically significant predictors of the maximum level of force. Specifically, relative to a suspect and victim who were strangers, if the suspect and victim were friends or family, there was a predicted decrease in the average level of maximum force. If the suspect and the bystanders were strangers, however, there was a predicted increase in the average level of maximum force used in the encounter. One should also note that the coefficients for a suspect and victim with an unknown relationship (-.13), a suspect and bystanders with an unknown relationship (.74), a suspect and bystanders who are friends (.23), and a suspect and bystanders who are family (.01) were not statistically significant. Most importantly in the context of this dissertation, the coefficients for suspect demeanor (1.61) and suspect physical resistance (5.92) represent relatively large effect sizes, indicating that these characteristics are predicted to exert the largest effects on the average level of maximum force between neighborhoods.

The cross-level interactions in which Level-1 variables were allowed to vary randomly across neighborhoods provided the main impetus for this dissertation, and the HLM analyses again prove instructive. The effects of officer race were allowed to vary across neighborhoods, and these interactions are examined here. The coefficients for officer race were .30 (Black officers – concentrated disadvantage), -.07 (Hispanic officers – concentrated disadvantage), and .19 ("Other" racial category officers – concentrated disadvantage). None of the coefficients for the interaction between officer race and concentrated disadvantage reached statistical significance, indicating that officer race does not have a significant effect on the average level of maximum force used across different types of neighborhoods. The second variable which was allowed to vary randomly was suspect race, and this was examined in a cross-level interaction with the measure of concentrated disadvantage. The coefficients for these interactions were .12 (Black suspects – concentrated disadvantage), .16 (Hispanic suspects – concentrated disadvantage), -.06 ("Other" racial category suspects – concentrated disadvantage), and .46 ("Unknown" racial category suspects – concentrated disadvantage), none of which reached statistical significance, indicating that suspect race does not have a significant effect on the average level of maximum force used across different types of neighborhoods. With respect to suspect demeanor, two cross-level interactions were examined: (1) the effects of suspect demeanor in high-crime neighborhoods, as measured by the Index I crime rate; and (2) the effects of suspect demeanor in neighborhoods high in concentrated disadvantage. The coefficients for these two cross-level interactions were .002 (for suspect demeanor – Index I crime rate) and .003 (for suspect demeanor – concentrated disadvantage), neither of which reached statistical significance, thereby indicating that suspect demeanor, although properly modeled as a random effect, does not have a significant effect on the average level of maximum force across different types of neighborhoods.

Dependent Variable Analyses for Physical Force plus Threats:

Consistent with regression techniques for dichotomous dependent variables, this dissertation used a subset of HLM analyses known as hierarchical generalized linear modeling (HGLM) to estimate the model with the dependent variable of physical force plus threats. The latter technique was used, as the use of the standard HLM model would be inappropriate for the following reasons: (1) given a binary outcome measure (i.e. force vs. no force), the random effect can take on only one of two values, and thus cannot be normally distributed; (2) the random effect cannot have homogeneous variance, as it depends upon the predicted values; and (3) effect sizes would be uninterpretable, as there are no restrictions on predicted values in the standard model but due to the presence of a binary variable there can be no values less than zero or greater than one (Bryk and Raudenbush 1992). In the output produced by HLM, therefore, the OLS estimates and the estimates from the linear model with the identity link function can be ignored, as there is no meaningful interpretation of linear model results for a dichotomous dependent variable (Gaitanis, 2003).

For all analyses regarding this dependent variable, coefficients and other statistics were taken from the unit-specific model with the logit link function. The latter contains the random effect from the level-2 model, and is therefore a prediction of the prevalence of force in a neighborhood typical of the independent variables in the model. Unit-specific models, then, are more appropriate in situations where the researcher is interested in the unique effects of level-2 units (i.e. neighborhoods) on the dependent variable. As the focus of this dissertation is the effects of neighborhood characteristics on the severity and prevalence of force, unit-specific models are used.[81]

As with the previous dependent variable, HLM was again used to produce an unconditional means model for the physical force plus threats dependent variable.[82] In the unconditional means model, the reliability estimate for the intercept was .192. As Gaitanis (2003: 10) notes, within HGLM analyses, a low reliability coefficient in the unconditional model indicates that the model is an insufficient predictor of the outcome variable, and is insufficient to explain variation in the dependent variable of physical force plus threats. Thus, a full model is tested, with predictors at both Level-1 (arrest encounters) and Level-2 (neighborhoods). This model is estimated with a random effect term in the Level-2 equation, which implies that the effect of Level-1 variables (specifically, officer race, suspect race and suspect demeanor) vary depending on the Level-2 unit (i.e. the specific type of neighborhood) being considered. Unlike the basic HLM model, the full model tested in HGLM does not produce diagnostic statistics which can be used to assess the appropriateness of the model. However, Bryk and Raudenbush (1992) note that the deviance statistic is often used as a proxy for a goodness-of-fit statistic in HGLM, and the magnitude of the current deviance statistic (4017.40) indicates that the full model is preferable to the

[81] The population-average model, in contrast, would be used where the researcher is interested in obtaining results that have maximum generalizability to all possible level-2 units (i.e. all possible neighborhoods). Note that the population-average model is less efficient when the full model with random variables within the nonlinear function is the correct model, as is the case here.

[82] Note that the dependent variable was modeled as a Bernoulli distribution, used to indicate a binary model where the outcome is only measured once, as force was only measured as having occurred at any point during the arrest and therefore was only measured one time per arrest encounter.

unconditional model.[83] In addition, based on the previous reliability estimate for the model which did not include Level-2 predictors, coupled with the fact that HGLM is the most appropriate statistical technique to test the full model, we can be reasonably certain in stating that the results obtained through the HGLM analyses represent the most accurate model description for the dependent variable of physical force plus threats. Therefore, Table 9 presents the results of the HGLM analyses for the full (i.e. intercepts and slopes as outcomes) model.

Table 9: Full Model for Physical Force Plus Threats

VARIABLE	6-SITE MODEL	SD	CMPD	CSPD	DPD	SPPD
Level-1						
Intercept	**0.01***	**0.05***	**0.02***	**0.04***	**0.07***	**0.01***
NATURE OF THE LOCATION						
Location known for criminal activity	1.17	1.29	0.92	1.09	1.03	**1.54***
Location known to be hazardous	0.97	0.65	1.13	1.13	0.85	1.20
Incident took place inside	1.02	0.69	0.78	0.93	1.30	1.37
Visibility	**0.96***	0.98	0.97	0.97	0.97	0.96
NATURE OF THE ENCOUNTER						
Violent offense	**1.34***	1.59	1.42	1.11	0.86	1.15
Incident took place on a weekend	1.15	0.95	1.10	1.11	1.26	1.09
Bystander demeanor	1.17	1.18	0.94	0.62	1.70	**1.80***
Number of suspects	1.00	1.17	1.08	1.03	1.05	**0.80***

[83] The deviance statistic is calculated as $D_1 - D_2$, which approximates by X^2 $(P_2 - P_1)$, where D_1 = -2log Likelihood for Model 1 and D_2 = -2log Likelihood for Model 2.

Table 9 (cont'd)

POLICE MOBILIZATION						
Suspect already in custody	**0.63***	0.66	0.81	0.74	**.51***	0.69
Citizen-initiated incident	1.23	1.82	0.99	1.54	0.71	0.68
Police-initiated incident	**1.48***	1.37	**1.88***	1.26	0.77	**1.69***
Other initiation to incident	1.04	**.48***	2.02	1.20	1.05	0.95
Priority approach to incident	**1.61***	**2.60***	**2.27***	1.05	1.35	**1.66***
Lights and sirens approach to incident	**1.41***	1.59	0.68	1.48	1.36	1.34
Other non-routine approach to incident	**1.45***	**1.87***	1.52	0.97	1.15	1.46
Officer off-duty	1.21	0.90	2.01	1.00	1.30	0.90
Officer called for back-up	**1.69***	**1.72***	**1.58***	1.31	1.30	**1.70***
Number of officers	**1.16***	**1.13***	**1.09***	**1.23***	1.03	**1.13***
OFFICER CHARACTERISTICS						
First officer age	0.99	0.99	0.99	1.00	0.99	0.99
African-American officer	1.06	0.83	**1.92***	0.76	1.29	1.08
Hispanic officer	**1.72***	1.67	1.10	1.53	**2.08***	0.42
Other officer race	1.32	1.60	4.15	1.47	0.07	3.51
Male officer	**2.02***	0.71	1.36	1.56	1.31	**4.78***
Officer demeanor toward suspect	1.77	0.39	**7.25***	0.86	0.87	6.97
Officer received prior medical attention	**1.34***	0.92	**2.63***	1.41	0.86	**1.54***
Number of surveys completed	1.00	0.96	1.03	0.98	1.00	1.00
SUSPECT CHARACTERISTICS						
Suspect age	1.00	0.99	0.99	1.00	1.00	0.99
African-American suspect	1.09	1.54	1.27	1.31	**.55***	0.93
Hispanic suspect	1.13	1.24	#	0.92	0.72	1.97
Other suspect race	1.35	1.38	4.15	2.74	1.51	1.32
Missing suspect race	1.46	0.00	#	1.29	1.66	1.88
Male suspect	**1.47***	1.27	**1.89***	0.99	1.34	1.32
Suspect believed to be assaultive	1.03	1.24	0.85	1.82	0.77	1.00
Suspect known to carry weapon	**1.91***	**3.51***	1.6	**3.40***	**2.71***	1.36
Suspect known to be a gang member	0.93	0.92	1.32	0.86	0.32	0.75
Suspect intoxicated	**1.35***	0.99	1.07	1.32	1.14	**1.72***
Victim is friend to suspect	0.93	0.99	**.64***	1.15	0.99	0.9
Victim is family to suspect	1.00	**.52***	1.23	0.78	0.92	1.18
Victim has unknown relationship to suspect	0.97	0.97	0.85	0.80	1.13	0.96
Bystanders have unknown relationship to suspect	**1.71***	0.94	**2.33***	0.76	1.44	1.74

Table 9 (cont'd)

Bystanders are strangers to suspect	**1.30***	**2.14***	**1.77***	1.12	1.03	1.25
Bystanders are friends to suspect	1.16	1.41	1.3	1.35	1.00	1.09
Bystanders are family to suspect	1.30	1.57	1.47	1.19	0.89	1.29
Suspect demeanor toward officer	**2.50***	**2.35***	**2.48***	**3.16***	**1.95***	**2.46***
Suspect uses physical force	**10.35***	**13.65***	**7.18***	**10.56***	**8.38***	**8.95***
Level-2						
Colorado Springs, CO	#	#	#	#	#	#
Charlotte, NC	1.18	#	#	#	#	#
Dallas, TX	0.73	#	#	#	#	#
St. Petersburg, FL	1.31	#	#	#	#	#
San Diego, CA	0.99	#	#	#	#	#
Violent crime rate	1.00	1.00	1.00	**1.05***	1.00	0.96
Concentrated disadvantage	1.10	1.14	0.76	0.96	1.17	1.53
Spatial Error Term	0.95	0.66	1.04	0.85	1.04	0.83
Interaction Effects						
African-American officer ** Concentrated Disadvantage	1.15	0.90	1.03	1.68	1.11	1.06
Hispanic officer ** Concentrated Disadvantage	0.95	**1.63***	0.24	0.80	1.04	1.08
Other officer race ** Concentrated Disadvantage	1.02	0.79	1.46	1.49	1.05	0.75
African-American suspect ** Concentrated Disadvantage	0.96	0.82	1.29	1.30	0.92	0.78
Hispanic suspect ** Concentrated Disadvantage	0.88	0.80	#	1.04	0.83	1.33
Other suspect race ** Concentrated Disadvantage	0.58	0.62	1.33	1.10	0.31	0.31
Missing suspect race ** Concentrated Disadvantage	1.00	9.50	#	0.99	0.89	0.46
Suspect demeanor toward officer ** Concentrated Disadvantage	1.00	1.00	1.00	0.91	1.00	1.06
Suspect demeanor toward officer ** Violent Crime Rate	0.92	1.22	0.88	0.86	1.20	0.82

*p < .05 # variable removed from model due to multicollinearity

Significant Findings from the Physical Force Plus Threats Model

The coefficients presented in Table 9, which represent the coefficients and log-odds for each variable, present some interesting findings concerning the predictors of the use of physical force or threats of physical force by police officers during arrest situations. The intercept, that is, the odds of force for a reference arrest encounter (i.e. one with zeroes on all of the independent variables) in a reference neighborhood (i.e. one with a mean of zero and random effects of zero), is .01, predicting that a reference arrest encounter is 99% less likely to contain a use of force behavior by an officer. It should be noted here that the percentages presented in discussion of the odds ratios represent an increase or decrease in relation to the base rate for the reference category of that variable, rather than an absolute increase or decrease. Thus, with respect to neighborhood-level variables, the dummy-coded variables for PUF study site predict that, relative to Colorado Springs, CO, arrest encounters in Dallas, TX were 27% less likely (.73) and in San Diego, CA were 1% less likely (.99) to have force used within them, while arrest encounters in Charlotte, NC (1.18, or 18% more likely), and St. Petersburg, FL (1.31, or 31% more likely), were more likely to have force used within them, although none of these provided a statistically significant effect. In relation to this dissertation's hypotheses on neighborhood effects, neither the log-odds for the Index I crime rate (1.00, or equally likely) or concentrated disadvantage (1.09, or 9% more likely) were statistically significant, nor was the log-odds for the spatial error term (.95, or 5% less likely). As with the previous dependent variable, these results indicate that neighborhood characteristics representing social disorganization do not, in and of themselves, predict increased use of force behavior in arrest encounters.

Regarding the effects of individual-level variables, analysis of the HGLM results again provide us with some interesting findings. It is important to note that these results are interpreted as the effects of a particular variable on the prevalence of force for a reference arrest (i.e. zeroes on all other independent variables) in any neighborhood. The first group of independent variables represents the nature of the arrest location, and three of the latter were not statistically significant. The log-odds for a known criminal location was 1.17 (17% more likely to have force used within the encounter), while the log-odds for a known hazardous location was .97 (3% less likely). In addition, the log-odds for an arrest occurring inside was 1.02 (2% more likely). The only statistically significant variable related to the nature of the arrest location was for the visibility at the arrest location (.96, or 4% less likely), which predicts that as visibility decreases force is less likely to be used during an encounter.

The second group of independent variables is that which focuses on the nature of the encounter. Again we note that the majority of these variables were not found to have a statistically significant effect. The log-odds for the crime occurring on a weekend (1.15, or 15% more likely), the demeanor of bystanders toward the officer (1.17, or 17% more likely), and the total number of suspects within the encounter (1.00, or equally likely) all predicted an increase in the prevalence of force, but none of these results were statistically significant. The only statistically significant variable related to the nature of the encounter was for a violent criminal offense (1.34, or 34% more likely), which predicts that an arrest encounter for a violent crime is more likely to have force used within that encounter than is an arrest encounter for a non-violent crime.

The next group of variables is concerned with how police officers were mobilized, approached the situation, and responded to the situation from an organizational standpoint. Within this subset of individual-level variables there were several independent variables which were not statistically significant. These included whether the encounter was initiated by the citizen (1.23, or 23% more likely), unknown initiation to the encounter (1.04, or 4% more likely), and the duty status of the officer (1.21, or 21% more likely). However, a large proportion of this subset of variables was statistically significant. The log-odds for the custody status of the suspect was .63, predicting that an arrest encounter with a suspect already in custody was 37% less likely to have force used within that encounter compared to an arrest encounter where the suspect was not in custody when the officer arrived. If the encounter was initiated by the police officer, the log-odds of force was 1.48, predicting that force was 48% more likely than in an arrest encounter where the officer was dispatched to the scene. If the officer engaged in a priority approach (i.e. above normal speeds) to the encounter, the log-odds of force was 1.61, predicting that force was 61% more likely than in an arrest encounter where the officer engaged in a routine approach. If the officer engaged in an approach with lights and sirens, the log-odds of force was 1.41, predicting that force was 41% more likely than in an encounter where the officer engaged in a routine approach. In addition, if the approach of the officer was unknown (non-routine), the log-odds of force was 1.45, predicting that force was 45% more likely than in an arrest encounter where the officer engaged in a routine approach. The log-odds for an officer's use of back-up officers was 1.69, predicting that force was 69% more likely in an arrest encounter where the officer called for back-up. Finally, the log-odds for the number of total officers at the scene was 1.16, predicting that for each increase in the number of officers, the use of force was 16% more likely. It should be noted here that all of the statistically significant independent variables in the nature of mobilization subset are related to an officer's perceived safety responding to, or during, an arrest encounter.

HGLM analyses also revealed several interesting findings regarding officer characteristics. The log-odds for officer age was .99, predicting that for each one year increase in officer age, force is 1% less likely in an arrest encounter. In addition, the log-odds for the number of surveys completed by the officer (a proxy for officer activity) was 1.00, predicting that for each additional survey the officer had completed, force was equally likely to be used in that arrest encounter. However, neither of these variables reached statistical significance, nor did officer demeanor (1.77 or 77% more likely when an officer was antagonistic toward the suspect), a somewhat surprising result. Of those officer characteristics that did reach statistical significance, the log-odds for an officer having received prior medical attention due to a law enforcement-related injury was 1.34, predicting that officers who had received prior medical attention were 34% more likely to use force within an arrest encounter than an officer who had never received medical attention for a job-related injury. In addition, the log-odds for a male officer was 2.02, predicting that male officers are twice as likely (102%) than female officers to use force within an arrest encounter. With regards to officer race, the log-odds for a Black officer (1.06, or 6% more likely), and officer of the "Other" racial category (1.32, or 32% more likely) were not statistically significant. However, the log-odds for Hispanic officers (1.72) were statistically significant, predicting that Hispanic officers are 72% more likely to use force relative to White officers.

As with officer characteristics, the analyses of suspect characteristics reveal numerous independent variables which were not statistically significant. Of the suspect's demographic characteristics, the log-odds for suspect age (1.00, or equally likely), a Black suspect (1.09, or 9% more likely), a Hispanic suspect (1.13, or 13% more likely), a suspect of the "Other" racial category (1.35, or 35% more likely), and a suspect of unknown race (1.46, or 46% more likely) were not statistically significant. Of the independent variables dealing with the suspect's behavior, the log-odds for a suspect believed to be assaultive (1.03, or 3% more likely) and a suspect believed to be a gang member (.90, or 10% less likely) were not statistically significant. Finally, of those independent variables related to the suspect's relationships, the log-odds for a suspect and victim who are friends (.93, or 7% less likely), a suspect and victim who are family (1.00, or equally likely), a suspect and victim with an unknown relationship (.97, or 3% less likely), a suspect and bystanders who are friends (1.16, or 16% more likely), and a suspect and bystanders who are family (1.30, or 30% more likely) were not statistically significant. However, there were numerous suspect characteristics which did reach the level of statistical significance. The log-odds for a male suspect was 1.47, predicting that force was 47% more likely to be used against a male suspect than against a female suspect. The log-odds for a suspect who was known to carry a weapon was 1.91, predicting that force was 91% more likely to be used in an arrest encounter where the suspect is known to carry a weapon than in an arrest encounter where the suspect is not known to carry a weapon. The log-odds for suspect sobriety was 1.35, predicting that suspects who were intoxicated (through the use of either alcohol or drugs) were 35% more likely to have forced used against them than suspects who were sober. Of the relationship variables, the log-odds for a suspect and bystanders with an unknown relationship (1.71, or 71% more likely), and a suspect and bystanders who are strangers (1.43, or 43% more likely) were statistically significant, predicting that when there are bystanders present who are strangers, or have an unknown relationship, to the suspect, force is more likely than in an arrest encounter where no bystanders are present. Finally, regarding overt suspect behavior toward the officer, the log-odds for suspect demeanor was 2.50, predicting that when a suspect is antagonistic toward the officer, force is 150% (two and a half times) more likely to be used than in arrest encounter where the suspect is not antagonistic. In addition, the log-odds for physical resistance on the part of the suspect was 10.35, predicting that when a suspect provides physical resistance to the officer, force is 935% (slightly under ten and a half times) more likely to be used than in arrest encounter where the suspect does not provide physical resistance to the officer.

The cross-level interactions in which Level-1 independent variables were allowed to vary randomly across neighborhoods provided the main research questions for this dissertation, and the HGLM analyses illuminate several interesting phenomena. It is important to note here that these parameters represent the effects of the Level-2 unit (i.e. neighborhood characteristic) on the effect of the Level-1 unit (i.e. individual-level independent variable) on the log-odds of force. The effects of officer race were allowed to vary across neighborhoods, and these interactions are examined here. The log-odds for a Black officer-concentrated disadvantage interaction (1.15, or 15% more likely), and an officer of the "Other" racial category-concentrated disadvantage interaction (1.02, or 2% more likely), were not statistically significant. However, the log-odds for a Hispanic officer-concentrated disadvantage interaction (.95) were statistically significant, predicting that for every one unit increase in the measure of concentrated disadvantage, Hispanic officers are 23% more likely to use force in an arrest encounter than are White officers in those same neighborhoods. The second variable which was allowed to vary randomly was suspect race, and this was examined in a cross-level interaction with the measure of concentrated disadvantage. The log-odds for a Black suspect-concentrated disadvantage interaction (.96, or 4% less likely), a Hispanic suspect-concentrated disadvantage interaction (.88, or 12% less likely), a suspect of the "Other" racial category-concentrated disadvantage (.58, or 42%

less likely), and a suspect of unknown race-concentrated disadvantage interaction (1.00, or equally likely) were all not statistically significant. Finally, with respect to suspect demeanor, cross-level interactions were examined with both the Index I crime rate and the degree to which the neighborhood displays concentrated disadvantage. The log-odds for the suspect demeanor-Index I rate interaction was 1.00, predicting that force was no more or less likely in high-crime neighborhoods for suspects who were antagonistic than for suspects in those same neighborhoods who were not antagonistic, but this result was not statistically significant. The log-odds for the suspect demeanor-concentrated disadvantage was .92, predicting that for every one-unit increase in concentrated disadvantage within the neighborhood, antagonistic suspects are 8% less likely to have force used against them than suspects who are not antagonistic and are arrested in those same neighborhoods, but once again this result was not statistically significant.

Summary

Throughout this dissertation several hypotheses were presented relating to the effects of officer race, suspect race and suspect demeanor on police use of force in varying types of neighborhoods. Analysis of the results from the HLM and HGLM models reveals that of the five hypotheses tested, none were confirmed within the 6-site model. Although it had been hypothesized that officers would use more force in neighborhoods high in concentrated disadvantage, this was not the case for the maximum force or the physical force plus threats dependent variable. In fact, this hypothesis was not supported in either the 6-site model or across any of the individual sites for either dependent variable. Similarly, the hypothesis concerning minority officers using less force than white officers in neighborhoods high in concentrated disadvantage was also found to not exhibit a statistically significant relationship in an overwhelming majority of situations. In the 6-site model, across both dependent variables, neither African-American officers, nor Hispanic officers, nor officers of the "Other" racial category used less force than White officers. The only statistically significant relationship was found in San Diego, California, where Hispanic officers were less likely (log-odds of .95, or 5% less likely) than White officers to use force for the physical force plus threats dependent variable. The third hypothesis tested was that more force would be used against suspects with poor demeanor who were encountered in high-crime neighborhoods. Once again this hypothesis was not supported in any of the models (6-site or individual) across either dependent variable. It was also hypothesized that officers would use more force against suspects with poor demeanor who were encountered in neighborhoods high in concentrated disadvantage due to their need to "save face" and maintain authority in potentially dangerous environments. In the 6-site model, and across the majority of the individual models, across both dependent variables, there was no statistically significant effect. However, in the only statistically significant effect, in Colorado Springs, Colorado, officers actually used less force against suspects with poor demeanor in neighborhoods high in concentrated disadvantage (.40) than against suspects with poor demeanor encountered in neighborhoods lower in concentrated disadvantage. Finally, it was hypothesized that officers would use less force against minority suspects in neighborhoods high in concentrated disadvantage due to ecological contamination. Once again, across all models and both dependent variables, there was no statistically significant effect.

The five hypotheses tested in this dissertation provided some interesting, if somewhat confounding, results. Although none of these hypotheses were found to exhibit statistically significant relationships within the 6-site model, two hypotheses were supported within individual sites, with one of those in the expected direction and the other in the direction opposite of what had been expected. In the concluding chapter, the results of the analyses will be interpreted in the context of neighborhood effects on police use of force, with special attention paid to the meaning of the results for the five hypotheses.

Chapter 5: Conclusions

Researchers in the field of criminal justice have, for the past four decades, recognized that the use of force by police officers is a serious and controversial issue. While there remains significant debate about what constitutes unreasonable force, the presence or absence of force more generally, as well as the rankings of different methods of force on a continuum, has been well-documented (Garner et al. 1995; Garner et al. 2002; Riksheim and Chermak 1993; Terrill and Mastrofski 2002). However, of the previous research examining use of force behavior, only Smith (1986) and Terrill and Reisig (2003) have acknowledged the potential effects of neighborhood characteristics on that behavior.

In seeking to prevent abuses of force, it is imperative that social scientists understand all potential influences on this type of behavior in order to more accurately prevent and respond to these situations. The first step is therefore examining use of force behavior in a general sense to identify which individual-level and which neighborhood-level characteristics may exert a significant influence on the prevalence and severity of force. As society becomes increasingly concerned with how police officers perform their duties, and law enforcement agencies become increasingly concerned with meeting the needs of their constituents through community-policing efforts, reducing abuses of force and understanding when and why force has been used properly can address both of these concerns.

The purpose of this research has been to identify those individual-level (Level-1) and, more importantly, neighborhood-level (Level-2) variables which act as predictors of either the prevalence or the severity of use of force behavior within arrest encounters. Previous research has demonstrated that individual-level predictors such as suspect race (Kavanagh 1997; Terrill and Mastrofski 2002; Worden 1995), suspect gender (Phillips and Smith 2000; Garner et al. 1995; Garner et al. 2002; Worden 1995), suspect demeanor (Bayley and Garafalo 1989; Engel et al. 2000; Friedrich 1980; Garner et al. 2002; Kavanagh 1997; Worden 1995), and suspect physical resistance (Engel et al. 2000; Garner et al. 1995; Garner et al. 2002; Phillips and Smith 2000; Terrill and Mastrofski 2002) have a statistically significant effect on use of force behavior. However, all of these studies failed to include neighborhood-level predictors, thus resulting in a severe limitation of their explanatory power. As behavior in general, and police behavior more specifically, has been shown to be responsive to neighborhood effects (Black 1980; Klinger 1997; Mastrofski et al. 1999; McGarrell et al. 1997; Weitzer 2000), the current research has sought to address this limitation through the inclusion of such neighborhood-level variables.

This dissertation, then, has had several goals. The first was to follow the development of the literature on police behavior and the use of force. As with any social scientific endeavor, it is imperative to understand past research in order to provide a sold contribution to the field. The second goal was to identify the limitations of these prior studies, in the form of arguing that the failure to include neighborhood-level variables has restricted our understanding of use of force behavior. The third goal was to introduce relevant theoretical principles in order to provide an underpinning for the current hypotheses. Using social control theory (Black 1980), social disorganization theory (Park and Burgess 1924; Sampson and Groves 1989; Shaw and McKay 1942; Stark 1987), and the concept of tolerance (Kohfeld and Sprague 1990; Klinger 1997), the current work proposed five hypotheses regarding use of force behavior during arrest encounters. The fourth, and final, goal was to demonstrate how the interaction of individual-level and neighborhood-level variables within a hierarchical linear model confirm or disconfirm the latter hypotheses.

Using data collected as part of the Police Use of Force (PUF) Study in six American cities, a framework was developed for testing the effects of neighborhood characteristics on use of force behavior, with special attention paid to how those neighborhood characteristics may exert influence through several individual-level characteristics. This research acts as a substantial contribution to the current literature in that it moves beyond simple linear analyses of use of force behavior, or even neighborhood-level analyses which have been mis-specified. These prior works have made assumptions that the influences on use of force behavior are either: (1) at the level of the individual; or (2) at the level of the neighborhood, but have neglected to include interaction effects. This assumption, or rather its repudiation, lies at the core of this research.

Discussion

The theoretical models of social control and social disorganization, as well as the concept of tolerance, provide the most advantageous foundation from which to view police use of force behavior. The latter all posit a direct relationship between ecological (i.e. neighborhood) characteristics and some type of human, including police officer, behavior. A discussion of these theories, and the foundation they provide for the current research, will allow for a greater understanding of the results of this dissertation. In order to further understand the contributions of these theories, the results for all theoretically-driven, as well as all control, variables will be more closely examined here.

Re-visiting the Theoretical Foundation for the Current Research:

The theory of social control, as posited by Donald Black (1976; 1980; 1989), provides the core of the theoretical foundation for the current work. In essence, social control theory has two tenets which are relevant to research on police use of force behavior. The first is the argument that formal social control, conceptualized here as use of force behavior within the context of an arrest, will be more prevalent in situations (i.e. arrests) where there is greater relational distance between participants (i.e. suspects and police officers). The second tenet argues that formal social control will be more prevalent in environments (i.e. neighborhoods) where there is a lack of informal social control. Thus, where neighborhood residents are unable, or unwilling to organize, or are incapable of coordinating social monitoring, police officers are more likely to be required to engage in formal social control.

The second tenet of social control theory discussed above is closely linked to social disorganization theory, which argues that areas (i.e. neighborhoods) in which the citizens lack the ability to organize themselves are characterized by populations that are: (1) immigrant; (2) minority; (3) lower class; and (4) accepting of unconventional norms (Park and Burgess 1924; Sampson and Groves 1989; Shaw and McKay 1942; Stark 1987). This concept has been modified more recently to focus on concentrated disadvantage, which argues that neighborhoods in distress are more aptly characterized by a factor which is comprised of: (1) the percentage of the population which is African-American; (2) the percentage of the population which is below the poverty level; (3) the percentage of the population which is on public assistance; (4) the percentage of female-headed households; (5) the percentage of the population which is unemployed; and (6) the density of individuals under the age of seventeen (Kane 2002; Morenoff et al. 2001; Sampson and Bartusch 1998; Sampson et al. 1997; Reisig and Parks 2000; Terrill and Reisig 2003). Thus, in areas that are higher in concentrated disadvantage, and are therefore disorganized and in distress, police officers are more likely to be required to engage in formal social control.

The final theoretical concepts which have informed the current research are that of ecological contamination, tolerance and face-saving behavior. In essence, the concept of ecological contamination (Bittner; Black 1998; Van Maanen 1973; Werthman and Piliavin 1967) argues that individuals, regardless of their own characteristics, become tainted when present in the "wrong" area (i.e. neighborhood). Thus, individuals who are present in a neighborhood high in concentrated disadvantage assume the negative associations of that neighborhood and become acceptable targets of police behavior (i.e. use of force). This concept has been modified by Klinger (1997; see also Bittner 1967; Black 1989; Kohfeld and Sprague 1990) who argues that this police response is only triggered when criminal activity has surpassed a threshold of frequency or severity. Thus, police officers in "bad" neighborhoods may be willing to overlook a certain amount of illegal activity due in large part to concerns regarding time constraints and the necessity of responding to more serious incidents. However, it has also been argued that it is precisely in these neighborhoods in which officers must engage in face-saving behavior as a preventative measure, particularly when confronted with aggressive or antagonistic suspects (Black 1980; Chevigny 1995; Fyfe 1997; Hawley and Messner 1989; Kavanagh 1997; Perez 1994; Skolnick and Fyfe 1993; Toch 1995). Thus, there is a balance which be must struck in such neighborhoods between tolerating some illegal activity, particularly since a certain amount of such activity is expected in these neighborhoods, and maintaining authority in order to prevent such illegal activities from escalating in frequency or severity.

Theoretical Foundations of Current Hypotheses:

This dissertation has proposed five hypotheses derived from the theories and concepts discussed above, which were tested using hierarchical linear modeling techniques. The first hypothesis (H1) proposed that officers would use more force in neighborhoods which are higher in concentrated disadvantage. This hypothesis is derived from the theory of social control, which argues that formal social control (i.e. use of force) is more likely to be used in areas which exhibit a lack of informal social control (i.e. are high in concentrated disadvantage). The second hypothesis (H2) proposed that minority officers would use less force than white officers in neighborhoods which are higher in concentrated disadvantage. This hypothesis is also derived from the theory of social control, which argues that formal social control is less likely between individuals who have a decreased social distance, such as minority officers and citizens in disadvantaged neighborhoods. The third hypothesis (H3) proposed that officers would use more force against suspects with poor demeanor who are encountered in neighborhoods with higher crime rates. This hypothesis is derived from the concepts of tolerance and face-saving behavior. That is, although a certain amount of illegal activity is tolerated in neighborhoods with higher crime rates due to the need to respond to more serious crimes, officers must still maintain authority and "save face" in these areas by not allowing suspects to exhibit poor demeanor. The fourth hypothesis (H4) proposed that officers would use more force against suspects with poor demeanor who are encountered in neighborhoods which are higher in concentrated disadvantage. This hypothesis is also derived from the concepts of tolerance and face-saving behavior. As with H3, officers must maintain authority and "save face" in these areas by not allowing suspects to exhibit poor demeanor. The fifth hypothesis (H5) proposed that officers would use less force against minority suspects who are encountered in neighborhoods which are higher in concentrated disadvantage than against White suspects encountered in these neighborhoods. This hypothesis is derived from the concepts of ecological contamination and tolerance. In essence, minority suspects encountered in these types of neighborhoods are assigned the negative attributes of the neighborhood, but their activity is tolerated due to the fact that it is precisely the type of behavior which is expected of them in these neighborhoods.

Impact of Variables Concerning Neighborhood-Level Effects:

Neighborhood-level variables were the focus of this dissertation, particularly in interaction with individual-level variables. However, the variables concerning neighborhood characteristics are introduced to determine if ecological variables, in and of themselves, are influences upon use of force behavior. These variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, three of the seven "neighborhood" variables were statistically significant. Notably, there was no statistically significant effect for the influence of the violent crime rate or the measure of concentrated disadvantage. In addition, an arrest encounter taking place in

Charlotte, North Carolina showed no significant difference in average maximum force from an arrest in Colorado Springs, Colorado. However, if the arrest encounter took place in a neighborhood located in Dallas, Texas, maximum force was predicted to increase in relation to an arrest that took place in a neighborhood located in Colorado Springs, Colorado. Similarly, if the arrest encounter took place in a neighborhood located in St. Petersburg, Florida, maximum force was predicted to increase in relation to the reference city. Finally, if the arrest encounter took place in San Diego, California, maximum force was predicted to increase in relation to the reference neighborhood. These results present a significant contrast to prior research which has found that the violent crime rate and concentrated disadvantage (Terrill and Reisig 2003) can influence use of force behavior. More importantly, these results disconfirm one of the current work's hypotheses (H1) that more force is expected in neighborhoods that are high in concentrated disadvantage.

Within the 6-site physical force plus threats model, none of the seven "neighborhood" variables were significant. Again, this is in direct contrast to previous studies which have found that the violent crime rate and concentrated disadvantage (Terrill and Reisig 2003) can influence the likelihood of force behavior. As with the previous dependent variable, the most relevant point is that these results disconfirm one of the current work's hypotheses (H1) that more force is expected in neighborhoods that are high in concentrated disadvantage.

The predictive power of the variables regarding neighborhood characteristics was unexpected, both in relation to the current work and in relation to previous research. Of the seven "neighborhood" variables, none were statistically significant across both models. Of these seven variables, three ("arrest took place in Dallas, TX", "arrest took place in St. Petersburg, FL", and "arrest took place in San Diego, CA") were statistically significant in the maximum force model, while none were statistically significant in the physical force plus threats model. These results represent a strong departure from prior research (Smith 1986; Terrill and Reisig 2003) which has found statistically significant effects for neighborhood variables. However, as has been noted previously, it is believed that the current work has modeled neighborhood variables more appropriately in interactions with several individual-level variables.

Impact of Variables Concerning Interaction Effects:

The variables concerning neighborhood characteristics are also introduced to determine if neighborhood-level variables, in interaction with individual-level variables, are influences upon use of force behavior. These variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats, although they are clearly thought to vary across different types of neighborhood. More importantly, these interactions are the main focus of the analyses of this dissertation.

Within the 6-site maximum model, none of the nine interaction variables were significant. Although this is consistent with prior research which has not found any statistically significant effects (Terrill and Reisig 2003), it is in direct contrast to the hypotheses of the current work. The second hypothesis of this dissertation (H2) predicted that minority officers would use less force than White officers in neighborhoods that are higher in concentrated disadvantage, due to decreased social distance. The results predicted that Black officers would use more force than White officers (.30) in these neighborhoods, as would officers of the "Other" racial category (.19), while Hispanic officers were predicted to use less force than White officers (-.07) in neighborhoods high in concentrated disadvantage. However, all of these represent relatively small effect sizes, and none of these are statistically significant. The third hypothesis of the current work (H3) predicted that more force would be used against suspects with poor demeanor arrested in neighborhoods with higher crime rates than against suspects with poor demeanor arrested in neighborhoods with lower crime rates, due to the officer's need to "save face" and maintain authority in these environments. The results predicted that more force would be used against suspects with poor demeanor who were arrested in high-crime neighborhoods (.003) than against suspects with poor demeanor who were arrested in lower-crime neighborhoods. However, this again represented a very small effect size, and was not statistically significant. The fourth hypothesis of this dissertation (H4) predicted that more force would be used against suspects with poor demeanor arrested in neighborhoods higher in concentrated disadvantage than against suspects with poor demeanor arrested in neighborhoods lower in concentrated disadvantage, due to the officer's need to "save face" and maintain authority in these environments. The results predicted that more force would be used against suspects with poor demeanor who were arrested in neighborhoods high in concentrated disadvantage (.002) than against suspects with poor demeanor who were arrested in neighborhoods lower in concentrated disadvantage. However, this again represented a very small effect size, and was not statistically significant. The fifth, and final, hypothesis of the current work (H5) predicted that less force would be used against minority suspects arrested in neighborhoods higher in concentrated disadvantage than against White suspects arrested in these neighborhoods, due to the concepts of tolerance and ecological contamination. The results predicted that more force would be used against Black (.12), Hispanic (.16), and "Missing race" (.46) suspects arrested in neighborhoods high in concentrated disadvantage than against White suspects arrested in these neighborhoods. In contrast, less force was predicted against suspects of the "Other" racial category (-.06) arrested in neighborhoods high in concentrated disadvantage than against White suspects in these neighborhoods. However, these effect sizes were also very small, and none of them were statistically significant.

Within the 6-site physical force plus threats model, again none of the nine interaction variables were significant. Although this is consistent with prior research which has not found any statistically significant effects (Terrill and Reisig 2003), it also is in direct contrast to the hypotheses of the current work. The second hypothesis of this dissertation (H2) predicted that minority officers would use less force than White officers in neighborhoods that are higher in concentrated disadvantage, due to decreased social distance. The results predicted that Black officers were more likely to use force than White officers

(1.15) in these neighborhoods, as were officers of the "Other" racial category (1.02), while Hispanic officers were predicted to be less likely to use force than White officers (.95) in neighborhoods high in concentrated disadvantage. However, all of these represent relatively small effect sizes, and none of these are statistically significant. The third hypothesis of the current work (H3) predicted that more force would be used against suspects with poor demeanor arrested in neighborhoods with higher crime rates than against suspects with poor demeanor arrested in neighborhoods with lower crime rates, due to the officer's need to "save face" and maintain authority in these environments. The results showed that force was predicted to be less likely to be used against suspects with poor demeanor who were arrested in high-crime neighborhoods (.92) than against suspects with poor demeanor who were arrested in lower-crime neighborhoods. Although this not in accordance with H3, this again represented a very small effect size, and was not statistically significant. The fourth hypothesis of this dissertation (H4) predicted that more force would be used against suspects with poor demeanor arrested in neighborhoods higher in concentrated disadvantage than against suspects with poor demeanor arrested in neighborhoods lower in concentrated disadvantage, due to the officer's need to "save face" and maintain authority in these environments. The results showed that force was predicted to be equally likely to be used against suspects with poor demeanor who were arrested in neighborhoods high in concentrated disadvantage (1.00) than against suspects with poor demeanor who were arrested in neighborhoods lower in concentrated disadvantage. Again, while this was not in accordance with H4, this represented a very small effect size, and was not statistically significant. The fifth, and final, hypothesis of the current work (H5) predicted that less force would be used against minority suspects arrested in neighborhoods higher in concentrated disadvantage than against White suspects arrested in these neighborhoods, due to the concepts of tolerance and ecological contamination. The results showed that, in accordance with H5, force was predicted to be less likely to be used against Black (.96), Hispanic (.88), and suspects of the "Other" racial category (.58) arrested in neighborhoods high in concentrated disadvantage than against White suspects arrested in these neighborhoods. In contrast, force was predicted to be equally likely to be used against suspects of the "Missing race" racial category (1.00) arrested in neighborhoods high in concentrated disadvantage than against White suspects in these neighborhoods. However, these effect sizes were also very small, and none of them were statistically significant.

The predictive power of the interaction variables was clearly less than was expected, given that the hypotheses predicted a statistically significant effect for these interactions and none was found. While previous research has been inconsistent with regards to findings concerning neighborhood variables and interaction effects (Smith 1986; Terrill and Reisig 2003), the current work is believed to have properly modeled these interactions by allowing the effects of individual-level variables to vary across Level-2 units. However, despite using the appropriate methodology, none of the five proposed hypotheses were supported in the current research. Thus, although this work has been conducted rigorously, the independent variables in the form of interactions have added almost no predictive power to the 6-site models for the dependent variables of maximum force and physical force plus threats.

Impact of Individual-Level Variables:

Although the focus of this dissertation is on the interaction effects between individual-level and neighborhood-level variables, none of these produced significant results. Therefore, it is also instructive to examine the impact of the numerous individual-level variables which were included as statistical controls due to their statistical significance in prior research efforts.

Impact of Variables Concerning the Nature of the Location

Police use of force behavior has been thought to be influenced by variables concerning the nature of the location of the arrest encounter due to the fact that there are certain physical characteristics of an area which may influence an officer's perception of his/her safety, and thus increase the use of force. These variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, only two of the four "location" variables were significant. When a location was known for criminal activity, maximum force was predicted to increase in arrest encounters at that location. However, as visibility increased at that location, maximum force was predicted to decrease. These results are consistent with the concept of officer concerns regarding safety influencing use of force behavior. More importantly, they are also consistent with findings from prior research on use of force behavior (Garner et al. 2002).

Within the 6-site physical force plus threats model, only one of the four "location" variables was significant. In an unexpected turn, as visibility increased at the arrest location, the likelihood of use of force behavior was predicted to increase. This is in direct contrast to the concept of officer concerns regarding safety influencing use of force behavior. In addition, this is also at odds with findings from previous research (Garner et al. 2002).

The predictive power of the variables regarding the nature of the location was as expected. Of the four "location" variables, only the visibility at the arrest encounter location was statistically significant across both models. In addition, the location being known for criminal activity was also statistically significant, but only in the maximum force model. Although the variables "arrest took place inside" and "location was known to be hazardous" were not statistically significant in either model, this finding is consistent with prior research as well (Garner et al. 2002).

Impact of Variables Concerning the Nature of the Encounter

As with the previous grouping of variables, the variables concerning the nature of the arrest encounter itself are all related to an officer's perceptions of safety during the arrest encounter. Once again, the perception of danger within a specific encounter is thought to increase use of force behavior. As before, these variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, only one of the four "encounter" variables was statistically significant. If the arrest was for a violent offense, maximum force in the arrest encounter was predicted to increase. This is consistent with an officer's concerns regarding safety leading to increased force. Prior research has repeatedly noted that offense seriousness, taken to show an arrestee's capacity for violence, exerts a significant influence on use of force behavior (Garner et al. 20002; Worden 1995).

Within the 6-site physical force plus threats model, there was again only one of the four "encounter" variables which was statistically significant. As with the previous model, if an arrest was for a violent offense, the likelihood of force in that specific arrest encounter was predicted to increase. Once again, this is consistent with prior literature on the likelihood of use of force behavior (Garner et al. 2002; Worden 1995).

The predictive power of the variables regarding the nature of the arrest encounter was more limited than was expected. Of the four "encounter" variables, only the seriousness of the offense was statistically significant across both models. Of the three other variables in this subgroup ("arrest took place on a weekend", "bystander demeanor toward the officer", and "number of suspects"), none were statistically significant in either model. These results are in contrast to previous research (Engel et al. 2000; Friedrich 1980; Garner et al.

2002; Worden 1995), which has found that bystander demeanor, as well as the number of suspects involved in the arrest, can result in increased use of force.

Impact of Variables Concerning Police Mobilization

The variables concerning an officer's mobilization to the arrest encounter are the final subgroup which is all related to an officer's perception of safety during an arrest encounter. In essence, these variables describe an officer's entry into the arrest, in reason, method, and response. As with the previous two subgroups, the perception of danger within a specific encounter is thought to increase use of force behavior. Once again, these variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, five of the ten "mobilization" variables were statistically significant. If the officer responded to the scene in a "priority approach" manner (i.e. with higher rates of speed, occasionally disregarding traffic signs and signals), maximum force was predicted to increase. Also with respect to an officer's approach, if the officer used lights and sirens en route to the encounter, maximum force was predicted to increase. In addition, if an officer requested the presence of back-up officers at the arrest encounter, maximum force was predicted to increase. An increase in maximum force was also predicted with each subsequent officer who arrived at the arrest encounter. Finally, if an officer was off-duty when the arrest was made, maximum force was predicted to increase. These results are once again consistent with findings from prior research (Garner et al. 1995; Garner et al. 2002), which has found statistically significant effects for officer mobilization.

Within the physical force plus threats model, seven of the ten "mobilization" variables were statistically significant. If the encounter was initiated by the officer (rather than having been dispatched, or flagged down by a citizen), the likelihood of force was predicted to increase. In addition, if the officer responded to the scene in a "priority approach" manner (i.e. with higher rates of speed, occasionally disregarding traffic signs and signals), the likelihood of force was predicted to increase. Also with respect to an officer's approach, if the officer used lights and sirens en route to the encounter, the likelihood of force was predicted to increase. In addition, if the officer took some other unknown (yet non-routine) approach to the encounter, the likelihood of force was predicted to increase. Once again, if an officer requested the presence of back-up officers at the arrest encounter, the likelihood of force was predicted to increase. An increase in the likelihood of force was also predicted with each subsequent officer who arrived at the arrest encounter. However, in an unexpected finding, if a suspect was already in custody when the officer arrived at the encounter, the likelihood of force was also predicted to increase. With the exception of the latter, these results are consistent with previous findings (Garner et al. 1995; Garner et al. 2002) which have demonstrated a statistically significant relationship between officer mobilization and increased likelihood of force.

The predictive power of the variables regarding the mobilization of police officers was as expected. Of the ten "mobilization" variables, four ("officer took a priority approach", "officer used lights and sirens on approach", "officer called for back-up", and "number of officers") were statistically significant across both models. Of the eight other variables in this subgroup, one ("officer was off-duty") was statistically significant in the maximum force model, while three ("suspect was already in custody", "police initiated the encounter", "officer took other (non-routine) approach to encounter") were statistically significant in the physical force plus threats model. These results are in agreement with previous research (Engel et al. 2000; Garner et al. 2002; Worden 1995), which has found that an officer's entry into the arrest encounter can increase use of force behavior.

Impact of Variables Concerning Officer Characteristics

The variables concerning officer characteristics are clearly meant to determine if an officer's fixed characteristics and variable behavior are influences upon use of force behavior. As with the previous subgroups, these variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, two of the eight "officer" variables were statistically significant. In relation to an officer's fixed characteristics, with each one unit increase in the age of the officer, maximum force was predicted to decrease. In addition, maximum force was predicted to increase if the officer was male. These findings are consistent with prior research (Engel et al. 2000; Garner et al. 2002; Terrill and Mastrofski 2002; Worden 1995) which has found that these officer characteristics can have significant effects on use of force behavior.

Within the 6-site physical force plus threats model, three of the eight "officer" variables were statistically significant. With respect to an officer's fixed characteristics, if an officer was Hispanic, the likelihood of force was predicted to increase in relation to White officers. In addition, the likelihood of force was predicted to increase if the officer was male. In relation to an officer's behavior, if an officer had received prior medical attention for an injury sustained while at work, the likelihood of force was predicted to increase. Once again, these findings are generally consistent with previous findings (Engel et al. 2000; Garner et al. 2002; Terrill and Mastrofski 2002; Worden 1995) which have demonstrated a statistically significant effect of officer characteristics on use of force behavior.

The predictive power of the variables regarding officer characteristics was generally as expected. Of the eight "officer" variables, only one ("officer was male") was statistically significant across both models. Of the eight other variables in this subgroup, one ("officer age") was statistically significant in the maximum force model, while two ("officer was Hispanic" and "officer received prior medical attention") were statistically significant in the physical force plus threats model. These results are generally in agreement with previous research (Engel et al. 2000; Garner et al. 2002; Terrill and Mastrofski 2002; Worden 1995), which has found that officer characteristics can influence use of force behavior. However, it should be noted that it is unusual that officer age was not found to be significant in the physical force plus threats model. In addition, although a race effect was found for Hispanic officers in the physical force plus threats model, it is believed that in the current research race effects are more properly modeled in an interaction with neighborhood-level variables.

Impact of Variables Concerning Suspect Characteristics

The variables concerning suspect characteristics are clearly meant to determine if a suspect's fixed characteristics, variable behavior, and relationships are influences upon use of force behavior. As with the previous subgroups, these variables are thought to act consistently across both dependent variables, maximum force and physical force plus threats.

Within the 6-site maximum force model, seven of the nineteen variables were statistically significant. In relation to a suspect's fixed characteristics, if the suspect was male maximum force was predicted to increase. There were numerous statistically significant effects related to a suspect's relationships. If the suspect was friends with the victim, maximum force was predicted to decrease. Similarly, if the suspect was a member of the victim's family, maximum force was predicted to decrease. Finally, if the suspect was a stranger to all of the bystanders, maximum force was predicted to increase. There were also several statistically significant effects related to a suspect's behavior. If the suspect was known to carry a weapon, maximum force was predicted to increase. If the suspect was antagonistic (i.e. had poor demeanor) toward the officer, maximum force was predicted to increase. Finally, if the suspect provided physical resistance to the officer, maximum force was predicted to increase. These results are consistent with prior research (Bayley and Garafalo 1989; Friedrich 1980; Garner et al. 2002; Kavanagh 1997) which has identified suspect characteristics as influencing use of force behavior.

Within the 6-site physical force plus threats model, seven of the nineteen variables were statistically significant. With respect to a suspect's fixed characteristics, if the suspect was male the likelihood of force was predicted to increase. There were also two statistically significant effects related to a suspect's relationships. If the suspect had an unknown relationship to the bystanders, there was a predicted increase in the likelihood of force. In addition, if the suspect was a stranger to all of the bystanders, the likelihood of force was also predicted to increase. There were also several statistically significant effects related to a suspect's behavior. If the suspect was known to carry a weapon, the likelihood of force was predicted to increase. In addition, if the suspect was intoxicated during the arrest encounter, the likelihood of force was predicted to increase. More importantly, however, if the suspect was antagonistic (i.e. exhibited poor demeanor) or physically resisted the officer, the likelihood of force was predicted to increase. As with the previous model, these results are consistent with previous studies (Bayley and Garafalo 1989; Friedrich 1980; Garner et al. 2002; Kavanagh 1997), which have identified these suspect characteristics as increasing the likelihood of force.

The predictive power of the variables regarding suspect characteristics was generally as expected. Of the nineteen "suspect" variables, five ("suspect was male", "suspect was known to carry a weapon", "suspect was a stranger to all bystanders", "suspect was antagonistic", and "suspect provided physical resistance") were statistically significant across both models. Of the remaining fourteen variables in this subgroup, two ("suspect was friends with the victim" and "suspect was family to the victim") were statistically significant in the maximum force model, while two ("suspect was intoxicated" and "suspect had an unknown relationship to all bystanders") were statistically significant in the physical force plus threats model. These results are generally in agreement with previous research (Bayley and Garafalo 1989; Friedrich 1980; Garner et al. 2002; Kavanagh 1997), which has found that suspect characteristics can influence use of force behavior. Notably, suspect race was not found to be significant, in contrast to some prior studies (Kavanagh 1997; Smith 1986; Terrill and Mastrofski 2002; Worden 1995). However, it is believed that the current work more properly models suspect race in interaction with neighborhood-level variables, and thus no effects were expected here.

Interpretation of Results:

Given that none of the five hypotheses of this dissertation were supported by the analyses of both dependent variables within hierarchical linear models, it is instructive to present a discussion of why these hypotheses were not confirmed. Table 10 presents a summary of the results obtained for each of the five hypotheses.[84]

[84] Appendix E contains a further description of how these results compare to the work found in Garner et al. (2002), where the PUF data were analyzed only at the individual level.

Table 10: Summary of Results

Hypothesis	Max. Force	p <.05	Hypothesis Direction	Physical Force Plus Threats	p <.05	Hypothesis Direction
H1: Officers will use more force in neighborhoods that are higher in concentrated disadvantage than in neighborhoods that are lower in concentrated disadvantage	-0.050	No	No	1.100	No	Yes
H2: Minority officers will use less force than White officers in neighborhoods that are higher in concentrated disadvantage						
African-American officers	0.300	No	No	1.150	No	No
Hispanic officers	-0.070	No	Yes	0.950	No	Yes
"Other" officers	0.190	No	No	1.020	No	No
H3: Officers will use more force against suspects with poor demeanor who are arrested in neighborhoods that have higher crime rates than against suspects who are arrested in neighborhoods that have lower crime rates	0.003	No	Yes	0.920	No	No
H4: Officers will use more force against suspects with poor demeanor who are arrested in neighborhoods that are higher in concentrated disadvantage than against suspects with poor demeanor who are arrested in neighborhoods that are lower in concentrated disadvantage	0.002	No	Yes	1.000	No	No
H5: Officers will use less force against minority suspects who are arrested in neighborhoods that are higher in concentrated disadvantage than against White suspects who are arrested in neighborhoods that are higher in concentrated disadvantage						
African-American suspects	0.120	No	No	0.960	No	Yes
Hispanic suspects	0.160	No	No	0.880	No	Yes
"Other" suspects	-0.060	No	Yes	0.580	No	Yes
"Missing" suspects	0.460	No	No	1.000	No	No

It can be seen from Table 10 that of the hypotheses examined within the maximum force model, none were statistically significant and only four coefficients were in the hypothesized direction. Within the physical force plus threats model, none of the hypotheses achieved statistical significance and only five log-odds were in the hypothesized direction. There are several possibilities for the failure of the current research to confirm the hypotheses. In particular, the current research, although believed to be methodologically and theoretically sound, experienced some limitations which must be considered when interpreting the results. There are data issues to be discussed (use of an arrest-only sample, use of officer self-reports, use of a community violent crime rate constructed by aggregating arrests sampled during data collection, use of volunteer sites, and small sample size for sites), as well as issues of variable choice (use of only two of a wide variety of potential use of force measures, and lack of certain variables), which may have impacted the results.

The first challenge to this dissertation concerns the sampling of use of force incidents. As has been previously discussed, the Police Use of Force (PUF) Study sampled only arrest encounters, and thus does not capture any use of force within an encounter which did not result in an arrest. As base rates of force vary rather widely among previous research studies which have sampled arrests and all police-public interactions (Engel et al. 2000; Friedrich 1980; Garner et al. 2002; Terrill and Mastrofski 2002; Worden 1995), it is difficult to ascertain the extent of use of force behavior which is not captured within the current study. However, it remains a real possibility that there are use of force incidents which occurred within the PUF sites which did not result in an arrest, and thus the current data must be seen as incomplete as an explanation of police use of force in all situations. However, it is important to note that as all arrests within the PUF sites were captured, the current data does accurately describe police use of force behavior in arrest situations.

The second concern to be discussed is the fact that the current data was taken from officer self-reports. Although data collection occurred under the guarantee of confidentiality as provided by Federal regulations, there remains a presumption of bias in situations where individuals are asked to report their own behavior. While clearly officers did report on their use of force actions against arrestees, it is unclear if these reports are entirely accurate, as certain behaviors may have been downplayed. In addition, officers may have failed to disclose certain activities for fear of facing departmental discipline. It should be noted, however, that while there are numerous potential data sources (e.g. arrestees' reports of force used against them, observational research, or police records), no prior research studies have used these in combination, and each has distinct advantages and disadvantages. More importantly, suspects in these arrest encounters were randomly sampled and surveyed regarding their own behavior, as well as that of the arresting officer. The latter's use of force actions were then compared between suspect surveys and officer surveys to assess the validity of the officer self-report. At the aggregate level, both suspects and officers reported a 20% base rate for use of force behavior, indicating that officer self-reports were an accurate measure of such behavior within the six jurisdictions studied in this research.[85]

The third concern dealing with data issues is the fact that the neighborhood violent crime rate was constructed using arrest charge codes for arrests made during the data collection period. These arrest charges were coded as either violent crimes or non-violent crimes, and were then aggregated up to the census tract level (the measure of neighborhood for the current study). In this situation there is a potential concern with multicollinearity. However, this concern is addressed in two ways. First, it should be noted that all arrests within each jurisdiction were sampled during the data collection period, and thus these reports represent official crime statistics for each neighborhood. Second, and most importantly, the variance inflation factor (VIF) and tolerance scores indicate that multicollinearity was not present.

The fourth concern regarding data issues is related to the fact that the PUF sites were enlisted in the study on a volunteer basis. Thus, there may be characteristics of these departments themselves, or of the command staff within the departments, which influence the use of force behavior of their officers. One could argue that these (unmeasured) characteristics make these sites distinct and therefore the results are not generalizable. However, it is the characteristics of the sites themselves, rather than of the law enforcement agencies within those sites, which have been posited to influence use of force behavior. Importantly,

[85] This information was obtained from a personal communication with Dr. Christopher D. Maxwell, one of the principal investigators on the Police Use of Force (PUF) study.

the PUF sites are sufficiently varied across numerous characteristics to instill confidence in the generalizability of the results.

The fifth, and final, concern stemming from data issues is the fact that a relatively small number of sites were involved in data collection for PUF. As noted previously, the most statistically sound model would be a three-level hierarchical linear model with PUF sites at the third level. However, the results from within the PUF sites are substantially similar to the 6-site model, and thus a two-level model with dummy-coded variables for sites is acceptable under the current conditions.

The first issue dealing with the choice of variables is related to the fact that there are numerous operationalizations of use of force behavior, and thus the current research has selected only two of those various options for study. As has been previously discussed, prior research has used a vast array of measures of use of force (Bayley and Garafalo 1989; Engel et al. 2000; Friedrich 1980; Garner et al. 2002; Terrill and Reisig 2003; Worden 1995). However, the measures used here have significant strengths. In particular, it is important to note that the maximum force measure is based on officer rankings of actual officer behavior in a variety of situations. In addition, the prevalence of force measure benefits from simplicity in that distinctions are not made between reasonable or unreasonable force, only in whether or not force has occurred.

The second, and final, concern regarding the choice of variables has already been briefly discussed. In any scientific endeavor the choice of dependent and independent variables is an important one, and out of necessity most research studies do not include an exhaustive range of variables. While there may be individual-level or neighborhood-level, including organizational, variables which have been omitted from the current work, the variables which have been included here represent a systematic effort to reproduce the effects of prior research.

Having considered potential limitations of the current research, it is most important to note that it remains a possibility that the hypotheses were not confirmed for the simple reason that neighborhood-level variables do not, in fact, exert any influence on police use of force behavior. Prior research (Bayley and Garafalo 1989; Engel et al. 2000; Friedrich 1980; Garner et al. 2002; Kavanagh 1997; Phillips and Smith 2000; Smith 1986; Terrill and Mastrofski 2002; Terrill and Reisig 2003; Worden 1995) has either failed to examine neighborhood effects or has suffered from inappropriate methodology. Thus, while Terrill and Reisig (2003) find statistically significant effects for the homicide rate and concentrated disadvantage, two neighborhood-level variables, it is possible that those findings were confounded by the use of a fixed-effects model. In essence, then, it is possible that the current research, in modeling neighborhood-level variables in a random-effects model, has correctly determined that these variables do not exert any statistically significant effect on police use of force behavior.

Implications of the Current Research

As has been discussed throughout this dissertation, the study of police use of force behavior is one of the most fundamental research issues in social scientific inquiry. The current research, in analyzing this behavior through use of multilevel modeling examining individual-level and neighborhood-level variables, strives to make a substantial contribution to the literature by identifying how these variables influence use of force. The results of this work have several implications, of a theoretical, research-driven and practical nature, and these will be discussed here.

<u>Theoretical Implications:</u>

The current research was built on the theoretical underpinnings of Black's social control theory and social disorganization theory, as well as the concepts of tolerance and ecological contamination. The results presented previously clearly have implications for these theoretical concepts, particularly in light of the fact that none of the five hypotheses were supported. With respect to Black's theory of social control, a suspect's social status and relational distance from an officer are thought to affect use of force behavior. However, the current research found no effects for either social status (i.e. suspect race in isolation) or relational distance (i.e. officer race in interaction with the measure of concentrated disadvantage). While these results are consistent with prior research, it is at odds with the proposed hypotheses of the current work. Yet, at this time it is not prudent to declare that Black's theory of social control is unable to explain police use of force behavior for two reasons: (1) suspect status is perhaps better measured by the suspect's actions, rather than fixed characteristics (that is, a suspect may place themselves in a particular status position through their behavior, such as physically resisting the officer or becoming antagonistic); and (2) relational distance is perhaps better measured through an interaction between officer race and suspect race. It should be noted, however, that the latter concept was not tested due to the fact that the analyses of this dissertation were aimed at understanding the effects of individual-level variables in interaction with neighborhood-level variables, such as officer race and concentrated disadvantage, rather than those of individual-level variables in interaction with other individual-level variables, such as officer race and suspect race.

In regards to social disorganization theory, the current work tested the effects of concentrated disadvantage on police use of force behavior. Again, this dissertation found no statistically significant effects for this concept, either alone or in interaction with individual-level variables, although the effects were generally in the hypothesized direction. These results are not consistent with previous multivariate studies which have studied neighborhood effects on police use of force (Smith, 1986; Terrill and Reisig, 2003), both of which found a statistically significant effect for neighborhood characteristics. More importantly, these results are at odds with the hypotheses proposed within this dissertation. It is possible that social disorganization theory is unable to explain police use of force behavior for two reasons. First, social disorganization theory was developed and primarily used to examine the behavior of criminal offenders (mostly delinquents). Thus, the theory may be more appropriate for explaining deviant behavior, such as *unreasonable* force by police officers, rather than all use of force behavior. Second, the concept of concentrated disadvantage may be more appropriately constructed using the percentage of non-white residents of the neighborhood, rather than the percentage of African-American residents of the neighborhood. Although none of the hypotheses tested here were statistically significant, numerous propositions regarding Hispanic officers and Hispanic suspects were in the hypothesized direction. Considering that the population of Hispanics is quite different in San Diego than it is in Colorado Springs, the use of a concentrated disadvantage variable constructed using the percentage of non-white residents may have led to statistical significance.

The current work also used the concepts of tolerance and ecological contamination to examine police use of force behavior. These theoretical concepts are connected in that both purport to describe levels of acceptable behavior by individuals in particular neighborhoods. Once again, this dissertation found no statistically significant effects for these concepts, a result that is inconsistent with prior work on officer behavior. The most likely explanation for the lack of significance is that previous research (Klinger, 1997; Kohfeld and Sprague, 1990) has focused on *arrest* behavior, rather than use of force behavior. Considering that the current work samples only arrests, it is possible that any variation in use of force behavior explainable by these concepts has been eliminated due to the lack of non-arrest situations.

Research Implications:

The limitations of the current research, discussed above, as well as the results of that research, lead to several implications for future research on the use of force behavior of police officers. This dissertation has demonstrated the importance of measuring suspect and officer behavior appropriately, as well as that of modeling that behavior using the appropriate statistical methods. Future research efforts would benefit from: (1) utilizing several measures of force; (2) utilizing several sources of data; (3) developing theoretical models which explain all police behavior, including use of force; and (4) focusing on suspect behavior.

Numerous research efforts have utilized a variety of measures of use of force, including maximum force, the prevalence of force, and the continuum of force. However, there has been a notable lack of research which has used more than one measure of force. While the current work uses two of these measures, there remains a great deal of variation to be explored. Similarly, previous studies have typically only used one source of data when examining use of force behavior. Although officer self-reports, arrestee interviews, official police reports, and observational data are all viable avenues of research, prior research has restricted itself to only one of these within specific studies. Future research efforts would greatly benefit from matching observational data to officer self-reports, or from matching the latter to arrestee interviews.

Perhaps even more important than the data issues discussed here are concerns regarding the theoretical bases of research on use of force behavior. Throughout the previous literature, researchers have focused on either use of force behavior or on police behavior more generally. Future researchers would benefit from developing a theoretical model which is capable of explaining all police behavior. Also in relation to the theoretical understanding of use of force behavior, the results of this dissertation have demonstrated the importance of variables concerning suspect behavior. In particular, the variables for suspect demeanor (i.e. antagonism) and suspect physical resistance had statistically significant and relatively large effects across both dependent variables. This indicates that future research would benefit from focusing more specifically on the role of these variables in relation to police use of force behavior.

Practical Implications:

The results of this dissertation also have several practical implications for law enforcement agencies with respect to training and policy on use of force behavior by their officers. In particular, this work has demonstrated that specific officer behaviors can lead to increased average maximum force, as well as an increased likelihood in the application of force. Thus, law enforcement agencies would benefit from focusing training efforts and policy revisions on these factors in order to more closely regulate use of force behavior.

The current work found that officers responding to a call with a "priority approach" (i.e. to a call dispatched as an emergency) or with lights and sirens engaged had higher levels of maximum force, and were more likely to use force during arrest encounters. In addition, arrest encounters where the officer called for back-up, or which had higher numbers of officers present, also experienced higher levels of maximum force, and were more likely to have force used within them. As discussed previously, these variables are related to an officer's sense of safety when entering an arrest encounter. Thus, these results indicate that law enforcement agencies can, and should, focus their training efforts and policies on identifying situations which have the potential for an elevated sense of danger. Evidence from the current work, as well as from prior studies, provide a firm foundation from which agencies can assess the behavior of officers across a variety of arrest situations, shifts, and types of police jurisdiction.

In conclusion, then, it should be noted that although the results of this dissertation did not confirm the proposed hypotheses, they do provide some interesting findings which support previous studies in relation to suspect behavior and officer safety. Future research efforts should continue a focus on these issues, with a clear understanding of the importance of using a variety of measures of use of force behavior, as well as numerous data sources.

Appendix A

Table A-1: Significant Predictors of Use of Force Behavior Across Multivariate Studies

	Friedrich 1980	Bayley and Garafalo 1989	Garner et al. 1995	Worden 1995
Base Rate of Force	5.10%	6-9%	22%	3.90%
Minority Suspect				+
Male Suspect			+	+
Increasing # of Bystanders	+		+	+
Increasing # of Officers	+		+	
Drunk / Drugged Suspect	+		+	+
Violent / Felony Offense			+	+
Antagonistic / Hostile Suspect	+	+		+
Suspect Resists / Uses Force			+	

	Kavanagh 1997	Engel et al. (2000)	Phillips and Smith 2000	Terrill and Mastrofski 2002	Garner et al. 2002
Base Rate of Force	17.20%	3.40%	NR	58.40%	17.10%
Minority Suspect	+			+	
Male Suspect			+		+
Increasing # of Bystanders		+	+		+
Increasing # of Officers			+		+
Drunk / Drugged Suspect	+	+		+	
Violent / Felony Offense	+	+			
Antagonistic / Hostile Suspect	+	+			+
Suspect Resists / Uses Force		+	+	+	+

Appendix B

Table B-1: Sample Characteristics for Variables used in Factor Analysis				
Variable Name	Variable Label	N	M	SD
BLACKPOP	% African-American within Census Tract	385	24.62	29.48
TRACTPOV	% Below Poverty Level within Census Tract	385	18.86	13.49
TRCTPASS	% on Public Assistance within Census Tract	385	4.82	4.62
TRCTFEMH	% Female-Headed Families within Census Tract	385	9.69	7.30
TRCTUNEM	% Unemployed within Census Tract	385	5.04	6.50
TRACTDEN	Density of Individuals under 17 Years Old within Census Tract	385	0.64	0.88

Table B-2: Correlation Matrix for Variables used in Factor Analysis						
Variable Names	**BLACK POP**	**TRACT POV**	**TRCTPASS**	**TRCTFEMH**	**TRCTUNEM**	**TRACT DEN**
BLACKPOP	**1.000**	**.438**	**.393**	**.647**	**.246**	**-.115**
TRACTPOV	**.438**	**1.000**	**.685**	**.575**	**.606**	**.340**
TRCTPASS	**.393**	**.685**	**1.000**	**.739**	**.201**	**.451**
TRCTFEMH	**.647**	**.575**	**.739**	**1.000**	**.180**	**.256**
TRCTUNEM	**.246**	**.606**	**.201**	**.180**	**1.000**	**.022**
TRACTDEN	**-.115**	**.340**	**.451**	**.256**	**.022**	**1.000**

Table B-3: Factor Loadings for Variables used in Factor Analysis		
Variable Name	**Variable Label**	**Factor Loading**
BLACKPOP	% African-American within Census Tract	.653
TRACTPOV	% Below Poverty Level within Census Tract	.874
TRCTPASS	% on Public Assistance within Census Tract	.857
TRCTFEMH	% Female-Headed Families within Census Tract	.850
TRCTUNEM	% Unemployed within Census Tract	.497
TRACTDEN	Density of Individuals under 17 Years Old within Census Tract	.406

KMO Measure of Sampling Adequacy = 0.66

Bartlett's Test of Sphericity

X^2 = 1177.88 (.000)

Appendix C

Table C-1: 6-Site Correlation Matrix

		LOCRIME	LOCHAZRD
LOCRIME	Pearson Correlation	1	
Location Known for Criminal Activity	Sig. (2-tailed)	.	
LOCHAZRD	Pearson Correlation	0.45	1
Location Known to be Hazardous	Sig. (2-tailed)	0	.
INSIDE	Pearson Correlation	-0.09	-0.04
Arrest Occurred Inside	Sig. (2-tailed)	8.40E-15	0.01
VISIBLE	Pearson Correlation	-0.09	-0.12
Visibility at Place of Arrest	Sig. (2-tailed)	1.69E-14	1.48E-22
VIOLENT	Pearson Correlation	-0.09	-0.03
Violent Offense	Sig. (2-tailed)	1.53E-13	0.04
WEEKEND	Pearson Correlation	-0.03	-0.02
Friday 6pm to Monday 6am	Sig. (2-tailed)	0.01	0.08
BPDEMEAN	Pearson Correlation	0.07	0.13
Bystander Demeanor Toward Police	Sig. (2-tailed)	2.42E-09	2.77E-28
NUMBERSO	Pearson Correlation	0.11	0.1
Number of Suspects at Completion of Arrest	Sig. (2-tailed)	4.63E-19	7.76E-16
CUSTODY	Pearson Correlation	-0.03	-0.06
Custody Status	Sig. (2-tailed)	0.03	9.18E-08
CIT2	Pearson Correlation	-0.01	-0.01
Citizen Initiated Contact with Police	Sig. (2-tailed)	0.46	0.7
POL2	Pearson Correlation	0.16	0.12
Police Initiated Contact with Arrestee	Sig. (2-tailed)	3.60E-41	1.17E-22
OTHAP2	Pearson Correlation	0.03	0.01
Dispatch or Onview Not Reported	Sig. (2-tailed)	0.01	0.85
PRIO2	Pearson Correlation	-0.05	0.01
Priority Call	Sig. (2-tailed)	5.52E-06	0.52
SIREN2	Pearson Correlation	-0.01	0.02
Used Lights and Siresn	Sig. (2-tailed)	1	0.06
NOTROUT2	Pearson Correlation	0.01	0.04
Approach Unknown	Sig. (2-tailed)	0.47	0.01
OFFDUTY	Pearson Correlation	0.01	0.01
Officer Duty Status	Sig. (2-tailed)	0.67	0.72

Table C-1 (cont'd)

		INSIDE	VISIBLE
LOCRIME	Pearson Correlation		
Location Known for Criminal Activity	Sig. (2-tailed)		
LOCHAZRD	Pearson Correlation		
Location Known to be Hazardous	Sig. (2-tailed)		
INSIDE	Pearson Correlation	1	
Arrest Occurred Inside	Sig. (2-tailed)	.	
VISIBLE	Pearson Correlation	0.06	1
Visibility at Place of Arrest	Sig. (2-tailed)	4.38E-06	.
VIOLENT	Pearson Correlation	0.14	-0.03
Violent Offense	Sig. (2-tailed)	7.59E-30	0.01
WEEKEND	Pearson Correlation	-0.06	0.01
Friday 6pm to Monday 6am	Sig. (2-tailed)	0.63	0.84
BPDEMEAN	Pearson Correlation	0.01	-0.05
Bystander Demeanor Toward Police	Sig. (2-tailed)	0.7	0.01
NUMBERSO	Pearson Correlation	0.01	-0.04
Number of Suspects at Completion of Arrest	Sig. (2-tailed)	0.53	0.01
CUSTODY	Pearson Correlation	0.17	0.08
Custody Status	Sig. (2-tailed)	1.20E-43	3.48E-12
CIT2	Pearson Correlation	0.02	0.02
Citizen Initiated Contact with Police	Sig. (2-tailed)	0.09	0.09
POL2	Pearson Correlation	-0.19	-0.03
Police Initiated Contact with Arrestee	Sig. (2-tailed)	5.56E-56	0.01
OTHAP2	Pearson Correlation	-0.15	-0.01
Dispatch or Onview Not Reported	Sig. (2-tailed)	5.87E-36	0.29
PRIO2	Pearson Correlation	0.1	-0.07
Priority Call	Sig. (2-tailed)	2.68E-15	1.82E-09
SIREN2	Pearson Correlation	-0.19	-0.03
Used Lights and Siresn	Sig. (2-tailed)	1.71E-54	0.02
NOTROUT2	Pearson Correlation	-0.01	-0.04
Approach Unknown	Sig. (2-tailed)	0.33	0.01
OFFDUTY	Pearson Correlation	0.01	0.01
Officer Duty Status	Sig. (2-tailed)	0.58	0.3

Table C-1 (cont'd)

		VIOLENT	WEEKEND
LOCRIME	Pearson Correlation		
Location Known for Criminal Activity	Sig. (2-tailed)		
LOCHAZRD	Pearson Correlation		
Location Known to be Hazardous	Sig. (2-tailed)		
INSIDE	Pearson Correlation		
Arrest Occurred Inside	Sig. (2-tailed)		
VISIBLE	Pearson Correlation		
Visibility at Place of Arrest	Sig. (2-tailed)		
VIOLENT	Pearson Correlation	1	
Violent Offense	Sig. (2-tailed)	.	
WEEKEND	Pearson Correlation	0.07	1
Friday 6pm to Monday 6am	Sig. (2-tailed)	3.18E-09	.
BPDEMEAN	Pearson Correlation	0.02	-0.01
Bystander Demeanor Toward Police	Sig. (2-tailed)	0.06	0.85
NUMBERSO	Pearson Correlation	-0.03	-0.01
Number of Suspects at Completion of Arrest	Sig. (2-tailed)	0.01	0.8
CUSTODY	Pearson Correlation	-0.05	-0.04
Custody Status	Sig. (2-tailed)	0.01	0.01
CIT2	Pearson Correlation	0.03	-0.02
Citizen Initiated Contact with Police	Sig. (2-tailed)	0.03	0.06
POL2	Pearson Correlation	-0.15	-0.07
Police Initiated Contact with Arrestee	Sig. (2-tailed)	8.96E-38	1.62E-08
OTHAP2	Pearson Correlation	-0.08	0.01
Dispatch or Onview Not Reported	Sig. (2-tailed)	3.22E-12	0.6
PRIO2	Pearson Correlation	0.14	0.01
Priority Call	Sig. (2-tailed)	7.89E-33	0.73
SIREN2	Pearson Correlation	-0.05	0.04
Used Lights and Siresn	Sig. (2-tailed)	0.01	0.01
NOTROUT2	Pearson Correlation	0.05	-0.01
Approach Unknown	Sig. (2-tailed)	0.01	0.25
OFFDUTY	Pearson Correlation	0.01	0.01
Officer Duty Status	Sig. (2-tailed)	0.43	0.38

Table C-1 (cont'd)

		BPDEMEAN	NUMBERSO
LOCRIME	Pearson Correlation		
Location Known for Criminal Activity	Sig. (2-tailed)		
LOCHAZRD	Pearson Correlation		
Location Known to be Hazardous	Sig. (2-tailed)		
INSIDE	Pearson Correlation		
Arrest Occurred Inside	Sig. (2-tailed)		
VISIBLE	Pearson Correlation		
Visibility at Place of Arrest	Sig. (2-tailed)		
VIOLENT	Pearson Correlation		
Violent Offense	Sig. (2-tailed)		
WEEKEND	Pearson Correlation		
Friday 6pm to Monday 6am	Sig. (2-tailed)		
BPDEMEAN	Pearson Correlation	1	
Bystander Demeanor Toward Police	Sig. (2-tailed)	.	
NUMBERSO	Pearson Correlation	0.04	1
Number of Suspects at Completion of Arrest	Sig. (2-tailed)	0.01	.
CUSTODY	Pearson Correlation	-0.05	-0.03
Custody Status	Sig. (2-tailed)	0.01	0.01
CIT2	Pearson Correlation	0.02	0.02
Citizen Initiated Contact with Police	Sig. (2-tailed)	0.14	0.15
POL2	Pearson Correlation	-0.01	0.06
Police Initiated Contact with Arrestee	Sig. (2-tailed)	0.52	2.14E-06
OTHAP2	Pearson Correlation	0.02	0.01
Dispatch or Onview Not Reported	Sig. (2-tailed)	0.04	0.51
PRIO2	Pearson Correlation	0.03	0.03
Priority Call	Sig. (2-tailed)	0.01	0.03
SIREN2	Pearson Correlation	0.03	0.02
Used Lights and Siresn	Sig. (2-tailed)	0.02	0.15
NOTROUT2	Pearson Correlation	0.01	0.04
Approach Unknown	Sig. (2-tailed)	0.23	0.01
OFFDUTY	Pearson Correlation	-0.01	0.01
Officer Duty Status	Sig. (2-tailed)	0.85	0.9

Table C-1 (cont'd)

		CUSTODY	CIT2
LOCRIME Location Known for Criminal Activity	Pearson Correlation		
	Sig. (2-tailed)		
LOCHAZRD Location Known to be Hazardous	Pearson Correlation		
	Sig. (2-tailed)		
INSIDE Arrest Occurred Inside	Pearson Correlation		
	Sig. (2-tailed)		
VISIBLE Visibility at Place of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
VIOLENT Violent Offense	Pearson Correlation		
	Sig. (2-tailed)		
WEEKEND Friday 6pm to Monday 6am	Pearson Correlation		
	Sig. (2-tailed)		
BPDEMEAN Bystander Demeanor Toward Police	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERSO Number of Suspects at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
CUSTODY Custody Status	Pearson Correlation	1	
	Sig. (2-tailed)	.	
CIT2 Citizen Initiated Contact with Police	Pearson Correlation	-0.01	1
	Sig. (2-tailed)	0.45	.
POL2 Police Initiated Contact with Arrestee	Pearson Correlation	-0.16	-0.16
	Sig. (2-tailed)	6.80E-40	7.84E-43
OTHAP2 Dispatch or Onview Not Reported	Pearson Correlation	-0.05	-0.09
	Sig. (2-tailed)	0.01	3.45E-13
PRIO2 Priority Call	Pearson Correlation	-0.01	-0.01
	Sig. (2-tailed)	0.49	0.27
SIREN2 Used Lights and Siresn	Pearson Correlation	-0.08	-0.02
	Sig. (2-tailed)	1.62E-10	0.08
NOTROUT2 Approach Unknown	Pearson Correlation	0.02	0.03
	Sig. (2-tailed)	0.11	0.01
OFFDUTY Officer Duty Status	Pearson Correlation	0.03	0.05
	Sig. (2-tailed)	0.02	0.01

Table C-1 (cont'd)

		POL2	OTHAP2
LOCRIME Location Known for Criminal Activity	Pearson Correlation		
	Sig. (2-tailed)		
LOCHAZRD Location Known to be Hazardous	Pearson Correlation		
	Sig. (2-tailed)		
INSIDE Arrest Occurred Inside	Pearson Correlation		
	Sig. (2-tailed)		
VISIBLE Visibility at Place of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
VIOLENT Violent Offense	Pearson Correlation		
	Sig. (2-tailed)		
WEEKEND Friday 6pm to Monday 6am	Pearson Correlation		
	Sig. (2-tailed)		
BPDEMEAN Bystander Demeanor Toward Police	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERSO Number of Suspects at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
CUSTODY Custody Status	Pearson Correlation		
	Sig. (2-tailed)		
CIT2 Citizen Initiated Contact with Police	Pearson Correlation		
	Sig. (2-tailed)		
POL2 Police Initiated Contact with Arrestee	Pearson Correlation	1	
	Sig. (2-tailed)	.	
OTHAP2 Dispatch or Onview Not Reported	Pearson Correlation	-0.31	1
	Sig. (2-tailed)	1.99E-148	.
PRIO2 Priority Call	Pearson Correlation	-0.19	-0.11
	Sig. (2-tailed)	1.13E-59	1.03E-20
SIREN2 Used Lights and Siresn	Pearson Correlation	0.16	0.04
	Sig. (2-tailed)	6.12E-41	0.01
NOTROUT2 Approach Unknown	Pearson Correlation	0.02	0.05
	Sig. (2-tailed)	0.15	8.18E-06
OFFDUTY Officer Duty Status	Pearson Correlation	0.01	0.01
	Sig. (2-tailed)	0.26	0.64

Table C-1 (cont'd)

		PRIO2	SIREN2
LOCRIME Location Known for Criminal Activity	Pearson Correlation		
	Sig. (2-tailed)		
LOCHAZRD Location Known to be Hazardous	Pearson Correlation		
	Sig. (2-tailed)		
INSIDE Arrest Occurred Inside	Pearson Correlation		
	Sig. (2-tailed)		
VISIBLE Visibility at Place of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
VIOLENT Violent Offense	Pearson Correlation		
	Sig. (2-tailed)		
WEEKEND Friday 6pm to Monday 6am	Pearson Correlation		
	Sig. (2-tailed)		
BPDEMEAN Bystander Demeanor Toward Police	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERSO Number of Suspects at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
CUSTODY Custody Status	Pearson Correlation		
	Sig. (2-tailed)		
CIT2 Citizen Initiated Contact with Police	Pearson Correlation		
	Sig. (2-tailed)		
POL2 Police Initiated Contact with Arrestee	Pearson Correlation		
	Sig. (2-tailed)		
OTHAP2 Dispatch or Onview Not Reported	Pearson Correlation		
	Sig. (2-tailed)		
PRIO2 Priority Call	Pearson Correlation	1	
	Sig. (2-tailed)	.	
SIREN2 Used Lights and Siresn	Pearson Correlation	0.04	1
	Sig. (2-tailed)	0.01	.
NOTROUT2 Approach Unknown	Pearson Correlation	-0.16	-0.12
	Sig. (2-tailed)	1.32E-41	1.06E-22
OFFDUTY Officer Duty Status	Pearson Correlation	-0.01	-0.01
	Sig. (2-tailed)	0.34	0.68

Table C-1 (cont'd)

		NOTROUT2	OFFDUTY
LOCRIME Location Known for Criminal Activity	Pearson Correlation		
	Sig. (2-tailed)		
LOCHAZRD Location Known to be Hazardous	Pearson Correlation		
	Sig. (2-tailed)		
INSIDE Arrest Occurred Inside	Pearson Correlation		
	Sig. (2-tailed)		
VISIBLE Visibility at Place of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
VIOLENT Violent Offense	Pearson Correlation		
	Sig. (2-tailed)		
WEEKEND Friday 6pm to Monday 6am	Pearson Correlation		
	Sig. (2-tailed)		
BPDEMEAN Bystander Demeanor Toward Police	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERSO Number of Suspects at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
CUSTODY Custody Status	Pearson Correlation		
	Sig. (2-tailed)		
CIT2 Citizen Initiated Contact with Police	Pearson Correlation		
	Sig. (2-tailed)		
POL2 Police Initiated Contact with Arrestee	Pearson Correlation		
	Sig. (2-tailed)		
OTHAP2 Dispatch or Onview Not Reported	Pearson Correlation		
	Sig. (2-tailed)		
PRIO2 Priority Call	Pearson Correlation		
	Sig. (2-tailed)		
SIREN2 Used Lights and Siresn	Pearson Correlation		
	Sig. (2-tailed)		
NOTROUT2 Approach Unknown	Pearson Correlation	1	
	Sig. (2-tailed)	.	
OFFDUTY Officer Duty Status	Pearson Correlation	0.03	1
	Sig. (2-tailed)	0.02	.

Table C-1 (cont'd)

		LOCRIME	LOCHAZRD
BACKUP	Pearson Correlation	0.05	0.07
Called for Backup	Sig. (2-tailed)	0.01	2.38E-08
NUMBERPO	Pearson Correlation	0.1	0.13
Number of Officers at Completion of Arrest	Sig. (2-tailed)	9.61E-17	5.06E-28
OFF1AGE	Pearson Correlation	-0.06	-0.06
Actual Age of First Officer	Sig. (2-tailed)	2.35E-07	1.56E-07
BLACK1	Pearson Correlation	-0.01	-0.01
First Officer Black	Sig. (2-tailed)	0.74	0.81
HISP1	Pearson Correlation	-0.01	0.01
First Officer Hispanic	Sig. (2-tailed)	1	0.75
OTH1	Pearson Correlation	0.03	0.02
First Officer Other Race	Sig. (2-tailed)	0.03	0.08
MALE1	Pearson Correlation	0.01	0.02
First Officer is Male	Sig. (2-tailed)	0.43	0.13
PSDEMEAN	Pearson Correlation	0.02	0.04
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.13	0.01
MEDPRIOR	Pearson Correlation	0.02	0.04
Prior Medical Attention to Officer	Sig. (2-tailed)	0.06	0.01
REPEAT	Pearson Correlation	0.01	0.01
Surveys Completed by this Officer	Sig. (2-tailed)	0.21	0.26
SUSPAGE	Pearson Correlation	-0.03	0.01
Actual Age of First Suspect	Sig. (2-tailed)	0.77	0.68
BLACKS	Pearson Correlation	0.16	0.15
Black Suspect	Sig. (2-tailed)	6.10E-41	1.20E-36
HISPS	Pearson Correlation	0.01	-0.02
Hispanic Suspect	Sig. (2-tailed)	0.81	0.04
OTHS	Pearson Correlation	-0.03	-0.03
Other Race Suspect	Sig. (2-tailed)	0.01	0.01
SMISS	Pearson Correlation	-0.02	-0.02
Missing Race Suspect	Sig. (2-tailed)	0.15	0.12
MALES	Pearson Correlation	-0.02	0.01
Suspect is Male	Sig. (2-tailed)	0.07	0.87
BELASSLT	Pearson Correlation	0.09	0.13
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	1.20E-13	2.55E-25

Table C-1 (cont'd)

		INSIDE	VISIBLE
BACKUP	Pearson Correlation	-0.02	-0.05
Called for Backup	Sig. (2-tailed)	0.11	0.01
NUMBERPO	Pearson Correlation	0.01	-0.08
Number of Officers at Completion of Arrest	Sig. (2-tailed)	0.42	1.22E-11
OFF1AGE	Pearson Correlation	0.04	0.11
Actual Age of First Officer	Sig. (2-tailed)	0.01	6.24E-21
BLACK1	Pearson Correlation	0.03	0.03
First Officer Black	Sig. (2-tailed)	0.01	0.01
HISP1	Pearson Correlation	-0.01	-0.03
First Officer Hispanic	Sig. (2-tailed)	0.22	0.01
OTH1	Pearson Correlation	-0.01	-0.01
First Officer Other Race	Sig. (2-tailed)	0.29	0.7
MALE1	Pearson Correlation	-0.03	0.01
First Officer is Male	Sig. (2-tailed)	0.01	0.96
PSDEMEAN	Pearson Correlation	-0.01	-0.01
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.34	0.36
MEDPRIOR	Pearson Correlation	-0.02	-0.03
Prior Medical Attention to Officer	Sig. (2-tailed)	0.11	0.02
REPEAT	Pearson Correlation	-0.04	-0.03
Surveys Completed by this Officer	Sig. (2-tailed)	0.01	0.03
SUSPAGE	Pearson Correlation	0.01	0.03
Actual Age of First Suspect	Sig. (2-tailed)	0.68	0.04
BLACKS	Pearson Correlation	0.01	0.01
Black Suspect	Sig. (2-tailed)	0.6	0.67
HISPS	Pearson Correlation	-0.03	-0.04
Hispanic Suspect	Sig. (2-tailed)	0.02	0.01
OTHS	Pearson Correlation	0.01	0.01
Other Race Suspect	Sig. (2-tailed)	0.44	0.45
SMISS	Pearson Correlation	0.01	-0.02
Missing Race Suspect	Sig. (2-tailed)	0.65	0.17
MALES	Pearson Correlation	-0.08	-0.03
Suspect is Male	Sig. (2-tailed)	2.31E-12	0.02
BELASSLT	Pearson Correlation	0.03	0.01
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.01	0.86

Table C-1 (cont'd)

		VIOLENT	WEEKEND
BACKUP	Pearson Correlation	0.08	0.01
Called for Backup	Sig. (2-tailed)	1.53E-11	0.61
NUMBERPO	Pearson Correlation	0.02	-0.01
Number of Officers at Completion of Arrest	Sig. (2-tailed)	0.16	0.35
OFF1AGE	Pearson Correlation	-0.04	-0.04
Actual Age of First Officer	Sig. (2-tailed)	0.01	0.01
BLACK1	Pearson Correlation	0.03	-0.01
First Officer Black	Sig. (2-tailed)	0.03	0.4
HISP1	Pearson Correlation	0.01	0.01
First Officer Hispanic	Sig. (2-tailed)	0.56	0.29
OTH1	Pearson Correlation	-0.02	0.02
First Officer Other Race	Sig. (2-tailed)	0.11	0.08
MALE1	Pearson Correlation	-0.02	0.02
First Officer is Male	Sig. (2-tailed)	0.13	0.09
PSDEMEAN	Pearson Correlation	0.02	0.01
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.16	0.72
MEDPRIOR	Pearson Correlation	-0.01	0.03
Prior Medical Attention to Officer	Sig. (2-tailed)	0.83	0.02
REPEAT	Pearson Correlation	-0.06	0.02
Surveys Completed by this Officer	Sig. (2-tailed)	1.88E-07	0.08
SUSPAGE	Pearson Correlation	-0.01	0.03
Actual Age of First Suspect	Sig. (2-tailed)	0.47	0.01
BLACKS	Pearson Correlation	0.06	0.01
Black Suspect	Sig. (2-tailed)	7.42E-08	0.96
HISPS	Pearson Correlation	0.01	0.05
Hispanic Suspect	Sig. (2-tailed)	0.23	0.01
OTHS	Pearson Correlation	-0.01	-0.03
Other Race Suspect	Sig. (2-tailed)	0.73	0.01
SMISS	Pearson Correlation	-0.08	-0.11
Missing Race Suspect	Sig. (2-tailed)	3.12E-10	7.69E-19
MALES	Pearson Correlation	0.05	0.02
Suspect is Male	Sig. (2-tailed)	0.01	0.09
BELASSLT	Pearson Correlation	0.09	-0.03
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	1.16E-12	0.06

Table C-1 (cont'd)

		BPDEMEAN	NUMBERSO
BACKUP	Pearson Correlation	0.05	0.07
Called for Backup	Sig. (2-tailed)	0.01	2.90E-09
NUMBERPO	Pearson Correlation	0.12	0.3
Number of Officers at Completion of Arrest	Sig. (2-tailed)	1.02E-22	6.25E-142
OFF1AGE	Pearson Correlation	-0.04	-0.03
Actual Age of First Officer	Sig. (2-tailed)	0.01	0.02
BLACK1	Pearson Correlation	0.01	-0.03
First Officer Black	Sig. (2-tailed)	0.78	0.01
HISP1	Pearson Correlation	0.01	-0.01
First Officer Hispanic	Sig. (2-tailed)	0.98	0.86
OTH1	Pearson Correlation	0.01	0.01
First Officer Other Race	Sig. (2-tailed)	0.92	0.45
MALE1	Pearson Correlation	0.03	0.01
First Officer is Male	Sig. (2-tailed)	0.01	0.72
PSDEMEAN	Pearson Correlation	0.18	0.01
Police Demeanor Toward Suspect	Sig. (2-tailed)	1.70E-50	0.69
MEDPRIOR	Pearson Correlation	0.02	0.01
Prior Medical Attention to Officer	Sig. (2-tailed)	0.09	0.77
REPEAT	Pearson Correlation	-0.01	-0.01
Surveys Completed by this Officer	Sig. (2-tailed)	0.54	0.42
SUSPAGE	Pearson Correlation	-0.05	-0.05
Actual Age of First Suspect	Sig. (2-tailed)	0.01	0.01
BLACKS	Pearson Correlation	0.08	0.03
Black Suspect	Sig. (2-tailed)	8.51	0.01
HISPS	Pearson Correlation	-0.02	0.01
Hispanic Suspect	Sig. (2-tailed)	0.12	0.52
OTHS	Pearson Correlation	-0.01	0.01
Other Race Suspect	Sig. (2-tailed)	0.92	0.52
SMISS	Pearson Correlation	-0.03	0.01
Missing Race Suspect	Sig. (2-tailed)	0.02	0.49
MALES	Pearson Correlation	-0.01	0.01
Suspect is Male	Sig. (2-tailed)	0.98	0.7
BELASSLT	Pearson Correlation	0.04	-0.01
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.01	0.93

Table C-1 (cont'd)

		CUSTODY	CIT
BACKUP Called for Backup	Pearson Correlation	-0.08	0.04
	Sig. (2-tailed)	2.39E-12	0.01
NUMBERPO Number of Officers at Completion of Arrest	Pearson Correlation	-0.05	0.02
	Sig. (2-tailed)	0.01	0.06
OFF1AGE Actual Age of First Officer	Pearson Correlation	0.01	0.05
	Sig. (2-tailed)	0.76	0.01
BLACK1 First Officer Black	Pearson Correlation	0.06	0.01
	Sig. (2-tailed)	4.69E-06	0.83
HISP1 First Officer Hispanic	Pearson Correlation	0.01023682	-0.02
	Sig. (2-tailed)	0.4	0.2
OTH1 First Officer Other Race	Pearson Correlation	-0.02	0.02
	Sig. (2-tailed)	0.06	0.13
MALE1 First Officer is Male	Pearson Correlation	-0.01	0.02
	Sig. (2-tailed)	0.41	0.05
PSDEMEAN Police Demeanor Toward Suspect	Pearson Correlation	-0.01	0.01
	Sig. (2-tailed)	0.45	0.25
MEDPRIOR Prior Medical Attention to Officer	Pearson Correlation	-0.01	0.05
	Sig. (2-tailed)	0.67	8.43E-06
REPEAT Surveys Completed by this Officer	Pearson Correlation	-0.08	-0.03
	Sig. (2-tailed)	8.21E-12	0.03
SUSPAGE Actual Age of First Suspect	Pearson Correlation	-0.04	-0.01
	Sig. (2-tailed)	0.01	0.89
BLACKS Black Suspect	Pearson Correlation	0.02	-0.01
	Sig. (2-tailed)	0.07	0.69
HISPS Hispanic Suspect	Pearson Correlation	-0.01	0.01
	Sig. (2-tailed)	0.66	0.94
OTHS Other Race Suspect	Pearson Correlation	-0.02	0.01
	Sig. (2-tailed)	0.21	0.58
SMISS Missing Race Suspect	Pearson Correlation	0.02	0.01
	Sig. (2-tailed)	0.04	0.32
MALES Suspect is Male	Pearson Correlation	-0.06	0.01
	Sig. (2-tailed)	1.21E-06	0.41
BELASSLT Police Believe Suspect to be Assaultive	Pearson Correlation	-0.04	0.02
	Sig. (2-tailed)	0.01	0.18

Table C-1 (cont'd)

		POL2	OTHAP2
BACKUP	Pearson Correlation	0.05	-0.08
Called for Backup	Sig. (2-tailed)	0.01	2.37E-10
NUMBERPO	Pearson Correlation	0.05	-0.01
Number of Officers at Completion of Arrest	Sig. (2-tailed)	0.01	0.94
OFF1AGE	Pearson Correlation	-0.02	0.03
Actual Age of First Officer	Sig. (2-tailed)	0.09	0.03
BLACK1	Pearson Correlation	-0.03	0.01
First Officer Black	Sig. (2-tailed)	0.02	0.52
HISP1	Pearson Correlation	-0.03	0.05
First Officer Hispanic	Sig. (2-tailed)	0.01	0.01
OTH1	Pearson Correlation	0.01	0.02
First Officer Other Race	Sig. (2-tailed)	0.29	0.09
MALE1	Pearson Correlation	0.01	0.03
First Officer is Male	Sig. (2-tailed)	0.45	0.01
PSDEMEAN	Pearson Correlation	-0.02	-0.01
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.1	0.95
MEDPRIOR	Pearson Correlation	-0.01	-0.02
Prior Medical Attention to Officer	Sig. (2-tailed)	0.56	0.05
REPEAT	Pearson Correlation	0.06	0.02
Surveys Completed by this Officer	Sig. (2-tailed)	3.06E-06	0.11
SUSPAGE	Pearson Correlation	-0.03	0.02
Actual Age of First Suspect	Sig. (2-tailed)	0.02	0.13
BLACKS	Pearson Correlation	0.05	-0.04
Black Suspect	Sig. (2-tailed)	0.01	0.01
HISPS	Pearson Correlation	-0.05	0.06
Hispanic Suspect	Sig. (2-tailed)	0.01	5.09E-06
OTHS	Pearson Correlation	-0.01	0.04
Other Race Suspect	Sig. (2-tailed)	0.34	0.01
SMISS	Pearson Correlation	-0.03	0.04
Missing Race Suspect	Sig. (2-tailed)	0.01	0.01
MALES	Pearson Correlation	-0.02	0.02
Suspect is Male	Sig. (2-tailed)	0.07	0.1
BELASSLT	Pearson Correlation	0.03	-0.04
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.01	0.01

Table C-1 (cont'd)

		PRIO2	SIREN2
BACKUP	Pearson Correlation	0.11	0.1
Called for Backup	Sig. (2-tailed)	1.72E-18	4.93E-16
NUMBERPO	Pearson Correlation	0.1	0.1
Number of Officers at Completion of Arrest	Sig. (2-tailed)	4.21E-17	2.41E-15
OFF1AGE	Pearson Correlation	0.01	-0.05
Actual Age of First Officer	Sig. (2-tailed)	0.24	0.01
BLACK1	Pearson Correlation	0.02	-0.03
First Officer Black	Sig. (2-tailed)	0.12	0.03
HISP1	Pearson Correlation	-0.01	-0.01
First Officer Hispanic	Sig. (2-tailed)	0.43	0.3
OTH1	Pearson Correlation	-0.05	0.02
First Officer Other Race	Sig. (2-tailed)	0.01	0.07
MALE1	Pearson Correlation	-0.04	0.01
First Officer is Male	Sig. (2-tailed)	0.01	0.42
PSDEMEAN	Pearson Correlation	0.03	0.01
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.02	0.98
MEDPRIOR	Pearson Correlation	0.01	0.01
Prior Medical Attention to Officer	Sig. (2-tailed)	0.24	0.54
REPEAT	Pearson Correlation	0.02	-0.01
Surveys Completed by this Officer	Sig. (2-tailed)	0.1	0.43
SUSPAGE	Pearson Correlation	-0.03	-0.05
Actual Age of First Suspect	Sig. (2-tailed)	0.02	0.01
BLACKS	Pearson Correlation	0.01	-0.01
Black Suspect	Sig. (2-tailed)	0.44	0.79
HISPS	Pearson Correlation	-0.02	0.02
Hispanic Suspect	Sig. (2-tailed)	0.09	0.08
OTHS	Pearson Correlation	-0.03	0.01
Other Race Suspect	Sig. (2-tailed)	0.02	0.32
SMISS	Pearson Correlation	0.01	-0.03
Missing Race Suspect	Sig. (2-tailed)	0.54	0.01
MALES	Pearson Correlation	0.03	0.04
Suspect is Male	Sig. (2-tailed)	0.03	0.01
BELASSLT	Pearson Correlation	0.03	0.01
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.01	0.96

Table C-1 (cont'd)

		NOTROUT2	OFFDUTY
BACKUP	Pearson Correlation	0.21	0.02
Called for Backup	Sig. (2-tailed)	8.82E-67	0.15
NUMBERPO	Pearson Correlation	0.09	0.01
Number of Officers at Completion of Arrest	Sig. (2-tailed)	4.87E-14	0.62
OFF1AGE	Pearson Correlation	-0.03	0.04
Actual Age of First Officer	Sig. (2-tailed)	0.01	0.01
BLACK1	Pearson Correlation	0.03	0.04
First Officer Black	Sig. (2-tailed)	0.03	0.01
HISP1	Pearson Correlation	0.01	-0.02
First Officer Hispanic	Sig. (2-tailed)	0.54	0.1
OTH1	Pearson Correlation	0.01	0.01
First Officer Other Race	Sig. (2-tailed)	0.65	0.97
MALE1	Pearson Correlation	0.01	0.12
First Officer is Male	Sig. (2-tailed)	0.23	0.21
PSDEMEAN	Pearson Correlation	0.01	-0.02
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.95	0.17
MEDPRIOR	Pearson Correlation	0.02	-0.01
Prior Medical Attention to Officer	Sig. (2-tailed)	0.2	0.95
REPEAT	Pearson Correlation	-0.02	-0.01
Surveys Completed by this Officer	Sig. (2-tailed)	0.05	0.26
SUSPAGE	Pearson Correlation	-0.02	-0.01
Actual Age of First Suspect	Sig. (2-tailed)	0.08	0.34
BLACKS	Pearson Correlation	0.01	0.01
Black Suspect	Sig. (2-tailed)	0.56	0.4
HISPS	Pearson Correlation	0.01	0.02
Hispanic Suspect	Sig. (2-tailed)	0.59	0.14
OTHS	Pearson Correlation	0.01	0.01
Other Race Suspect	Sig. (2-tailed)	0.83	0.67
SMISS	Pearson Correlation	0.02	-0.02
Missing Race Suspect	Sig. (2-tailed)	0.13	0.1
MALES	Pearson Correlation	0.03	0.01
Suspect is Male	Sig. (2-tailed)	0.01	0.48
BELASSLT	Pearson Correlation	0.01	0.01
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.71	0.45

Table C-1 (cont'd)

		BACKUP	NUMBERPO
BACKUP	Pearson Correlation	1	
Called for Backup	Sig. (2-tailed)	.	
NUMBERPO	Pearson Correlation	0.17	1
Number of Officers at Completion of Arrest	Sig. (2-tailed)	1.22E-47	.
OFF1AGE	Pearson Correlation	-0.01	-0.08
Actual Age of First Officer	Sig. (2-tailed)	0.38	1.50326E-10
BLACK1	Pearson Correlation	0.03	-0.05
First Officer Black	Sig. (2-tailed)	0.02	0.01
HISP1	Pearson Correlation	-0.03	-0.01
First Officer Hispanic	Sig. (2-tailed)	0.01	0.3
OTH1	Pearson Correlation	-0.01	0.01
First Officer Other Race	Sig. (2-tailed)	0.51	0.91
MALE1	Pearson Correlation	-0.01	-0.01
First Officer is Male	Sig. (2-tailed)	0.72	0.8
PSDEMEAN	Pearson Correlation	0.01	0.05
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.29	0.01
MEDPRIOR	Pearson Correlation	0.05	0.03
Prior Medical Attention to Officer	Sig. (2-tailed)	0.01	0.02
REPEAT	Pearson Correlation	0.02	-0.02
Surveys Completed by this Officer	Sig. (2-tailed)	0.05	0.05
SUSPAGE	Pearson Correlation	-0.06	-0.05
Actual Age of First Suspect	Sig. (2-tailed)	1.42E-07	0.01
BLACKS	Pearson Correlation	0.04	0.05
Black Suspect	Sig. (2-tailed)	0.01	6.97E-06
HISPS	Pearson Correlation	-0.03	-0.01
Hispanic Suspect	Sig. (2-tailed)	0.01	0.68
OTHS	Pearson Correlation	-0.01	-0.02
Other Race Suspect	Sig. (2-tailed)	0.31	0.16
SMISS	Pearson Correlation	-0.02	-0.02
Missing Race Suspect	Sig. (2-tailed)	0.21	0.07
MALES	Pearson Correlation	0.04	0.01
Suspect is Male	Sig. (2-tailed)	0.01	0.32
BELASSLT	Pearson Correlation	0.09	0.05
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	2.62E-13	0.01

Table C-1 (cont'd)

		OFF1AGE	BLACK1
BACKUP	Pearson Correlation		
Called for Backup	Sig. (2-tailed)		
NUMBERPO	Pearson Correlation		
Number of Officers at Completion of Arrest	Sig. (2-tailed)		
OFF1AGE	Pearson Correlation	1	
Actual Age of First Officer	Sig. (2-tailed)	.	
BLACK1	Pearson Correlation	-0.03	1
First Officer Black	Sig. (2-tailed)	0.01	.
HISP1	Pearson Correlation	-0.03	-0.12
First Officer Hispanic	Sig. (2-tailed)	0.02	7.43E-22
OTH1	Pearson Correlation	-0.02	-0.07
First Officer Other Race	Sig. (2-tailed)	0.05	4.20E-08
MALE1	Pearson Correlation	0.06	-0.04
First Officer is Male	Sig. (2-tailed)	1.01E-07	0.01
PSDEMEAN	Pearson Correlation	-0.01	0.05
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.27	0.01
MEDPRIOR	Pearson Correlation	0.02	-0.04
Prior Medical Attention to Officer	Sig. (2-tailed)	0.04	0.01
REPEAT	Pearson Correlation	-0.05	-0.04
Surveys Completed by this Officer	Sig. (2-tailed)	0.01	0.01
SUSPAGE	Pearson Correlation	0.04	-0.01
Actual Age of First Suspect	Sig. (2-tailed)	0.01	0.79
BLACKS	Pearson Correlation	-0.09	0.11
Black Suspect	Sig. (2-tailed)	1.09E-14	2.69E-18
HISPS	Pearson Correlation	0.01	-0.02
Hispanic Suspect	Sig. (2-tailed)	0.75	0.06
OTHS	Pearson Correlation	0.01	0.01
Other Race Suspect	Sig. (2-tailed)	0.41	0.82
SMISS	Pearson Correlation	0.01	0.02
Missing Race Suspect	Sig. (2-tailed)	0.63	0.05
MALES	Pearson Correlation	0.01	-0.01
Suspect is Male	Sig. (2-tailed)	0.72	0.82
BELASSLT	Pearson Correlation	0.03	0.01
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.03	0.27

Table C-1 (cont'd)

		HISP1	OTH1
BACKUP	Pearson Correlation		
Called for Backup	Sig. (2-tailed)		
NUMBERPO	Pearson Correlation		
Number of Officers at Completion of Arrest	Sig. (2-tailed)		
OFF1AGE	Pearson Correlation		
Actual Age of First Officer	Sig. (2-tailed)		
BLACK1	Pearson Correlation		
First Officer Black	Sig. (2-tailed)		
HISP1	Pearson Correlation	1	
First Officer Hispanic	Sig. (2-tailed)	.	
OTH1	Pearson Correlation	-0.05	1
First Officer Other Race	Sig. (2-tailed)	0.01	.
MALE1	Pearson Correlation	0.03	0.02
First Officer is Male	Sig. (2-tailed)	0.01	0.05
PSDEMEAN	Pearson Correlation	0.01	0.02
Police Demeanor Toward Suspect	Sig. (2-tailed)	0.33	0.18
MEDPRIOR	Pearson Correlation	-0.02	0.01
Prior Medical Attention to Officer	Sig. (2-tailed)	0.19	0.95
REPEAT	Pearson Correlation	-0.06	-0.05
Surveys Completed by this Officer	Sig. (2-tailed)	8.58E-07	7.55E-06
SUSPAGE	Pearson Correlation	-0.02	-0.01
Actual Age of First Suspect	Sig. (2-tailed)	0.05	0.96
BLACKS	Pearson Correlation	-0.05	-0.03
Black Suspect	Sig. (2-tailed)	0.01	0.03
HISPS	Pearson Correlation	0.09	0.03
Hispanic Suspect	Sig. (2-tailed)	4.77E-15	0.01
OTHS	Pearson Correlation	0.01	0.05
Other Race Suspect	Sig. (2-tailed)	0.32	9.45E-06
SMISS	Pearson Correlation	0.04	-0.01
Missing Race Suspect	Sig. (2-tailed)	0.01	0.5
MALES	Pearson Correlation	0.02	-0.02
Suspect is Male	Sig. (2-tailed)	0.12	0.18
BELASSLT	Pearson Correlation	-0.01	-0.02
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.18	0.1

Table C-1 (cont'd)

		MALE1	PSDEMEAN
BACKUP Called for Backup	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERPO Number of Officers at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
OFF1AGE Actual Age of First Officer	Pearson Correlation		
	Sig. (2-tailed)		
BLACK1 First Officer Black	Pearson Correlation		
	Sig. (2-tailed)		
HISP1 First Officer Hispanic	Pearson Correlation		
	Sig. (2-tailed)		
OTH1 First Officer Other Race	Pearson Correlation		
	Sig. (2-tailed)		
MALE1 First Officer is Male	Pearson Correlation	1	
	Sig. (2-tailed)	.	
PSDEMEAN Police Demeanor Toward Suspect	Pearson Correlation	0.01	1
	Sig. (2-tailed)	0.87	.
MEDPRIOR Prior Medical Attention to Officer	Pearson Correlation	-0.01	-0.01
	Sig. (2-tailed)	0.26	0.91
REPEAT Surveys Completed by this Officer	Pearson Correlation	0.02	-0.03
	Sig. (2-tailed)	0.05	0.02
SUSPAGE Actual Age of First Suspect	Pearson Correlation	-0.01	0.01
	Sig. (2-tailed)	0.42	0.71
BLACKS Black Suspect	Pearson Correlation	-0.01	0.02
	Sig. (2-tailed)	0.94	0.13
HISPS Hispanic Suspect	Pearson Correlation	0.02	0.01
	Sig. (2-tailed)	0.06	0.95
OTHS Other Race Suspect	Pearson Correlation	-0.02	-0.01
	Sig. (2-tailed)	0.1	0.83
SMISS Missing Race Suspect	Pearson Correlation	0.01	0.01
	Sig. (2-tailed)	0.62	0.51
MALES Suspect is Male	Pearson Correlation	0.05	0.02
	Sig. (2-tailed)	7.29E-06	0.08
BELASSLT Police Believe Suspect to be Assaultive	Pearson Correlation	0.01	0.018
	Sig. (2-tailed)	0.39	0.13

Table C-1 (cont'd)

		MEDPRIOR	REPEAT
BACKUP	Pearson Correlation		
Called for Backup	Sig. (2-tailed)		
NUMBERPO	Pearson Correlation		
Number of Officers at Completion of Arrest	Sig. (2-tailed)		
OFF1AGE	Pearson Correlation		
Actual Age of First Officer	Sig. (2-tailed)		
BLACK1	Pearson Correlation		
First Officer Black	Sig. (2-tailed)		
HISP1	Pearson Correlation		
First Officer Hispanic	Sig. (2-tailed)		
OTH1	Pearson Correlation		
First Officer Other Race	Sig. (2-tailed)		
MALE1	Pearson Correlation		
First Officer is Male	Sig. (2-tailed)		
PSDEMEAN	Pearson Correlation		
Police Demeanor Toward Suspect	Sig. (2-tailed)		
MEDPRIOR	Pearson Correlation	1	
Prior Medical Attention to Officer	Sig. (2-tailed)	.	
REPEAT	Pearson Correlation	0.03	1
Surveys Completed by this Officer	Sig. (2-tailed)	0.01	.
SUSPAGE	Pearson Correlation	0.02	0.01
Actual Age of First Suspect	Sig. (2-tailed)	0.05	0.77
BLACKS	Pearson Correlation	-0.04	-0.01
Black Suspect	Sig. (2-tailed)	0.01	0.83
HISPS	Pearson Correlation	0.05	-0.029
Hispanic Suspect	Sig. (2-tailed)	0.01	0.02
OTHS	Pearson Correlation	-0.01	-0.03
Other Race Suspect	Sig. (2-tailed)	0.58	0.02
SMISS	Pearson Correlation	-0.04	-0.12
Missing Race Suspect	Sig. (2-tailed)	0.01	3.24E-25
MALES	Pearson Correlation	-0.02	-0.02
Suspect is Male	Sig. (2-tailed)	0.1	0.19
BELASSLT	Pearson Correlation	0.01	-0.02
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.66	0.09

Table C-1 (cont'd)

		SUSPAGE	BLACKS
BACKUP	Pearson Correlation		
Called for Backup	Sig. (2-tailed)		
NUMBERPO	Pearson Correlation		
Number of Officers at Completion of Arrest	Sig. (2-tailed)		
OFF1AGE	Pearson Correlation		
Actual Age of First Officer	Sig. (2-tailed)		
BLACK1	Pearson Correlation		
First Officer Black	Sig. (2-tailed)		
HISP1	Pearson Correlation		
First Officer Hispanic	Sig. (2-tailed)		
OTH1	Pearson Correlation		
First Officer Other Race	Sig. (2-tailed)		
MALE1	Pearson Correlation		
First Officer is Male	Sig. (2-tailed)		
PSDEMEAN	Pearson Correlation		
Police Demeanor Toward Suspect	Sig. (2-tailed)		
MEDPRIOR	Pearson Correlation		
Prior Medical Attention to Officer	Sig. (2-tailed)		
REPEAT	Pearson Correlation		
Surveys Completed by this Officer	Sig. (2-tailed)		
SUSPAGE	Pearson Correlation	1	
Actual Age of First Suspect	Sig. (2-tailed)	.	
BLACKS	Pearson Correlation	-0.02	1
Black Suspect	Sig. (2-tailed)	0.06	.
HISPS	Pearson Correlation	-0.08	-0.37
Hispanic Suspect	Sig. (2-tailed)	7.36E-11	3.33E-217
OTHS	Pearson Correlation	-0.01	-0.14
Other Race Suspect	Sig. (2-tailed)	0.35	1.23E-29
SMISS	Pearson Correlation	-0.03	0.02
Missing Race Suspect	Sig. (2-tailed)	0.02	0.11
MALES	Pearson Correlation	0.03	-0.01
Suspect is Male	Sig. (2-tailed)	0.02	0.34
BELASSLT	Pearson Correlation	0.01	0.04
Police Believe Suspect to be Assaultive	Sig. (2-tailed)	0.46	0.01

Table C-1 (cont'd)

		HISPS	OTHS
BACKUP Called for Backup	Pearson Correlation		
	Sig. (2-tailed)		
NUMBERPO Number of Officers at Completion of Arrest	Pearson Correlation		
	Sig. (2-tailed)		
OFF1AGE Actual Age of First Officer	Pearson Correlation		
	Sig. (2-tailed)		
BLACK1 First Officer Black	Pearson Correlation		
	Sig. (2-tailed)		
HISP1 First Officer Hispanic	Pearson Correlation		
	Sig. (2-tailed)		
OTH1 First Officer Other Race	Pearson Correlation		
	Sig. (2-tailed)		
MALE1 First Officer is Male	Pearson Correlation		
	Sig. (2-tailed)		
PSDEMEAN Police Demeanor Toward Suspect	Pearson Correlation		
	Sig. (2-tailed)		
MEDPRIOR Prior Medical Attention to Officer	Pearson Correlation		
	Sig. (2-tailed)		
REPEAT Surveys Completed by this Officer	Pearson Correlation		
	Sig. (2-tailed)		
SUSPAGE Actual Age of First Suspect	Pearson Correlation		
	Sig. (2-tailed)		
BLACKS Black Suspect	Pearson Correlation		
	Sig. (2-tailed)		
HISPS Hispanic Suspect	Pearson Correlation	1	
	Sig. (2-tailed)	.	
OTHS Other Race Suspect	Pearson Correlation	-0.07	1
	Sig. (2-tailed)	2.38E-08	.
SMISS Missing Race Suspect	Pearson Correlation	0.01	-0.01
	Sig. (2-tailed)	0.74	0.26
MALES Suspect is Male	Pearson Correlation	0.08	0.01
	Sig. (2-tailed)	4.62E-12	0.58
BELASSLT Police Believe Suspect to be Assaultive	Pearson Correlation	-0.01	0.02
	Sig. (2-tailed)	0.33	0.06

Table C-1 (cont'd)

		SMISS	MALES	BELASSLT
BACKUP Called for Backup	Pearson Correlation			
	Sig. (2-tailed)			
NUMBERPO Number of Officers at Completion of Arrest	Pearson Correlation			
	Sig. (2-tailed)			
OFF1AGE Actual Age of First Officer	Pearson Correlation			
	Sig. (2-tailed)			
BLACK1 First Officer Black	Pearson Correlation			
	Sig. (2-tailed)			
HISP1 First Officer Hispanic	Pearson Correlation			
	Sig. (2-tailed)			
OTH1 First Officer Other Race	Pearson Correlation			
	Sig. (2-tailed)			
MALE1 First Officer is Male	Pearson Correlation			
	Sig. (2-tailed)			
PSDEMEAN Police Demeanor Toward Suspect	Pearson Correlation			
	Sig. (2-tailed)			
MEDPRIOR Prior Medical Attention to Officer	Pearson Correlation			
	Sig. (2-tailed)			
REPEAT Surveys Completed by this Officer	Pearson Correlation			
	Sig. (2-tailed)			
SUSPAGE Actual Age of First Suspect	Pearson Correlation			
	Sig. (2-tailed)			
BLACKS Black Suspect	Pearson Correlation			
	Sig. (2-tailed)			
HISPS Hispanic Suspect	Pearson Correlation			
	Sig. (2-tailed)			
OTHS Other Race Suspect	Pearson Correlation			
	Sig. (2-tailed)			
SMISS Missing Race Suspect	Pearson Correlation	1		
	Sig. (2-tailed)	.		
MALES Suspect is Male	Pearson Correlation	-0.01	1	
	Sig. (2-tailed)	0.44	.	
BELASSLT Police Believe Suspect to be Assaultive	Pearson Correlation	-0.01	-0.01	1
	Sig. (2-tailed)	0.93	0.84	.

Table C-1 (cont'd)

		LOCRIME	LOCHAZRD
KNOWEAPN	Pearson Correlation	0.12	0.2
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	4.36E-25	2.39E-64
GANG_RG	Pearson Correlation	0.12	0.13
Police Knowledge of Gang Membership	Sig. (2-tailed)	9.05E-23	8.84E-28
INTOX	Pearson Correlation	0.06	0.06
Suspect is Intoxicated	Sig. (2-tailed)	1.83E-06	1.68E-07
VFRIEND	Pearson Correlation	0.03	0.04
Victim is Friend of Suspect	Sig. (2-tailed)	0.02	0.01
VFAMILY	Pearson Correlation	-0.1	-0.02
Victim is Related to Suspect	Sig. (2-tailed)	5.77E-17	0.07
VUNK	Pearson Correlation	0.11	0.08
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	2.26E-20	8.35E-11
BUNK	Pearson Correlation	-0.01	-0.01
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.99	0.6
BSTRANGE	Pearson Correlation	-0.01	-0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.6	0.42
BFRIEND	Pearson Correlation	0.04	0.07
Bystander is Friend of Suspect	Sig. (2-tailed)	0.01	1.87E-08
BFAMILY	Pearson Correlation	-0.08	-0.01
Bystander is Related to Suspect	Sig. (2-tailed)	4.42E-12	0.46
SPDEMEAN	Pearson Correlation	0.07	0.09
Suspect Demeanor Toward Police	Sig. (2-tailed)	4.78E-09	6.15E-15
PHYSSUS	Pearson Correlation	0.06	0.09
Suspect Uses Physical Force	Sig. (2-tailed)	3.63E-07	4.49E-13
PTHREAT	Pearson Correlation	0.07	0.09
Police Use or Threaten Physical Force	Sig. (2-tailed)	1.43E-09	9.26E-13
MAXIMUM	Pearson Correlation	0.07	0.07
Average Maximum Force by Police	Sig. (2-tailed)	3.00E-09	2.76E-08

Table C-1 (cont'd)

		INSIDE	VISIBLE
KNOWEAPN	Pearson Correlation	0.04	-0.04
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.01	0.01
GANG_RG	Pearson Correlation	0.05	-0.01
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.67
INTOX	Pearson Correlation	-0.09	-0.11
Suspect is Intoxicated	Sig. (2-tailed)	2.40E-13	3.00E-20
VFRIEND	Pearson Correlation	-0.03	-0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.01	0.12
VFAMILY	Pearson Correlation	0.14	-0.03
Victim is Related to Suspect	Sig. (2-tailed)	1.64E-33	0.02
VUNK	Pearson Correlation	-0.17	-0.03
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	3.51E-46	0.03
BUNK	Pearson Correlation	-0.02	-0.01
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.06	0.34
BSTRANGE	Pearson Correlation	0.07	0.06
Bystander is Stranger to Suspect	Sig. (2-tailed)	3.23E-08	1.62E-07
BFRIEND	Pearson Correlation	0.06	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	1.38E-07	0.48
BFAMILY	Pearson Correlation	0.14	-0.05
Bystander is Related to Suspect	Sig. (2-tailed)	7.39E-33	0.01
SPDEMEAN	Pearson Correlation	-0.04	-0.09
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.01	9.34E-13
PHYSSUS	Pearson Correlation	-0.04	-0.09
Suspect Uses Physical Force	Sig. (2-tailed)	0.01	3.55E-14
PTHREAT	Pearson Correlation	-0.03	-0.1
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.01	1.24E-15
MAXIMUM	Pearson Correlation	-0.03	-0.07
Average Maximum Force by Police	Sig. (2-tailed)	0.01	7.17E-09

Table C-1 (cont'd)

		VIOLENT	WEEKEND
KNOWEAPN	Pearson Correlation	0.09	-0.01
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	3.83E-14	0.31
GANG_RG	Pearson Correlation	0.02	-0.02
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.08	0.14
INTOX	Pearson Correlation	-0.01	0.08
Suspect is Intoxicated	Sig. (2-tailed)	0.71	1.33E-11
VFRIEND	Pearson Correlation	-0.03	-0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.02	0.18
VFAMILY	Pearson Correlation	0.3	0.05
Victim is Related to Suspect	Sig. (2-tailed)	9.73E-139	0.01
VUNK	Pearson Correlation	-0.28	-0.06
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	2.59E-119	1.72E-06
BUNK	Pearson Correlation	-0.02	0.02
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.2	0.05
BSTRANGE	Pearson Correlation	-0.01	-0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.3	0.33
BFRIEND	Pearson Correlation	0.06	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	4.26E-07	0.8
BFAMILY	Pearson Correlation	0.1	0.04
Bystander is Related to Suspect	Sig. (2-tailed)	8.51E-16	0.01
SPDEMEAN	Pearson Correlation	0.09	0.03
Suspect Demeanor Toward Police	Sig. (2-tailed)	4.70E-13	0.01
PHYSSUS	Pearson Correlation	0.11	0.01
Suspect Uses Physical Force	Sig. (2-tailed)	4.21E-19	0.27
PTHREAT	Pearson Correlation	0.11	0.03
Police Use or Threaten Physical Force	Sig. (2-tailed)	7.28E-19	0.03
MAXIMUM	Pearson Correlation	0.09	0.02
Average Maximum Force by Police	Sig. (2-tailed)	1.25E-13	0.08

Table C-1 (cont'd)

		BPDEMEAN	NUMBERSO
KNOWEAPN	Pearson Correlation	0.07	0.13
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	7.66E-10	1.93E-26
GANG_RG	Pearson Correlation	0.06	0.05
Police Knowledge of Gang Membership	Sig. (2-tailed)	2.13E-07	0.01
INTOX	Pearson Correlation	0.04	0.01
Suspect is Intoxicated	Sig. (2-tailed)	0.01	0.42
VFRIEND	Pearson Correlation	0.01	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.28	0.46
VFAMILY	Pearson Correlation	-0.01	-0.04
Victim is Related to Suspect	Sig. (2-tailed)	0.86	0.01
VUNK	Pearson Correlation	0.02	0.05
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.06	0.01
BUNK	Pearson Correlation	-0.01	0.06
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.23	3.11E-07
BSTRANGE	Pearson Correlation	-0.01	-0.02
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.88	0.15
BFRIEND	Pearson Correlation	0.13	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	1.51E-25	0.42
BFAMILY	Pearson Correlation	0.1	-0.06
Bystander is Related to Suspect	Sig. (2-tailed)	2.14E-17	4.31E-06
SPDEMEAN	Pearson Correlation	0.19	0.02
Suspect Demeanor Toward Police	Sig. (2-tailed)	9.99E-57	0.06
PHYSSUS	Pearson Correlation	0.14	-0.01
Suspect Uses Physical Force	Sig. (2-tailed)	1.66E-30	0.43
PTHREAT	Pearson Correlation	0.13	0.06
Police Use or Threaten Physical Force	Sig. (2-tailed)	8.26E-27	2.61E-07
MAXIMUM	Pearson Correlation	0.08	0.08
Average Maximum Force by Police	Sig. (2-tailed)	4.96E-12	2.80E-12

Table C-1 (cont'd)

		CUSTODY	CIT2
KNOWEAPN	Pearson Correlation	-0.03	0.01
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.01	0.83
GANG_RG	Pearson Correlation	0.01	-0.01
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.46	0.32
INTOX	Pearson Correlation	-0.09	0.01
Suspect is Intoxicated	Sig. (2-tailed)	1.65E-12	0.9
VFRIEND	Pearson Correlation	-0.06	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	4.48E-07	0.23
VFAMILY	Pearson Correlation	-0.08	0.01
Victim is Related to Suspect	Sig. (2-tailed)	2.82E-11	0.68
VUNK	Pearson Correlation	-0.06	-0.01
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	3.35E-07	0.24
BUNK	Pearson Correlation	-0.04	0.02
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.01	0.1
BSTRANGE	Pearson Correlation	0.14	0.03
Bystander is Stranger to Suspect	Sig. (2-tailed)	6.88E-30	0.03
BFRIEND	Pearson Correlation	-0.06	0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	1.90E-07	0.24
BFAMILY	Pearson Correlation	-0.05	-0.02
Bystander is Related to Suspect	Sig. (2-tailed)	0.01	0.15
SPDEMEAN	Pearson Correlation	-0.04	0.01
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.01	0.4
PHYSSUS	Pearson Correlation	-0.05	0.01
Suspect Uses Physical Force	Sig. (2-tailed)	0.01	0.37
PTHREAT	Pearson Correlation	-0.08	0.02
Police Use or Threaten Physical Force	Sig. (2-tailed)	9.47E-11	0.15
MAXIMUM	Pearson Correlation	-0.09	0.03
Average Maximum Force by Police	Sig. (2-tailed)	9.07E-13	0.02

Table C-1 (cont'd)

		POL2	OTHAP2
KNOWEAPN	Pearson Correlation	0.06	-0.01
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	1.05E-06	0.38
GANG_RG	Pearson Correlation	0.05	-0.05
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.01
INTOX	Pearson Correlation	-0.06	0.06
Suspect is Intoxicated	Sig. (2-tailed)	1.47E-06	3.45E-07
VFRIEND	Pearson Correlation	0.06	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	1.96E-07	0.26
VFAMILY	Pearson Correlation	-0.14	-0.06
Victim is Related to Suspect	Sig. (2-tailed)	6.81E-30	2.31E-06
VUNK	Pearson Correlation	0.18	0.13
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	1.60E-52	5.23E-27
BUNK	Pearson Correlation	-0.05	0.1
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.01	1.60E-16
BSTRANGE	Pearson Correlation	-0.14	0.05
Bystander is Stranger to Suspect	Sig. (2-tailed)	5.99E-32	0.01
BFRIEND	Pearson Correlation	0.01	-0.08
Bystander is Friend of Suspect	Sig. (2-tailed)	0.46	1.57E-10
BFAMILY	Pearson Correlation	-0.05	-0.08
Bystander is Related to Suspect	Sig. (2-tailed)	0.01	3.62E-10
SPDEMEAN	Pearson Correlation	-0.08	-0.01
Suspect Demeanor Toward Police	Sig. (2-tailed)	2.11E-10	0.22
PHYSSUS	Pearson Correlation	-0.04	-0.02
Suspect Uses Physical Force	Sig. (2-tailed)	0.01	0.13
PTHREAT	Pearson Correlation	0.02	-0.04
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.04	0.01
MAXIMUM	Pearson Correlation	0.02	-0.03
Average Maximum Force by Police	Sig. (2-tailed)	0.05	0.01

Table C-1 (cont'd)

		PRIO2	SIREN2
KNOWEAPN	Pearson Correlation	0.04	0.04
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.01	0.01
GANG_RG	Pearson Correlation	0.01	0.03
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.88	0.02
INTOX	Pearson Correlation	0.02	0.02
Suspect is Intoxicated	Sig. (2-tailed)	0.07	0.12
VFRIEND	Pearson Correlation	-0.04	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.01	0.89
VFAMILY	Pearson Correlation	0.13	-0.06
Victim is Related to Suspect	Sig. (2-tailed)	1.72E-26	2.44E-07
VUNK	Pearson Correlation	-0.16	0.06
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	2.42E-40	8.58E-07
BUNK	Pearson Correlation	-0.07	-0.02
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	1.42E-09	0.19
BSTRANGE	Pearson Correlation	0.03	-0.04
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.02	0.01
BFRIEND	Pearson Correlation	0.05	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	0.01	0.83
BFAMILY	Pearson Correlation	0.08	-0.04
Bystander is Related to Suspect	Sig. (2-tailed)	1.86E-10	0.01
SPDEMEAN	Pearson Correlation	0.08	0.04
Suspect Demeanor Toward Police	Sig. (2-tailed)	2.20E-11	0.01
PHYSSUS	Pearson Correlation	0.07	0.04
Suspect Uses Physical Force	Sig. (2-tailed)	2.00E-08	0.01
PTHREAT	Pearson Correlation	0.1	0.07
Police Use or Threaten Physical Force	Sig. (2-tailed)	5.70E-16	1.95E-09
MAXIMUM	Pearson Correlation	0.07	0.07
Average Maximum Force by Police	Sig. (2-tailed)	1.63E-08	5.20E-09

Table C-1 (cont'd)

		NOTROUT2	OFFDUTY
KNOWEAPN	Pearson Correlation	0.04	0.03
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.01	0.01
GANG_RG	Pearson Correlation	0.02	0.02
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.05	0.12
INTOX	Pearson Correlation	0.01	0.01
Suspect is Intoxicated	Sig. (2-tailed)	0.6	0.98
VFRIEND	Pearson Correlation	0.01	-0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.28	0.98
VFAMILY	Pearson Correlation	0.01	-0.02
Victim is Related to Suspect	Sig. (2-tailed)	0.66	0.13
VUNK	Pearson Correlation	0.02	-0.02
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.04	0.08
BUNK	Pearson Correlation	0.03	0.04
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.02	0.01
BSTRANGE	Pearson Correlation	-0.03	0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.04	0.93
BFRIEND	Pearson Correlation	-0.01	0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	0.32	0.82
BFAMILY	Pearson Correlation	-0.02	-0.02
Bystander is Related to Suspect	Sig. (2-tailed)	0.1	0.07
SPDEMEAN	Pearson Correlation	0.01	0.02
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.26	0.08
PHYSSUS	Pearson Correlation	0.01	0.04
Suspect Uses Physical Force	Sig. (2-tailed)	0.3	0.01
PTHREAT	Pearson Correlation	0.06	0.03
Police Use or Threaten Physical Force	Sig. (2-tailed)	1.72E-07	0.01
MAXIMUM	Pearson Correlation	0.03	0.02
Average Maximum Force by Police	Sig. (2-tailed)	0.03	0.11

Table C-1 (cont'd)

		BACKUP	NUMBERPO
KNOWEAPN	Pearson Correlation	0.07	0.16
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	1.73E-09	5.45E-40
GANG_RG	Pearson Correlation	0.06	0.06
Police Knowledge of Gang Membership	Sig. (2-tailed)	4.09E-06	1.67E-06
INTOX	Pearson Correlation	-0.03	0.03
Suspect is Intoxicated	Sig. (2-tailed)	0.01	0.01
VFRIEND	Pearson Correlation	-0.01	-0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.74	0.09
VFAMILY	Pearson Correlation	0.01	-0.01
Victim is Related to Suspect	Sig. (2-tailed)	0.49	0.35
VUNK	Pearson Correlation	-0.06	0.01
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	2.48E-06	0.35
BUNK	Pearson Correlation	0.01	0.03
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.38	0.02
BSTRANGE	Pearson Correlation	-0.01	0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.48	0.78
BFRIEND	Pearson Correlation	0.06	0.05
Bystander is Friend of Suspect	Sig. (2-tailed)	7.86E-07	0.01
BFAMILY	Pearson Correlation	0.01	0.01
Bystander is Related to Suspect	Sig. (2-tailed)	0.29	0.7
SPDEMEAN	Pearson Correlation	0.08	0.12
Suspect Demeanor Toward Police	Sig. (2-tailed)	1.20E-11	4.19E-23
PHYSSUS	Pearson Correlation	0.08	0.12
Suspect Uses Physical Force	Sig. (2-tailed)	5.28E-11	6.29E-23
PTHREAT	Pearson Correlation	0.16	0.19
Police Use or Threaten Physical Force	Sig. (2-tailed)	2.54E-42	1.02E-59
MAXIMUM	Pearson Correlation	0.18	0.22
Average Maximum Force by Police	Sig. (2-tailed)	4.53E-52	2.25E-78

Table C-1 (cont'd)

		OFF1AGE	BLACK1
KNOWEAPN	Pearson Correlation	0.01	-0.02
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.92	0.1
GANG_RG	Pearson Correlation	-0.04	0.03
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.02
INTOX	Pearson Correlation	-0.02	0.01
Suspect is Intoxicated	Sig. (2-tailed)	0.06	0.8
VFRIEND	Pearson Correlation	-0.01	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.22	0.36
VFAMILY	Pearson Correlation	0.01	-0.01
Victim is Related to Suspect	Sig. (2-tailed)	0.66	0.27
VUNK	Pearson Correlation	-0.01	-0.01
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.34	0.88
BUNK	Pearson Correlation	0.01	0.01
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.59	0.65
BSTRANGE	Pearson Correlation	0.02	0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.05	0.73
BFRIEND	Pearson Correlation	-0.02	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	0.14	0.88
BFAMILY	Pearson Correlation	0.01	0.01
Bystander is Related to Suspect	Sig. (2-tailed)	0.59	0.53
SPDEMEAN	Pearson Correlation	-0.05	-0.01
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.01	0.69
PHYSSUS	Pearson Correlation	-0.03	0.01
Suspect Uses Physical Force	Sig. (2-tailed)	0.01	0.76
PTHREAT	Pearson Correlation	-0.05	0.01
Police Use or Threaten Physical Force	Sig. (2-tailed)	6.78E-06	0.67
MAXIMUM	Pearson Correlation	-0.04	0.01
Average Maximum Force by Police	Sig. (2-tailed)	0.01	0.58

Table C-1 (cont'd)

		HISP1	OTH1
KNOWEAPN	Pearson Correlation	-0.01	0.01
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.45	0.69
GANG_RG	Pearson Correlation	-0.04	-0.01
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.93
INTOX	Pearson Correlation	0.03	0.01
Suspect is Intoxicated	Sig. (2-tailed)	0.03	0.91
VFRIEND	Pearson Correlation	0.01	0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.62	0.09
VFAMILY	Pearson Correlation	0.03	-0.03
Victim is Related to Suspect	Sig. (2-tailed)	0.02	0.02
VUNK	Pearson Correlation	0.01	0.03
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.45	0.03
BUNK	Pearson Correlation	0.02	0.04
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.07	0.01
BSTRANGE	Pearson Correlation	-0.01	-0.03
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.99	0.03
BFRIEND	Pearson Correlation	-0.02	-0.02
Bystander is Friend of Suspect	Sig. (2-tailed)	0.09	0.15
BFAMILY	Pearson Correlation	-0.02	-0.02
Bystander is Related to Suspect	Sig. (2-tailed)	0.09	0.05
SPDEMEAN	Pearson Correlation	0.02	-0.14
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.19	0.22
PHYSSUS	Pearson Correlation	0.01	-0.02
Suspect Uses Physical Force	Sig. (2-tailed)	0.63	0.07
PTHREAT	Pearson Correlation	0.03	-0.01
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.02	0.68
MAXIMUM	Pearson Correlation	-0.03	0.01
Average Maximum Force by Police	Sig. (2-tailed)	0.02	0.61

Table C-1 (cont'd)

		MALE1	PSDEMEAN
KNOWEAPN	Pearson Correlation	0.01	0.03
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.54	0.01
GANG_RG	Pearson Correlation	0.02	-0.01
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.07	0.59
INTOX	Pearson Correlation	0.01	0.02
Suspect is Intoxicated	Sig. (2-tailed)	0.65	0.21
VFRIEND	Pearson Correlation	-0.01	-0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.22	0.87
VFAMILY	Pearson Correlation	-0.02	-0.01
Victim is Related to Suspect	Sig. (2-tailed)	0.15	0.6
VUNK	Pearson Correlation	0.02	-0.01
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.18	0.59
BUNK	Pearson Correlation	0.02	-0.01
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.05	0.98
BSTRANGE	Pearson Correlation	0.01	-0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.72	0.88
BFRIEND	Pearson Correlation	0.01	0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	0.5	0.82
BFAMILY	Pearson Correlation	-0.01	-0.01
Bystander is Related to Suspect	Sig. (2-tailed)	0.29	0.28
SPDEMEAN	Pearson Correlation	0.01	0.1
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.34	2.12E-17
PHYSSUS	Pearson Correlation	-0.01	0.06
Suspect Uses Physical Force	Sig. (2-tailed)	0.58	2.38E-06
PTHREAT	Pearson Correlation	0.05	0.06
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.01	2.27E-07
MAXIMUM	Pearson Correlation	0.03	0.05
Average Maximum Force by Police	Sig. (2-tailed)	0.01	5.25E-06

Table C-1 (cont'd)

		MEDPRIOR	REPEAT
KNOWEAPN	Pearson Correlation	0.01	-0.03
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.22	0.01
GANG_RG	Pearson Correlation	-0.04	-0.03
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.02
INTOX	Pearson Correlation	0.03	0.05
Suspect is Intoxicated	Sig. (2-tailed)	0.01	0.01
VFRIEND	Pearson Correlation	-0.01	0.01
Victim is Friend of Suspect	Sig. (2-tailed)	0.48	0.31
VFAMILY	Pearson Correlation	0.03	-0.02
Victim is Related to Suspect	Sig. (2-tailed)	0.03	0.17
VUNK	Pearson Correlation	-0.02	0.06
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.21	1.73E-06
BUNK	Pearson Correlation	0.03	0.02
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.02	0.09
BSTRANGE	Pearson Correlation	0.05	-0.03
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.01	0.01
BFRIEND	Pearson Correlation	0.02	0.04
Bystander is Friend of Suspect	Sig. (2-tailed)	0.16	0.01
BFAMILY	Pearson Correlation	0.03	0.02
Bystander is Related to Suspect	Sig. (2-tailed)	0.03	0.11
SPDEMEAN	Pearson Correlation	0.04	0.01
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.01	0.33
PHYSSUS	Pearson Correlation	0.07	0.01
Suspect Uses Physical Force	Sig. (2-tailed)	1.21E-09	0.89
PTHREAT	Pearson Correlation	0.06	0.02
Police Use or Threaten Physical Force	Sig. (2-tailed)	3.36E-07	0.1
MAXIMUM	Pearson Correlation	0.08	0.1
Average Maximum Force by Police	Sig. (2-tailed)	3.01E-11	1.23E-16

Table C-1 (cont'd)

		SUSPAGE	BLACKS
KNOWEAPN	Pearson Correlation	-0.07	0.05
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	1.13E-08	0.01
GANG_RG	Pearson Correlation	-0.08	0.1
Police Knowledge of Gang Membership	Sig. (2-tailed)	6.97E-11	2.95E-18
INTOX	Pearson Correlation	0.13	-0.1
Suspect is Intoxicated	Sig. (2-tailed)	1.46E-25	1.19E-17
VFRIEND	Pearson Correlation	-0.01	0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.23	0.04
VFAMILY	Pearson Correlation	0.05	-0.01
Victim is Related to Suspect	Sig. (2-tailed)	0.01	0.45
VUNK	Pearson Correlation	-0.01	0.04
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.57	0.01
BUNK	Pearson Correlation	0.02	-0.11
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.06	6.44E-19
BSTRANGE	Pearson Correlation	0.01	-0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.47	0.3
BFRIEND	Pearson Correlation	-0.06	0.06
Bystander is Friend of Suspect	Sig. (2-tailed)	7.45E-07	1.38E-07
BFAMILY	Pearson Correlation	-0.02	0.04
Bystander is Related to Suspect	Sig. (2-tailed)	0.09	0.01
SPDEMEAN	Pearson Correlation	0.02	0.02
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.05	0.05
PHYSSUS	Pearson Correlation	-0.01	0.05
Suspect Uses Physical Force	Sig. (2-tailed)	0.46	0.01
PTHREAT	Pearson Correlation	-0.02	0.05
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.09	0.01
MAXIMUM	Pearson Correlation	0.01	0.02
Average Maximum Force by Police	Sig. (2-tailed)	0.58	0.06

Table C-1 (cont'd)

		HISPS	OTHS
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation	-0.01	0.02
	Sig. (2-tailed)	0.68	0.05
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation	-0.04	-0.01
	Sig. (2-tailed)	0.01	0.46
INTOX Suspect is Intoxicated	Pearson Correlation	0.06	0.02
	Sig. (2-tailed)	1.38E-07	0.1
VFRIEND Victim is Friend of Suspect	Pearson Correlation	-0.02	0.02
	Sig. (2-tailed)	0.05	0.17
VFAMILY Victim is Related to Suspect	Pearson Correlation	0.02	-0.01
	Sig. (2-tailed)	0.09	0.73
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation	-0.01	0.02
	Sig. (2-tailed)	0.37	0.11
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation	0.09	0.11
	Sig. (2-tailed)	2.12E-14	1.46E-21
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation	-0.01	-0.01
	Sig. (2-tailed)	0.83	0.25
BFRIEND Bystander is Friend of Suspect	Pearson Correlation	-0.03	-0.01
	Sig. (2-tailed)	0.02	0.95
BFAMILY Bystander is Related to Suspect	Pearson Correlation	0.01	-0.02
	Sig. (2-tailed)	0.73	0.07
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	0.01	-0.02
	Sig. (2-tailed)	0.97	0.1
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	0.01	-0.01
	Sig. (2-tailed)	0.31	0.63
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	0.01	0.01
	Sig. (2-tailed)	0.37	0.76
MAXIMUM Average Maximum Force by Police	Pearson Correlation	0.01	0.01
	Sig. (2-tailed)	0.33	0.6

Table C-1 (cont'd)

		SMISS	MALES
KNOWEAPN	Pearson Correlation	-0.02	0.06
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	0.09	3.69E-07
GANG_RG	Pearson Correlation	-0.05	0.02
Police Knowledge of Gang Membership	Sig. (2-tailed)	0.01	0.06
INTOX	Pearson Correlation	-0.01	0.05
Suspect is Intoxicated	Sig. (2-tailed)	0.71	0.01
VFRIEND	Pearson Correlation	0.01	-0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.42	0.09
VFAMILY	Pearson Correlation	0.01	0.03
Victim is Related to Suspect	Sig. (2-tailed)	0.71	0.03
VUNK	Pearson Correlation	0.03	-0.02
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.01	0.1
BUNK	Pearson Correlation	-0.04	0.03
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.01	0.04
BSTRANGE	Pearson Correlation	-0.01	-0.01
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.94	0.27
BFRIEND	Pearson Correlation	-0.01	-0.01
Bystander is Friend of Suspect	Sig. (2-tailed)	0.52	0.25
BFAMILY	Pearson Correlation	-0.01	-0.01
Bystander is Related to Suspect	Sig. (2-tailed)	0.45	0.47
SPDEMEAN	Pearson Correlation	0.01	0.04
Suspect Demeanor Toward Police	Sig. (2-tailed)	0.55	0.01
PHYSSUS	Pearson Correlation	-0.01	0.01
Suspect Uses Physical Force	Sig. (2-tailed)	0.63	0.3
PTHREAT	Pearson Correlation	-0.01	0.06
Police Use or Threaten Physical Force	Sig. (2-tailed)	0.9	2.38E-06
MAXIMUM	Pearson Correlation	-0.01	0.07
Average Maximum Force by Police	Sig. (2-tailed)	0.65	4.09E-08

Table C-1 (cont'd)

		BELASSLT	KNOWEAPN
KNOWEAPN	Pearson Correlation	0.32	1
Police Believe Suspect Carries Weapon	Sig. (2-tailed)	4.65E-161	.
GANG_RG	Pearson Correlation	0.17	0.29
Police Knowledge of Gang Membership	Sig. (2-tailed)	2.14E-46	3.53E-132
INTOX	Pearson Correlation	0.04	0.01
Suspect is Intoxicated	Sig. (2-tailed)	0.01	0.25
VFRIEND	Pearson Correlation	-0.02	0.02
Victim is Friend of Suspect	Sig. (2-tailed)	0.07	0.18
VFAMILY	Pearson Correlation	0.04	-0.03
Victim is Related to Suspect	Sig. (2-tailed)	0.01	0.03
VUNK	Pearson Correlation	-0.05	-0.01
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)	0.01	0.95
BUNK	Pearson Correlation	-0.01	0.01
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)	0.51	0.4
BSTRANGE	Pearson Correlation	-0.02	-0.02
Bystander is Stranger to Suspect	Sig. (2-tailed)	0.13	0.21
BFRIEND	Pearson Correlation	0.03	0.03
Bystander is Friend of Suspect	Sig. (2-tailed)	0.01	0.02
BFAMILY	Pearson Correlation	0.01	-0.01
Bystander is Related to Suspect	Sig. (2-tailed)	0.21	0.79
SPDEMEAN	Pearson Correlation	0.09	0.05
Suspect Demeanor Toward Police	Sig. (2-tailed)	6.53E-13	0.01
PHYSSUS	Pearson Correlation	0.07	0.04
Suspect Uses Physical Force	Sig. (2-tailed)	2.41E-08	0.01
PTHREAT	Pearson Correlation	0.08	0.12
Police Use or Threaten Physical Force	Sig. (2-tailed)	3.06E-11	4.01E-22
MAXIMUM	Pearson Correlation	0.07	0.11
Average Maximum Force by Police	Sig. (2-tailed)	3.49E-08	4.68E-20

Table C-1 (cont'd)

		GANG_RG	INTOX
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation		
	Sig. (2-tailed)		
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation	1	
	Sig. (2-tailed)	.	
INTOX Suspect is Intoxicated	Pearson Correlation	-0.01	1
	Sig. (2-tailed)	0.61	.
VFRIEND Victim is Friend of Suspect	Pearson Correlation	0.01	-0.01
	Sig. (2-tailed)	0.53	0.97
VFAMILY Victim is Related to Suspect	Pearson Correlation	-0.05	0.02
	Sig. (2-tailed)	0.01	0.09
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation	0.01	0.05
	Sig. (2-tailed)	0.68	0.01
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation	-0.03	0.08
	Sig. (2-tailed)	0.02	4.16E-10
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation	-0.02	-0.01
	Sig. (2-tailed)	0.12	0.23
BFRIEND Bystander is Friend of Suspect	Pearson Correlation	0.01	-0.02
	Sig. (2-tailed)	0.28	0.05
BFAMILY Bystander is Related to Suspect	Pearson Correlation	-0.01	-0.02
	Sig. (2-tailed)	0.63	0.19
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	0.05	0.18
	Sig. (2-tailed)	0.01	2.11E-51
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	0.03	0.12
	Sig. (2-tailed)	0.01	3.24E-23
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	0.04	0.11
	Sig. (2-tailed)	0.01	4.84E-21
MAXIMUM Average Maximum Force by Police	Pearson Correlation	-0.01	0.12
	Sig. (2-tailed)	0.26	1.03E-22

Table C-1 (cont'd)

		VFRIEND	VFAMILY
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation		
	Sig. (2-tailed)		
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation		
	Sig. (2-tailed)		
INTOX Suspect is Intoxicated	Pearson Correlation		
	Sig. (2-tailed)		
VFRIEND Victim is Friend of Suspect	Pearson Correlation	1	
	Sig. (2-tailed)	.	
VFAMILY Victim is Related to Suspect	Pearson Correlation	-0.33	1
	Sig. (2-tailed)	1.68E-168	.
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation	0.32	-0.11
	Sig. (2-tailed)	4.26E-159	1.76E-19
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation	0.01	0.01
	Sig. (2-tailed)	0.83	0.84
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation	-0.08	-0.06
	Sig. (2-tailed)	3.19E-12	3.64E-06
BFRIEND Bystander is Friend of Suspect	Pearson Correlation	0.08	0.03
	Sig. (2-tailed)	4.41E-11	0.01
BFAMILY Bystander is Related to Suspect	Pearson Correlation	0.01	0.19
	Sig. (2-tailed)	0.63	6.57E-56
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	-0.018	0.02
	Sig. (2-tailed)	0.14	0.11
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	-0.03	0.02
	Sig. (2-tailed)	0.02	0.06
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	-0.02	0.02
	Sig. (2-tailed)	0.05	0.18
MAXIMUM Average Maximum Force by Police	Pearson Correlation	-0.02	-0.01
	Sig. (2-tailed)	0.07	0.48

Table C-1 (cont'd)

		VUNK	BUNK
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation		
	Sig. (2-tailed)		
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation		
	Sig. (2-tailed)		
INTOX Suspect is Intoxicated	Pearson Correlation		
	Sig. (2-tailed)		
VFRIEND Victim is Friend of Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VFAMILY Victim is Related to Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation	1	
	Sig. (2-tailed)	.	
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation	0.04	1
	Sig. (2-tailed)	0.01	.
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation	-0.13	-0.12
	Sig. (2-tailed)	4.28E-29	1.37E-23
BFRIEND Bystander is Friend of Suspect	Pearson Correlation	0.01	-0.12
	Sig. (2-tailed)	0.4	8.96E-24
BFAMILY Bystander is Related to Suspect	Pearson Correlation	-0.06	-0.09
	Sig. (2-tailed)	2.30E-06	7.52E-13
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	-0.03	0.02
	Sig. (2-tailed)	0.01	0.09
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	-0.03	0.03
	Sig. (2-tailed)	0.02	0.01
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	-0.03	0.02
	Sig. (2-tailed)	0.07	0.04
MAXIMUM Average Maximum Force by Police	Pearson Correlation	-0.02	0.05
	Sig. (2-tailed)	0.14	0.01

Table C-1 (cont'd)

		BSTRANGE	BFRIEND
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation		
	Sig. (2-tailed)		
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation		
	Sig. (2-tailed)		
INTOX Suspect is Intoxicated	Pearson Correlation		
	Sig. (2-tailed)		
VFRIEND Victim is Friend of Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VFAMILY Victim is Related to Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation		
	Sig. (2-tailed)		
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation		
	Sig. (2-tailed)		
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation	1	
	Sig. (2-tailed)	.	
BFRIEND Bystander is Friend of Suspect	Pearson Correlation	-0.17	1
	Sig. (2-tailed)	2.42E-45	.
BFAMILY Bystander is Related to Suspect	Pearson Correlation	-0.12	-0.12
	Sig. (2-tailed)	8.20E-24	5.36E-24
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	0.03	0.04
	Sig. (2-tailed)	0.02	0.01
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	0.02	0.06
	Sig. (2-tailed)	0.04	4.97E-07
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	0.03	0.06
	Sig. (2-tailed)	0.02	4.92E-06
MAXIMUM Average Maximum Force by Police	Pearson Correlation	0.04	0.06
	Sig. (2-tailed)	0.01	0.01

Table C-1 (cont'd)

		BFAMILY	SPDEMEAN
KNOWEAPN Police Believe Suspect Carries Weapon	Pearson Correlation		
	Sig. (2-tailed)		
GANG_RG Police Knowledge of Gang Membership	Pearson Correlation		
	Sig. (2-tailed)		
INTOX Suspect is Intoxicated	Pearson Correlation		
	Sig. (2-tailed)		
VFRIEND Victim is Friend of Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VFAMILY Victim is Related to Suspect	Pearson Correlation		
	Sig. (2-tailed)		
VUNK Victim and Suspect have Unknown Relationship	Pearson Correlation		
	Sig. (2-tailed)		
BUNK Victim and Bystanders have Unknown Relationship	Pearson Correlation		
	Sig. (2-tailed)		
BSTRANGE Bystander is Stranger to Suspect	Pearson Correlation		
	Sig. (2-tailed)		
BFRIEND Bystander is Friend of Suspect	Pearson Correlation		
	Sig. (2-tailed)		
BFAMILY Bystander is Related to Suspect	Pearson Correlation	1	
	Sig. (2-tailed)	.	
SPDEMEAN Suspect Demeanor Toward Police	Pearson Correlation	0.01	1
	Sig. (2-tailed)	0.26	.
PHYSSUS Suspect Uses Physical Force	Pearson Correlation	0.03	0.48
	Sig. (2-tailed)	0.01	0
PTHREAT Police Use or Threaten Physical Force	Pearson Correlation	0.03	0.35
	Sig. (2-tailed)	0.01	8.67E-202
MAXIMUM Average Maximum Force by Police	Pearson Correlation	0.02	0.24
	Sig. (2-tailed)	0.12	1.34E-91

Table C-1 (cont'd)

		PHYSSUS	PTHREAT	MAXIMUM
KNOWEAPN	Pearson Correlation			
Police Believe Suspect Carries Weapon	Sig. (2-tailed)			
GANG_RG	Pearson Correlation			
Police Knowledge of Gang Membership	Sig. (2-tailed)			
INTOX	Pearson Correlation			
Suspect is Intoxicated	Sig. (2-tailed)			
VFRIEND	Pearson Correlation			
Victim is Friend of Suspect	Sig. (2-tailed)			
VFAMILY	Pearson Correlation			
Victim is Related to Suspect	Sig. (2-tailed)			
VUNK	Pearson Correlation			
Victim and Suspect have Unknown Relationship	Sig. (2-tailed)			
BUNK	Pearson Correlation			
Victim and Bystanders have Unknown Relationship	Sig. (2-tailed)			
BSTRANGE	Pearson Correlation			
Bystander is Stranger to Suspect	Sig. (2-tailed)			
BFRIEND	Pearson Correlation			
Bystander is Friend of Suspect	Sig. (2-tailed)			
BFAMILY	Pearson Correlation			
Bystander is Related to Suspect	Sig. (2-tailed)			
SPDEMEAN	Pearson Correlation			
Suspect Demeanor Toward Police	Sig. (2-tailed)			
PHYSSUS	Pearson Correlation	1		
Suspect Uses Physical Force	Sig. (2-tailed)	.		
PTHREAT	Pearson Correlation	0.48	1	
Police Use or Threaten Physical Force	Sig. (2-tailed)	0	.	
MAXIMUM	Pearson Correlation	0.32	0.6	1
Average Maximum Force by Police	Sig. (2-tailed)	3.16E-165	0	.

Appendix D

Table D-1: Descriptive Statistics (NUMBERSO, NUMBERPO, OFF1AGE, SUSPAGE, REPEAT)

VARIABLE NAME	VALUE	N	MEAN	SD
Number of Suspects at Completion of Arrest		5932	1.39	1.18
	1	5371		
	2	927		
	3	323		
	4	125		
	5	40		
	6	31		
	7	18		
	8	8		
	9	2		
	10	5		
	14	1		
	17	1		
	20	1		
	35	3		
Number of Officers at Completion of Arrest		5932	2.50	2.00
	1	1536		
	2	3028		
	3	1180		
	4	550		
	5	197		
	6	161		
	7	62		
	8	63		
	9	3		
	10	35		
	11	9		
	12	8		
	13	9		
	14	4		
	15	6		
	18	1		
	20	3		
	50	1		

Table D-1 (cont'd)

VARIABLE NAME	VALUE	N	MEAN	SD
Actual Age of First Officer		5932	32.46	6.57
	20	1		
	21	3		
	22	43		
	23	74		
	24	183		
	25	423		
	26	471		
	27	443		
	28	504		
	29	417		
	30	754		
	31	424		
	32	444		
	33	325		
	34	277		
	35	315		
	36	217		
	37	169		
	38	165		
	39	122		
	40	197		
	41	96		
	42	129		
	43	95		
	44	95		
	45	102		
	46	64		
	47	62		
	48	63		
	49	30		
	50	55		
	51	19		
	52	24		
	53	23		
	54	10		
	55	13		
	56	2		
	57	1		
	60	1		
	70	1		

Table D-1 (cont'd)

VARIABLE NAME	VALUE	N	MEAN	SD
Actual Age of Suspect		5932	31.17	9.76
	16	40		
	17	132		
	18	257		
	19	269		
	20	361		
	21	247		
	22	228		
	23	230		
	24	263		
	25	275		
	26	268		
	27	236		
	28	233		
	29	197		
	30	257		
	31	240		
	32	262		
	33	257		
	34	248		
	35	238		
	36	209		
	37	205		
	38	205		
	39	185		
	40	187		
	41	127		
	42	116		
	43	122		
	44	105		
	45	96		
	46	88		
	47	77		
	48	60		
	49	52		
	50	44		
	51	34		
	52	31		
	53	21		
	54	20		
	55	13		
	56	21		
	57	10		
	58	10		
	59	11		
	60	10		

Table D-1 (cont'd)

	VALUE	N	MEAN	SD
Actual Age of Suspect	61	9		
	62	9		
	63	5		
	64	9		
	65	9		
	66	1		
	68	3		
	69	3		
	70	3		
	72	4		
	73	1		
	74	1		
	75	1		
	78	1		

	VALUE	N	MEAN	SD
Number of Surveys Completed by this Officer		5932	4.60	4.00
	1	1445		
	2	1049		
	3	930		
	4	778		
	5	539		
	6	449		
	7	394		
	8	250		
	9	277		
	10	213		
	11	161		
	12	69		
	13	38		
	14	109		
	15	25		
	16	45		
	17	48		
	21	19		
	23	18		

Appendix E

The data used within this dissertation were obtained from the Police Use of Force Study. These data have been previously analyzed at the individual level, with an emphasis on explaining how these encounter-level characteristics can influence use of force behavior (Garner et al., 2002). The latter study noted that the association between these independent variables and the dependent variables was influenced by the incorporation of suspects' resistance, as well as the specific measure of force used. The tables presented below examine the effects of introducing neighborhood-level variables into the models used in these previous analyses.

Table E-1: Maximum Force Model

	SEVERITY				
	Garner et al. (2002)		Heraux (2006)		
Variable	**b**	**sig**	**b**	**sig**	**Consistency**
SD Police	5.03	Yes	N/A	N/A	Not Compared
DPD	3.95	Yes	3.73	Yes	Both Significant
SD Sheriff	6.99	Yes	4.44	Yes	Both Significant
Charlotte	3.43	Yes	0.30	No	Garner et al. Sig / Heraux NS
St. Pete	3.65	Yes	10.32	Yes	Both Significant
Loc. Criminal Activity	0.21	No	0.39	Yes	Garner et al. NS / Heraux Sig.
Loc. Hazardous	0.27	No	-0.08	No	Both Not Significant
Arrest Inside	N/A	N/A	0.13	No	Not Compared
Visibility	-0.18	Yes	-0.14	Yes	Both Significant
Violent Offense	1.25	Yes	0.72	Yes	Both Significant
Weekend	0.42	Yes	0.15	No	Garner et al. Sig / Heraux NS
Bystander Demeanor	0.04	No	-0.03	No	Both Not Significant
# Suspects	0.55	Yes	-0.01	No	Garner et al. Sig / Heraux NS
Patrol Division	0.37	No	N/A	N/A	Not Compared
Suspect in Custody	-0.54	Yes	-0.36	No	Garner et al. Sig / Heraux NS
Citizen Initiated	0.07	No	0.26	No	Both Not Significant
Police Initiated	0.22	No	0.20	No	Both Not Significant
Unknown Initiated	-0.14	Yes	-0.41	No	Garner et al. Sig / Heraux NS
Priority Call Approach	1.56	Yes	1.14	Yes	Both Significant
Lights and Sirens Approach	2.57	Yes	1.22	Yes	Both Significant
Unknown Approach	-0.23	No	-0.22	No	Both Not Significant

Table E-1 (cont'd)

Off-Duty	N/A	N/A	1.08	Yes	Not Compared
Called for Backup	1.21	Yes	1.05	Yes	Both Significant
# of Officers	2.61	Yes	0.72	Yes	Both Significant
Officer Age	-2.00	Yes	-0.06	Yes	Both Significant
Black Officer	-0.18	No	-0.20	No	Both Not Significant
Hispanic Officer	-0.55	No	-0.38	No	Both Not Significant
Other Race Officer	0.46	No	1.32	No	Both Not Significant
Male Officer	1.10	Yes	0.56	Yes	Both Significant
Police Demeanor	2.75	Yes	2.12	No	Garner et al. Sig / Heraux NS
Prior Medical Attention	0.87	Yes	0.33	No	Garner et al. Sig / Heraux NS
# of Surveys	N/A	N/A	-0.02	No	Not Compared
Suspect Age	-0.05	No	-0.02	No	Both Not Significant
Black Suspect	0.02	No	0.09	No	Both Not Significant
Hispanic Suspect	0.34	No	0.54	No	Both Not Significant
Other Race Suspect	-0.93	No	0.60	No	Both Not Significant
Missing Race Suspect	0.06	No	-0.02	No	Both Not Significant
Male Suspect	0.85	Yes	0.56	Yes	Both Significant
Suspect Assaultive	0.14	No	0.26	No	Both Not Significant
Suspect Weapon	1.98	Yes	1.65	Yes	Both Significant
Suspect Gang	N/A	N/A	0.52	No	Not Compared
Suspect Intoxicated	0.28	No	0.29	No	Both Not Significant
Victim and Suspect Friends	-1.17	Yes	-0.59	Yes	Both Significant
Victim and Suspect Family	-1.47	Yes	-0.51	Yes	Both Significant
Unknown Victim	-0.82	Yes	-0.13	No	Garner et al. Sig / Heraux NS
Unknown Bystander and Suspect	0.91	Yes	0.74	No	Garner et al. Sig / Heraux NS
Bystander and Suspect Strangers	0.52	Yes	0.44	Yes	Both Significant
Bystander and Suspect Friends	0.44	No	0.23	No	Both Not Significant
Bystander and Suspect Family	0.10	No	0.01	No	Both Not Significant
Suspect Antagonistic	1.11	Yes	1.61	Yes	Both Significant
Suspect Physical Resistance	7.30	Yes	5.92	Yes	Both Significant

Of the 52 independent variables tested in the maximum force model either by Garner et al. (2002) or in this dissertation, 6 were not directly compared due to their removal in either the former or the latter research due to multicollinearity. Of the remaining 46 variables, 36 produced the same result in both sets of research (i.e. the variable was statistically significant in both Garner et al. (2002) and in this dissertation, or the variable was not statistically significant in both Garner et al. (2002) and in this dissertation). Of the 10 instances where a variable's effects were different between the two sets of research, in 9 of those instances the variable was statistically significant in Garner et al. (2002) and not statistically significant in this dissertation. In the remaining instance, the variable was not statistically significant in Garner et al. (2002), yet was statistically significant in this dissertation. These results indicate that the inclusion of neighborhood-level variables in the current research has reduced the influence of numerous individual-level variables from prior research (Garner et al., 2002) below statistical significance. Considering that Garner et al. (2002: 743) acknowledged that the lack of neighborhood-level variables was a concern, it is believed that the results of the current research are theoretically and methodologically sound.

The results for the prevalence of force model are presented below,

Table E-2: Prevalence of Force Model

	PREVALENCE				
	Garner et al. (2002)		Heraux (2006)		
Variable	B	sig	B	sig	Consistency
SD Police	1.00	No	N/A	N/A	Not Compared
DPD	0.85	No	0.73	No	Both Not Significant
SD Sheriff	0.87	No	0.99	No	Both Not Significant
Charlotte	0.83	No	1.18	No	Both Not Significant
St. Pete	1.78	Yes	1.31	No	Garner et al. Sig / Heraux NS
Loc. Criminal Activity	1.32	Yes	1.17	No	Garner et al. Sig / Heraux NS
Loc. Hazardous	0.94	No	0.97	No	Both Not Significant
Arrest Inside	1.00	No	1.02	No	Both Not Significant
Visibility	0.02	No	0.96	Yes	Garner et al. NS / Heraux Sig.
Violent Offense	1.17	No	1.34	Yes	Garner et al. NS / Heraux Sig.
Weekend	1.18	Yes	1.15	No	Garner et al. Sig / Heraux NS
Bystander Demeanor	1.47	Yes	1.17	No	Garner et al. Sig / Heraux NS

Table E-2 (cont'd)

# Suspects	0.92	No	1.00	No	Both Not Significant
Patrol Division	N/A	N/A	N/A	N/A	Not Compared
Suspect in Custody	0.74	Yes	0.63	Yes	Both Significant
Citizen Initiated	1.10	No	1.23	No	Both Not Significant
Police Initiated	1.29	Yes	1.48	Yes	Both Significant
Unknown Initiated	0.87	No	1.04	No	Both Not Significant
Priority Call Approach	1.40	Yes	1.61	Yes	Both Significant
Lights and Sirens Approach	1.44	Yes	1.41	Yes	Both Significant
Unknown Approach	1.40	Yes	1.45	Yes	Both Significant
Off-Duty	1.26	No	1.21	No	Both Not Significant
Called for Backup	1.51	Yes	1.69	Yes	Both Significant
# of Officers	1.42	Yes	1.16	Yes	Both Significant
Officer Age	0.57	Yes	0.99	No	Garner et al. Sig / Heraux NS
Black Officer	1.07	No	1.06	No	Both Not Significant
Hispanic Officer	1.52	Yes	1.72	Yes	Both Significant
Other Race Officer	1.07	No	1.32	No	Both Not Significant
Male Officer	1.72	Yes	2.02	Yes	Both Significant
Police Demeanor	1.18	No	1.77	No	Both Not Significant
Prior Medical Attention	1.30	Yes	1.34	Yes	Both Significant
# of Surveys	0.92	No	1.00	No	Both Not Significant
Suspect Age	1.00	No	1.00	No	Both Not Significant
Black Suspect	1.19	No	1.09	No	Both Not Significant
Hispanic Suspect	1.19	No	1.13	No	Both Not Significant
Other Race Suspect	1.77	Yes	1.35	No	Garner et al. Sig / Heraux NS
Missing Race Suspect	1.24	No	1.46	No	Both Not Significant
Male Suspect	1.42	Yes	1.47	Yes	Both Significant
Suspect Assaultive	1.19	No	1.03	No	Both Not Significant
Suspect Weapon	1.59	Yes	1.91	Yes	Both Significant
Suspect Gang	0.66	Yes	0.93	No	Garner et al. Sig / Heraux NS
Suspect Intoxicated	1.23	Yes	1.35	Yes	Both Significant
Victim and Suspect Friends	0.75	No	0.93	No	Both Not Significant
Victim and Suspect Family	0.92	No	1.00	No	Both Not Significant
Unknown Victim	0.88	No	0.97	No	Both Not Significant
Unknown Bystander and Suspect	1.44	Yes	1.71	Yes	Both Significant
Bystander and Suspect Strangers	1.15	No	1.30	Yes	Garner et al. NS / Heraux Sig.
Bystander and Suspect Friends	1.24	No	1.16	No	Both Not Significant
Bystander and Suspect Family	1.28	No	1.30	No	Both Not Significant
Suspect Antagonistic	2.63	Yes	2.50	Yes	Both Significant
Suspect Physical Resistance	19.00	Yes	10.35	Yes	Both Significant

Of the 51 independent variables tested in the prevalence of force model either by Garner et al. (2002) or in this dissertation, 2 were not directly compared due to their removal in either the former or the latter research due to multicollinearity. Of the remaining 49 variables, 39 produced the same result in both sets of research (i.e. the variable was statistically significant in both Garner et al. (2002) and in this dissertation, or the variable was not statistically significant in both Garner et al. (2002) and in this dissertation). Of the 10 instances where a variable's effects were different between the two sets of research, in 7 of those instances the variable was statistically significant in Garner et al. (2002) and not statistically significant in this dissertation. In the remaining 3 instances, the variables were not statistically significant in Garner et al. (2002), yet were statistically significant in this dissertation. Once again, these results indicate that the inclusion of neighborhood-level variables in the current research has reduced the influence of numerous individual-level variables from prior research (Garner et al., 2002) below statistical significance.

Appendix F

The analyses in this dissertation used 350 Level-2 units (i.e. census tracts, the measure of neighborhood in the current work). However, the initial data collection encompassed 1,206 census tracts, distributed as follows: (1) Charlotte-Mecklenberg, NC had 128 census tracts; (2) Colorado Springs, CO had 97 census tracts; (3) Dallas, TX had 304 census tracts; (4) St. Petersburg, FL had 72 census tracts; and (5) San Diego, CA (city and county combined) had 605 census tracts. Of this total, 604 were removed from the analysis due to the fact that no arrest had occurred in that tract during data collection, and an additional 252 were removed from the analysis due to the fact that fewer than the appropriate HLM threshold of 5 cases (i.e. arrests) had occurred in that tract during data collection, leaving the final sample size of 350 census tracts. In other words, the limitation in this dissertation is that we are unable to include all census tracts for two reasons: (1) not all tracts had an arrest during the data collection period[86]; and (2) tracts with only one through four arrests present too little variation. The following discussion evaluates these tracts and seeks to determine: (1) their nature; and (2) the impact of removing them from the analyses.

It is instructive to begin by examining the impact of removing census tracts with no arrests by creating a dichotomous (i.e. arrest vs. no arrest) variable. As no arrests occurred in 604 of these tracts, a comparison on the dependent variables is not possible, since PUF only sampled use of force incidents in an arrest encounter. However, all of these tracts were used to create the

[86] This is due in large part to the fact that the data was originally collected to examine Level-1 effects, and thus not enough time was spent to ensure that data was collected in all neighborhoods. Such issues are inherent limitations in using secondary data.

concentrated disadvantage factor score which was entered into the analysis as a neighborhood-level variable. Therefore, differences in the variables used to create this factor can be analyzed in order to determine if there are significant differences between census tracts with and without an arrest.

Table F-1: Mean Differences in Arrest – No Arrest Census Tracts

Variable	6-SITE	CMPD	CSPD	DPD	SPPD	SDPD	SDSO
BLACK POP	-14.22 (.00*)	-4.08 (.00*)	-5.71 (.00*)	-5.49 (.00*)	-2.22 (.03*)	-4.86 (.00*)	-.26 (.80)
POV LEVEL	-12.29 (.00*)	-4.23 (.00*)	-3.92 (.00*)	-7.78 (.00*)	-3.83 (.00*)	-9.13 (.00*)	.68 (.50)
PUB ASST	-7.27 (.00*)	-3.60 (.00*)	-.93 (.36)	-5.11 (.00*)	-3.28 (.00*)	-7.51 (.00*)	.23 (.82)
FEM HOUSE	-10.58 (.00*)	-2.98 (.00*)	-3.61 (.00*)	-5.65 (.00*)	-4.20 (.00*)	-6.96 (.00*)	1.09 (.28)
TOT UNEM	-7.67 (.00*)	-4.33 (.00*)	-5.54 (.00*)	-5.66 (.00*)	-4.30 (.00*)	-5.76 (.00*)	.47 (.64)
DEN TOT18	-2.58 (.01*)	-1.84 (.07)	-4.58 (.00*)	-4.54 (.00*)	-4.66 (.00*)	-7.52 (.00*)	3.83 (.00*)
SPAT LAG2	-45.86 (.00*)	-48.80 (.00*)	-51.72 (.00*)	-35.11 (.00*)	-68.18 (.00*)	-102.39 (.00*)	-90.17 (.00*)

Of the 49 mean differences in these analyses, 42 were statistically significant, indicating that in the majority of situations there are significant differences in the demographic characteristics of census tracts with and without arrests. The exception is the county of San Diego (excluding the city of San Diego), in which there were significant differences only in the density of individuals under the age of 18, and in the spatial error correction term. Given that such significant differences exist between those census tracts with and without arrests, it is possible that these demographic characteristics are in fact better predictors of arrests than of use of force events. In order to explore this possibility, a logistic regression was conducted using the dichotomous arrest variable (i.e. arrest vs. no arrest) as a dependent variable.

Table F-2: Logistic Regression Analysis		
Variable Name	**B**	**Significance**
CONSTANT	**-5.78**	**.00***
BLACKPOP	.02	.23
POVLEVEL	**.06**	**.01***
PUBASST	.04	.44
FEMHOUSE	-.04	.26
TOTUNEM	-.07	.10
DENTOT18	-.15	.45
CSPD	**3.07**	**.00***
DPD	**1.91**	**.00***

Table F-2 (cont'd)		
SPPD	2.09	.17
SDPD	-1.08	.00*
SDSO	-1.01	.00*
SPATLAG2	.01	.00*
MODEL FIT: -2 Log Likelihood = 486.775		

The results of the logistic regression indicate that although there are significant mean differences between census tracts with and without arrests, these demographic characteristics are not generally predictive of the presence or absence of those arrests. In fact, the classification table from the logistic regression indicates that the observed arrest-no arrest census tracts match their predicted census tracts in 88.1% of the cases. It is also possible to examine the influences on arrest behavior by using a continuous variable regarding the number of arrests as the dependent variable. Using a negative binomial model in this analysis, we find that the results differ considerably from those of the logistic regression.

Table F-3: Negative Binomial Regression Analysis		
Variable Name	**B**	**Significance**
CONSTANT	**-1.96**	**.00***
BLACKPOP	**.008**	**.01***
POVLEVEL	**.07**	**.00***
PUBASST	-.02	.45
FEMHOUSE	**-.03**	**.03***
TOTUNEM	-.03	.07
DENTOT18	-.01	.88
CSPD	**1.65**	**.00***
DPD	**-.45**	**.01***
SPPD	**.98**	**.00***
SDPD	.12	.60
SDSO	.34	.88
SPATLAG2	**.42**	**.00***
ALPHA	**1.65**	**.00***
MODEL FIT: Restricted Log-Likelihood = -4901.006		

The alpha, or dispersion parameter, from the model confirms that the negative binomial model is appropriate for these data. With respect to the independent variables, three of the variables that comprise the concentrated disadvantage factor score (blackpop, povlevel, and femhouse) exhibit a statistically significant effect on arrests within a census tract. Thus, in contrast to the logistic regression analyses, the results of the negative binomial regression indicate that differences between independent variables established in Table 1 are, in fact, predictive of arrests within neighborhoods.

Considering that the results of the negative binomial regression indicate that arrest, when measured as a count variable, is influenced by neighborhood characteristics, it is instructive to now examine whether differences exist between those census tracts with 1 to 4 arrests and those tracts with 5 or more arrests. There were 252 of the former and 350 of the latter used in the analyses for this dissertation. Given that an arrest occurred in all of these census tracts, we are now able to compare them on the dependent variables. The physical force plus threats (PTHREAT) dependent variable was normalized by the number of arrests in the tract to account for the fact that tracts with more arrests present more opportunities for the use of force. Both the original variable and the normalized variable (NORMPREV) are used here for comparisons across tracts. Results for these analyses can be found in the table below. It should be noted that there were no census tracts with only 1 to 4 arrests in the city of San Diego, and thus the SDPD is excluded from these analyses.

Table F-4: Mean Differences in 1-4 Arrests – 5 or more Arrest Census Tracts							
Variable	**6-SITE**	**CMPD**	**CSPD**	**DPD**	**SPPD**	**SDPD**	**SDSO**
BLACK POP	**-5.95** (**.00***)	**-5.99** (**.00***)	**-2.48** (**.02***)	**-3.70** (**.00***)	**-2.47** (**.02***)	N/A	-.47 (.64)
POV LEVEL	**-9.55** (**.00***)	**-4.11** (**.00***)	**-4.11** (**.00***)	**-6.89** (**.00***)	**-3.35** (**.00***)	N/A	**-2.64** (**.01***)
PUB ASST	**-8.64** (**.00***)	**-4.02** (**.00***)	**-4.91** (**.00***)	**-4.59** (**.00***)	**-2.85** (**.01***)	N/A	-.89 (.38)
FEM HOUSE	**-7.54** (**.00***)	**-4.55** (**.00***)	**-2.39** (**.02***)	**-3.77** (**.00***)	**-3.18** (**.00***)	N/A	-1.71 (.10)
TOT UNEM	**-5.15** (**.00***)	**-3.33** (**.00***)	**-2.70** (**.01***)	**-3.79** (**.00***)	**-3.75** (**.00***)	N/A	-1.07 (.29)
DEN TOT18	**-3.99** (**.00***)	-.80 (.43)	.23 (.82)	**-2.79** (**.01***)	**-2.60** (**.02***)	N/A	-.98 (.33)
SPAT LAG2	**3.57** (**.00***)	-1.75 (.08)	-.57 (.57)	**4.79** (**.00***)	**2.16** (**.04***)	N/A	.62 (.54)
PTHREAT	**-11.45** (**.00***)	**-5.44** (**.00***)	**-4.16** (**.00***)	**-9.55** (**.00***)	**-2.90** (**.01***)	N/A	**-6.06** (**.00***)
MAX FORCE	.35 (.73)	.87 (.39)	-1.54 (.13)	-.01 (.99)	1.46 (.17)	N/A	.90 (.38)
NORM PREV	-.95 (.34)	.04 (.97)	**-2.36** (**.02***)	-.30 (.76)	.31 (.76)	N/A	-.24 (.81)

Of the 60 mean differences in these analyses, 39 were statistically significant. This indicates that there are significant differences in the demographic characteristics of census tracts with 1 to 4 arrests and those with 5 or more arrests. However, it is important to note that there was only 1 statistically significant mean difference among the 12 mean differences for both dependent variables ((MAXFORCE and NORMPREV). Thus, it would appear that the number of arrests made in a census tract does not influence either the prevalence or severity of force. This is further explored through regression analyses on both dependent variables.

Table F-5: Poisson Regression Analysis for Maximum Force

Variable Name	**B**	**Significance**
CONSTANT	**3.25**	**.00***
BLACKPOP	.0002	.69
POVLEVEL	-.0003	.82
PUBASST	.004	.18
FEMHOUSE	-.002	.44
TOTUNEM	.0008	.68
DENTOT18	-.0005	.73
CSPD	-.02	.50
DPD	**.12**	**.00***
SPPD	**.30**	**.00***
SDPD	**.09**	**.02***

Table F-5 (cont'd)		
SDSO	**.16**	**.00***
SPATLAG2	.00002	.65
ARREST2	-.002	.92
MODEL FIT: Restricted Log-Likelihood = -1871.328		

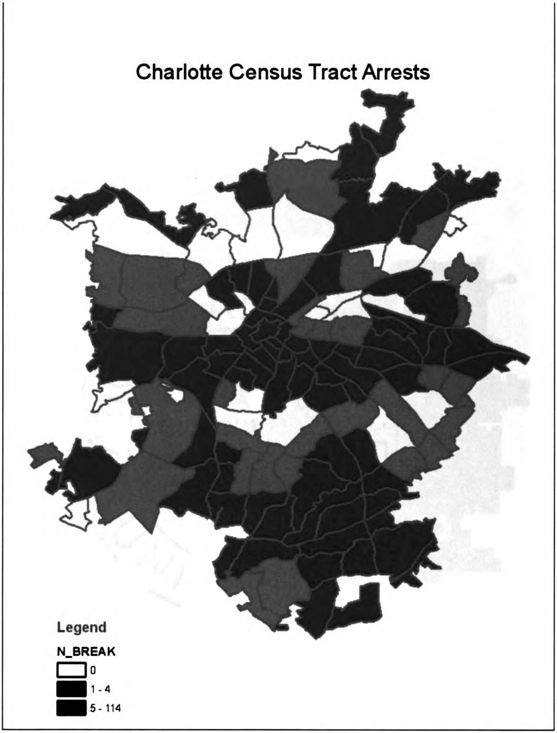
The regression analysis[87] presented in Table F-5 indicates that: (1) these neighborhood-level variables fail to explain the maximum amount of force used in an arrest encounter; and (2) the effect sizes for the statistically significant variables (city dichotomies) are extremely small. These results are consistent with those of this dissertation which used only the 350 census tracts with 5 or more arrests. More importantly, the dichotomous arrest variable (1-4 arrests vs. 5 or more arrests) used as an independent variable was not statistically significant, indicating that there is no appreciable difference in census tracts with 1 to 4 arrests when compared to census tracts with 5 or more arrests with regards to the maximum amount of force used in an encounter. Results for the prevalence of force are found in the table below.

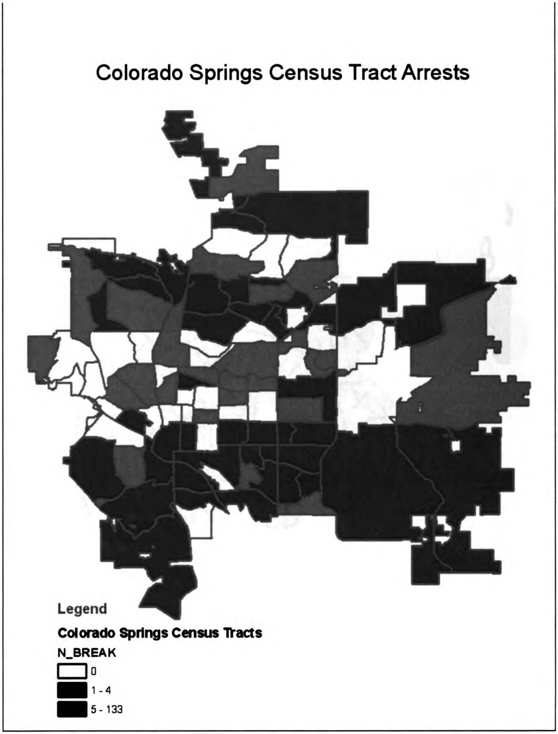
[87] Note that Poisson regression was used, as the overdispersion parameter indicated that negative binomial was not appropriate.

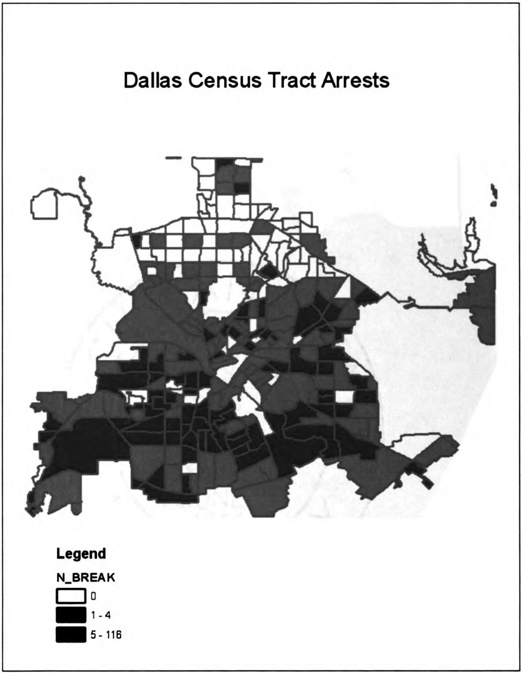
Table F-6: Negative Binomial Regression Analysis for Prevalence of Force		
Variable Name	**B**	**Significance**
CONSTANT	**2.52**	**.00***
BLACKPOP	.003	.56
POVLEVEL	.003	.82
PUBASST	.03	.44
FEMHOUSE	-.02	.30
TOTUNEM	.00004	.99
DENTOT18	-.10	.51
CSPD	-.41	.26
DPD	-.08	.74
SPPD	.15	.64
SDPD	.67	.87
SDSO	.13	.75
SPATLAG2	.0002	.70
ARREST2	.17	.40
ALPHA	**3.51**	**.00***
MODEL FIT: Restricted Log-Likelihood = -8526.979		

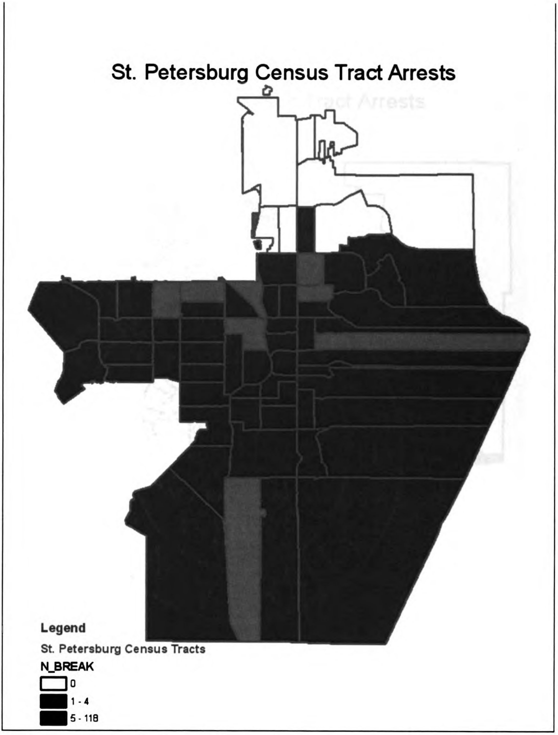
The regression analysis presented in Table F-6 indicates that these neighborhood-level variables fail to explain the prevalence of force. These results are again consistent with those of this dissertation which used only the 350 census tracts with 5 or more arrests. More importantly, there is once again no difference between census tracts with 1 to 4 arrests when compared to census tracts with 5 or more arrests with regards to the prevalence of force.

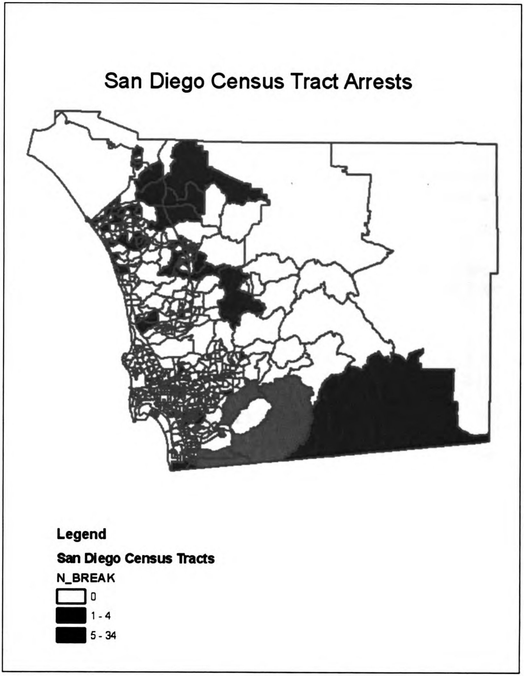
Overall, the analyses of this appendix have demonstrated that: (1) consistent with the results of this dissertation, demographic characteristics exert a negligible effect on both the prevalence and severity of force; (2) these demographic characteristics may be more effective predictors of arrest behavior than of use of force behavior; and (3) the differences between census tracts with 1 to 4 arrests and those with 5 or more arrests are negligible regarding the effect on the prevalence and severity of force. These results serve to strengthen confidence in the results of the current dissertation. The following pages present maps of each city with an indication of the number of arrests in each census tract.


Charlotte Census Tract Arrests
Legend
N_BREAK
0
1 - 4
5 - 114


Colorado Springs Census Tract Arrests
Legend
Colorado Springs Census Tracts
N_BREAK
0
1 - 4
5 - 133


Dallas Census Tract Arrests
Legend
N_BREAK
0
1 - 4
5 - 116


St. Petersburg Census Tract Arrests
Legend
St. Petersburg Census Tracts
N_BREAK
0
1 - 4
5 - 118


San Diego Census Tract Arrests
Legend
San Diego Census Tracts
N_BREAK
0
1 - 4
5 - 34

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